WELCOME

Self-Organizing Matter

Boulder School for Condensed Matter and Materials Physics 2024
(BSS2024)

24-rd School

University of Colorado at Boulder

$$$ ***NSF-DMR, CU Boulder, U of Chicago***

School's Founders

- Founded in 2000 by Steve Girvin, Matthew Fisher, Andy Millis and L.R.

Steve Girvin

Andy Millis

Matthew Fisher

Leo Radzihovsky

- Andy Millis -> Cristina Marchetti

School funding and operations

- NSF – DMR $300K/year, thanks Daryl Hess
- University of Colorado (CU) Physics Department
- Advisory board of 20 distinguished scientists
- Past schools from superconductivity to biophysics
  http://boulderschool.yale.edu/

Boulder School 2024

Self-organizing Matter: from Inanimate to Animate

https://boulderschool.yale.edu/2024/boulder-school-2024

Great program, thanks to hard work by the co-organizers:

Shiladitya Banerjee

Andela Saric

Eric Dufresne

Margaret Gardel

Local Details

- Assistants: ***audio/visual:*** *Tzu-Chi, Jack, Emil, Mert*
- Reimbursement: *Maura, Dakota* email: nanton@colorado.edu
- Library privileges upon request
- Rec center facilities (pool, weight-room, basketball court, climbing wall, soccer field, ice rink,…) free with C4C card and name tag
- Computers: *UCB guest wireless, eduroam*
- No alcohol in public areas
- No meals on weekends
- No housekeeping

Local Details

- Soccer ball, basketball, hiking guides,…need something? Ask!
- Discussion lounge in Buckingham, tv, etc
- Reserved special dining Tree House room (seats 20) in C4C for lunches and dinners (reserved dates posted in handout)
- AC in rooms only works with closed windows; close during the day

Things to do in Boulder

- Hiking (guides/maps available in the back)
- Biking (rent on the Hill)
- Tubing in the Boulder creek (3 tubes in back)
- Chautauqua park
- Shakespeare Festival
- Eldorado Canyon
- Rocky Mountain National Park
- Red Rocks Amphitheater
- Pearl Street Mall fine dining and hanging out

Discount for BSS attendees on BCycle

- Download the BCycle.app
- Select a Monthly Pass and uncheck "sign up for auto-renewal"
- Apply promo code BSS24: *gives $1 single ride first 5 days of BSS2024*
- Start riding! *Use the BCycle app to check out bikes and see system info*
- Keep every trip under 60 minutes to avoid overtime fees. A pre-authorization on your credit card will disappear within 1-3 business days

Participate

- Ask lots of questions
- Organize student seminars, discussions and tutorials
- Set up Slack
- Facebook group
- Actively participate in the poster/social sessions
- Organize research projects
- Meet classmates and lecturers
- ***T-shirts designs urgently needed!***

Remarks

If you feel lost or find the lectures unclear, don't be discouraged!

- Ask questions to the speakers

- Ask questions to the organizers

- Some of the students are more expert and are available to help, answer questions, organize tutorials, etc.

- The first lectures of every mini-course are critical: don't wait until you are lost

Special Events

- **Tonight:** *Participant Introductions, brief (1 min) comments about yourself, your social and scientific interests*
- **week 1-3 evenings:** *Poster Session preceded by 2 min slide-free advertisements*
- **Tuesday night week 2:** *special Indian dinner on 11th floor of Gamow Tower*
- **Monday night week 3:** *public lecture by Prakash*
- **Friday end of day each week:** *Problem solving, "What have we learned?" discussion*

Scientific Program

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1: July 1-5					
8:30 - 9:00	Welcome				
9:00 - 10:30	**W. Jacobs**	**W. Jacobs**	**W. Jacobs**	**M. Das**	**E. Matsumoto**
10:30 - 11:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:00 - 12:30	**M. Deserno**	**M. Deserno**	**M. Das**	**M. Deserno**	**M. Das**
12:30 - 13:45	Lunch	Lunch	Lunch	Lunch	Lunch
14:00 - 15:30	**P. Bassereau**	**P. Bassereau**	**E. Matsumoto**	**E. Matsumoto**	**Problem solving/ What have we learned? - A. Saric**
15:30 - 17:00	**Introductions**		**Problem solving - A. Saric (15:45-17:15)**		
Evening	**18:30-18:55 Poster Blurbs I 19:00 - 22:00 Poster Session I**	**18:00-20:30 Social (Dessert on Flagstaff Mtn.)**			**19:00 - 21:30 Catered Dinner**
Week 2: July 8-12					
9:00 - 10:30	**M.C. Marchetti**	**M.C. Marchetti**	**D. Zwicker**	**M.C. Marchetti**	**K. Wan**
10:30 - 11:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:00 - 12:30	**N. Mitchell**	**N. Mitchell**	**N. Mitchell**	**K. Wan**	**M. Prakash**
12:30 - 13:45	Lunch	Lunch	Lunch	Lunch	Lunch
14:00 - 15:30	**D. Zwicker**	**D. Zwicker**	**K. Wan**	**M. Prakash**	**Problem solving/ What have we learned? - M. Gardel**
Evening	**18:30-18:55 Poster Blurbs II 19:00 - 22:00 Poster Session II**		**Problem solving - M. Gardel (15:45-17:15)**		
Week 3: July 15-19					
9:00 - 10:30	**U. Schwarz**	**U. Schwarz**	**J. Yeomans**	**J. Yeomans**	**J. Yeomans**
10:30 - 11:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:00 - 12:30	**M. Manning**	**M. Manning**	**M. Manning**	**U. Schwarz**	**E. Hannezo**
12:30 - 13:45	Lunch		Lunch	Lunch	Lunch
14:00 - 15:30	**M. Murrell**	**M. Murrell**	**M. Murrell**	**E. Hannezo**	**Problem solving/ What have we learned? - S. Banerjee**
Evening	**19:00-20:00 Public Lecture, M. Prakash**	**18:30-18:55 Poster Blurbs III 19:00 - 22:00 Poster Session III**	**Problem solving - S. Banerjee (15:45-17:15)**		
Week 4 July 22-26					
9:00 - 10:30	**Y. Mao**	**Y. Mao**	**D. Durian**	**D. Durian**	**D. Durian**
10:30 - 11:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:00 - 12:30	**A. Liu**	**I. Cohen**	**V. Vitelli**	**V. Vitelli**	**V. Vitelli**
12:30 - 13:45	Lunch	Lunch	Lunch	Lunch	Lunch
14:00 - 15:30	**I. Cohen**	**A. Liu**	**A. Liu**	**I. Cohen**	**What have we learned? - E. Dufresne**
Evening			**Problem solving - E. Dufresne [15:45-17:15]**		

SELF-ORGANISING MATTER: FROM INANIMATE TO ANIMATE

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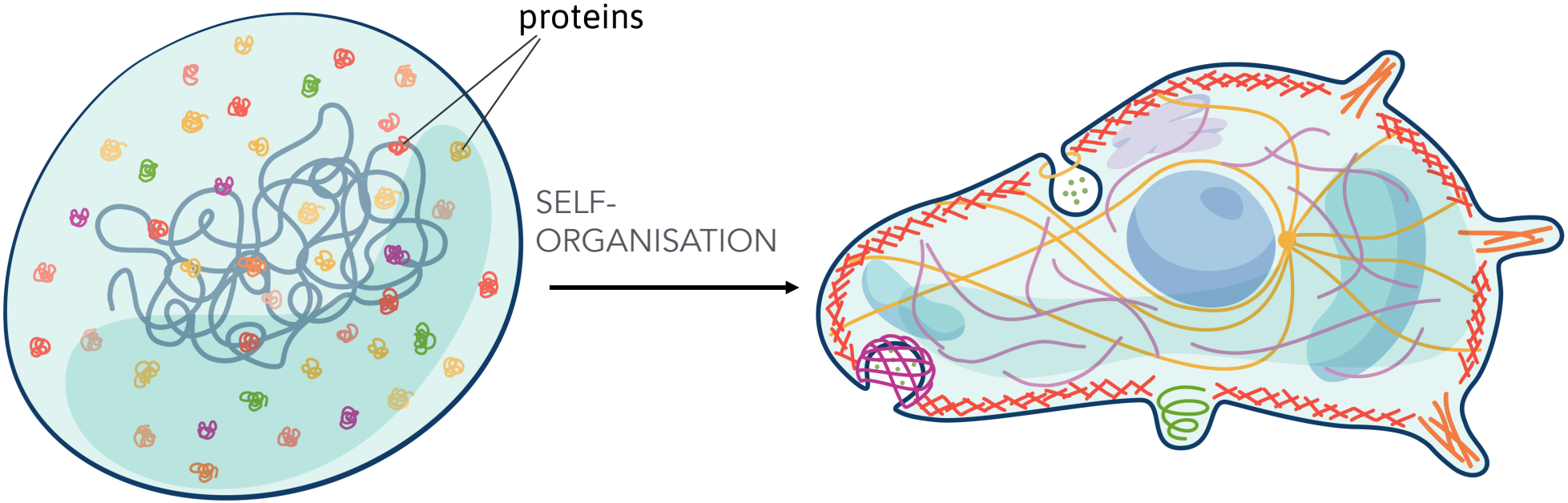

LIFE (by Wikipedia)

INSPIRATION FOR
MATERIALS
MAT

SELF-ORGANIZING MATTER: FROM INANIMATE TO ANIMATE

The 4-week journey:

Physics + **Biology** + **Engineering**.

SELF-ORGANIZING MATTER: FROM INANIMATE TO ANIMATE

The 4-week journey:

Week 1 – Self-organization near equilibrium (Andela Saric)
Rooted in soft matter and statistical physics: protein self-organisation into fibrils and networks, functional compartments, phase transition in cells, remodelling and sensing of biological membranes.

Week 2 – Self-organization far-from-equilibrium I: Motile Matter (Margaret Gardel)
Motility — key emergent property of self-organisation at nanoscale. Autonomous motion in living and non-living matter, from fluid droplets to synthetic gels, living cells to groups of organisms.

Week 3 – Self-organisation far from equilibrium II: Morphing Matter (Shila Banerjee)
Tissues & morphogenesis: cells change their individual shapes using mechanical and chemical cues, to create large scale organ/organism reshaping. Inspiration for programmable morphing materials.

Week 4 - Smart Engineered Matter (Eric Dufresne)
Self-organization principles in nature as an inspiration to design smart artificial matter capable of shape transformations, motion, reprogrammable structural and mechanical properties.

SELF-ORGANIZING MATTER:
FROM INANIMATE TO ANIMATE

The 4-week journey:
Working together, friendship, and community building.

2009

2011

WELCOME!