2015 Boulder Summer School
*Soft Matter In and Out of Equilibrium*

July 6 – 31, 2015

**Detailed schedule**

All lectures are in **Duane Physics Room G130**
Public lecture in **Duane Physics Room G1B30**

**Sunday, July 5th**
6:30pm – 8:30pm  
Registration mixer with refreshments
WeatherTech Café in the C4C

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**Week 1, July 6 – 10**

_Elasticity, chirality and frustration in soft matter_

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**Monday, July 6th**

8:30 – 9:00  
Leo Radzihovsky  
*Welcome and Introduction*

9:00 – 10:30  
Tom Lubensky  
_Elastomers and isostatic lattices I_

10:30 – 11:00  
Coffee Break

11:00 – 12:30  
Alex Levine  
_Filaments, membranes and surfaces I_

12:30 – 13:45  
Lunch

14:00 – 15:30  
Efi Efrati  
_Chirality and frustration I_

15:30 – 16:30  
participants’ introductions
Tuesday, July 7th

9:00 – 10:30  
**Tom Lubensky**  
*Elastomers and isostatic lattices II*

10:30 – 11:00  
Coffee Break

11:00 – 12:30  
**Efi Efrati**  
*Chirality and frustration II*

12:30 – 13:45  
Lunch

14:00 – 15:30  
**Alex Levine**  
*Filaments, membranes and surfaces II*

19:00 – 20:00  
**David Nelson** - Public lecture, Duane Physics G1B30  
*The Physics of Thermal Crumpling and Wrinkling*

Wednesday, July 8th

9:00 – 10:30  
**Tom Lubensky**  
*Elastomers and isostatic lattices III*

10:30 – 11:00  
Coffee Break

11:00 – 12:30  
**Efi Efrati**  
*Chirality and frustration III*

12:30 – 13:45  
Lunch

14:00 – 15:30  
**Alex Levine**  
*Filaments, membranes and surfaces III*

Thursday, July 9th

9:00 – 10:30  
**Vincenzo Vitelli**  
tutorial: *Topological mechanics I*

10:30 – 11:00  
Coffee Break

11:00 – 12:30  
**David Nelson**  
seminar: *Statistical mechanics of free-standing graphene ribbons*

12:30 – 13:45  
Lunch

14:00 – 15:30  
**Student activity**

19:00 – 22:00  
**Poster session I**  
11th Floor Commons Room
Friday, July 10th

9:00 – 10:30 William Irvine
Fluid hydrodynamics I

10:30 – 11:00 Coffee Break

11:00 – 12:30 Narayanan Menon
Mechanics of wrinkling, folding, & crumpling I

12:30 – 13:45 Lunch

14:00 – 15:30 Vincenzo Vitelli
tutorial: topological mechanics II

17:30 – 19:00 Weeks overview, discussion, Q&A
What have we learned?

19:00 – 21:30 Catered dinner (11th floor, Gamow Tower, Duane Physics)
Week 2, July 13 – 17
*Generalized elasticity and heterogeneity in soft matter*

### Monday, July 13th
- **9:00 – 10:30** Eric Dufresne  
  *Surface tension, droplets, & contact lines I*
- **10:30 – 11:00** Coffee Break
- **11:00 – 12:30** Narayanan Menon  
  *Mechanics of wrinkling, folding, & crumpling II*
- **12:30 – 13:45** Lunch
- **14:00 – 15:30** William Irvine  
  *Fluid hydrodynamics II*
- **15:30 – 17:00** Student activity

### Tuesday, July 14th
- **9:00 – 10:30** Leo Radzihovsky  
  *Introduction to quenched disorder I*
- **10:30 – 11:00** Coffee Break
- **11:00 – 12:30** Eric Dufresne  
  *Surface tension, droplets, & contact lines II*
- **12:30 – 13:45** Lunch
- **14:00 – 15:30** Oleg Lavrentovich  
  *Liquid crystals I*
- **18:00 – 20:00** Dessert on Flagstaff Mountain  
  *busses leave south of C4C at 6pm*

### Wednesday, July 15th
- **9:00 – 10:30** Narayanan Menon  
  *Mechanics of wrinkling, folding, & crumpling III*
- **10:30 – 11:00** Coffee Break
- **11:00 – 12:30** Leo Radzihovsky  
  *Introduction to quenched disorder II*
- **12:30 – 13:45** Lunch
- **14:00 – 15:30** Oleg Lavrentovich  
  *Liquid crystals II*
- **19:00 – 22:00** Poster session II  
  *11th floor Commons Room*
Thursday, July 16th

9:00 – 10:30  Eric Dufresne  
Surface tension, droplets, & contact lines III
10:30 – 11:00  Coffee Break
11:00 – 12:30  Leo Radzihovsky  
Introduction to quenched disorder III
12:30 – 13:45  Lunch
14:00 – 15:30  Oleg Lavrentovich  
Liquid crystals III

Friday, July 17th

9:00 – 10:30  Noel Clark  
seminar: Chiral liquid crystals, DNA, origin of life
10:30 – 11:00  Coffee Break
11:00 – 12:30  Ivan Smalyukh  
seminar: Liquid crystals skyrmions, topological colloids
12:30 – 13:45  Lunch
14:00 – 15:30  Student Activity
15:30 – 16:30  Weeks overview, discussion, Q&A  
What have we learned?
<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Seminar</th>
<th>Title</th>
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<tbody>
<tr>
<td>Monday, July</td>
<td>9:00 – 10:30</td>
<td>Sid Nagel</td>
<td>glasses I</td>
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<td>20&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10:30 – 11:00</td>
<td>Coffee Break</td>
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<td>11:00 – 12:30</td>
<td>William Irvine</td>
<td>seminar: Life of vortex knots: conservation of helicity across scales</td>
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<td>12:30 – 13:45</td>
<td>Lunch</td>
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<td>14:00 – 15:30</td>
<td>Noel Clark</td>
<td>seminar: Athermal photo-fluidization of glasses</td>
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<tr>
<td>Tuesday, July</td>
<td>9:00 – 10:30</td>
<td>Sid Nagel</td>
<td>glasses II</td>
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<td>21&lt;sup&gt;st&lt;/sup&gt;</td>
<td>10:30 – 11:00</td>
<td>Coffee Break</td>
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<td>11:00 – 12:30</td>
<td>William Irvine</td>
<td>seminar: Topological mechanics of gyroscopic metamaterials</td>
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<td>12:30 – 13:45</td>
<td>Lunch</td>
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<td>14:00 – 15:30</td>
<td>student activity</td>
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<tr>
<td>Wednesday, July</td>
<td>9:00 – 10:30</td>
<td>Pierre Le Doussal</td>
<td>Driven disordered systems I</td>
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<td>22&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>10:30 – 11:00</td>
<td>Coffee Break</td>
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<td>11:00 – 12:30</td>
<td>Sid Nagel</td>
<td>glasses III</td>
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<td>12:30 – 13:45</td>
<td>Lunch</td>
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<td>14:00 – 15:30</td>
<td>Leo Radzihovsky</td>
<td>seminar: “Critical” soft matter: liquid crystals, membranes, &amp; elastomers</td>
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<td>19:00 – 22:00</td>
<td>Poster session III</td>
<td>11&lt;sup&gt;th&lt;/sup&gt; Floor Commons Room</td>
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Thursday, July 23\textsuperscript{rd}

9:00 – 10:30   Pierre Le Doussal  

\textit{Driven disordered systems II}

10:30 – 11:00   Coffee Break

11:00 – 12:30   Mark Bowick  

seminar: \textit{Flat faces from floppy vesicles}

12:30 – 13:45   Lunch

14:00 – 15:30   Student activity

Friday, July 24\textsuperscript{nd}

9:00 – 10:30   Pierre Le Doussal  

\textit{Driven disordered systems III}

10:30 – 11:00   Coffee Break

11:00 – 12:30   Cristina Marchetti  

\textit{Microscopics to hydrodynamics of active matter I}

12:30 – 13:45   Lunch

14:00 – 15:30   Lisa Manning  

seminar: \textit{Computational glassy dynamics in cell}

15:30 – 16:30   \textbf{Weeks overview, discussion, Q\&A}

\textit{What have we learned?}

19:00 – 21:30   \textbf{Catered dinner} (11\textsuperscript{th} floor, Gamow Tower, Duane Physics)
### Week 4, July 27 – 31

**Active matter**

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Speaker</th>
<th>Topic</th>
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<tr>
<td><strong>Monday, July 27</strong>&lt;sup&gt;th&lt;/sup&gt;</td>
<td>9:00 – 10:30</td>
<td>John Toner</td>
<td><em>Hydrodynamics of active matter I</em></td>
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<td>10:30 – 11:00</td>
<td>Coffee Break</td>
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<td>11:00 – 12:30</td>
<td>Cristina Marchetti</td>
<td><em>Microscopics to hydrodynamics of active matter II</em></td>
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<td>12:30 – 14:00</td>
<td>Lunch</td>
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<td>14:00 – 15:30</td>
<td>Zvonimir Dogic</td>
<td><em>Active liquid crystals I</em></td>
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<td><strong>Tuesday, July 28</strong>&lt;sup&gt;th&lt;/sup&gt;</td>
<td>9:00 – 10:30</td>
<td>Jean-François Joanny</td>
<td><em>Cytoskeletons, cells, tissue I</em></td>
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<td>10:30 – 11:00</td>
<td>Coffee Break</td>
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<td>11:00 – 12:30</td>
<td>John Toner</td>
<td><em>Hydrodynamics of active matter II</em></td>
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<td>12:30 – 13:45</td>
<td>Lunch</td>
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<td>14:00 – 15:30</td>
<td>Cristina Marchetti</td>
<td><em>Microscopics to hydrodynamics of active matter III</em></td>
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<td><strong>Wednesday, July 29</strong>&lt;sup&gt;th&lt;/sup&gt;</td>
<td>9:00 – 10:30</td>
<td>Jean- François Joanny</td>
<td><em>Cytoskeletons, cells, tissue II</em></td>
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<td>11:00 – 12:30</td>
<td>John Toner</td>
<td><em>Hydrodynamics of active III</em></td>
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<td>12:30 – 13:45</td>
<td>Lunch</td>
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<td>14:00 – 15:30</td>
<td>Jennifer Ross</td>
<td><em>Microtubules organization</em></td>
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Thursday, July 30th
9:00 – 10:30  Jean-François Joanny  
*Cytoskeletons, cells, tissue III*
10:30 – 11:00  
Coffee Break
11:00 – 12:30  Zvonimir Dogic  
*Active liquid crystals II*
12:30 – 13:45  
Lunch
14:00 – 15:30  Mark Bowick  
seminar: *Shape-shifting droplet networks*

Friday, July 31st
9:00 – 10:30  Zvonimir Dogic  
*Active liquid crystals III*
10:30 – 11:00  
Coffee Break
11:00 – 12:30  *What did we learn this month?*  
*Overview, discussion & feedback*
12:30 – 14:00  
Lunch