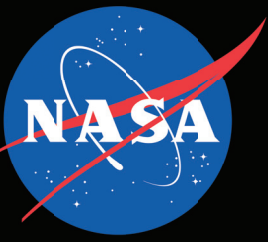


# NASA Physical Sciences



## Using the Light Microscopy Module (LMM) on the International Space Station (ISS) The Advanced Colloids Experiment (ACE) and MacroMolecular Biophysics (MMB)

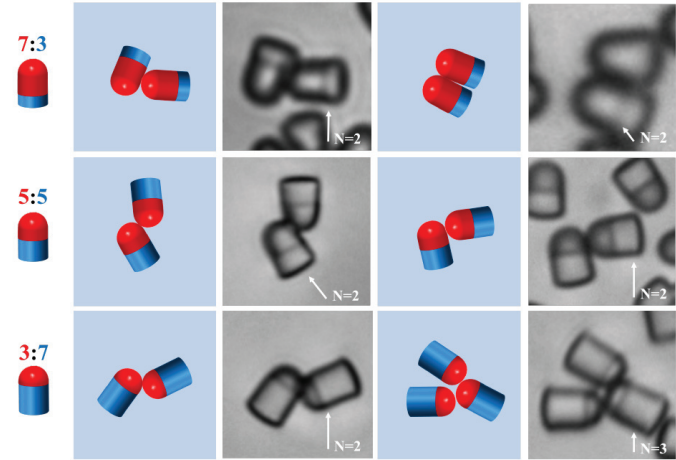


William Meyer,<sup>1</sup> Ronald Sicker,<sup>2</sup> Amber Abbott-Hearn,<sup>3</sup> David Chao,<sup>2</sup> Fran Chiaramonte,<sup>4</sup>  
<sup>1</sup>USRA at NASA Glenn Research Center, <sup>2</sup>NASA Glenn Research Center, <sup>3</sup>ZIN Technologies, Inc., and <sup>4</sup>NASA Headquarters

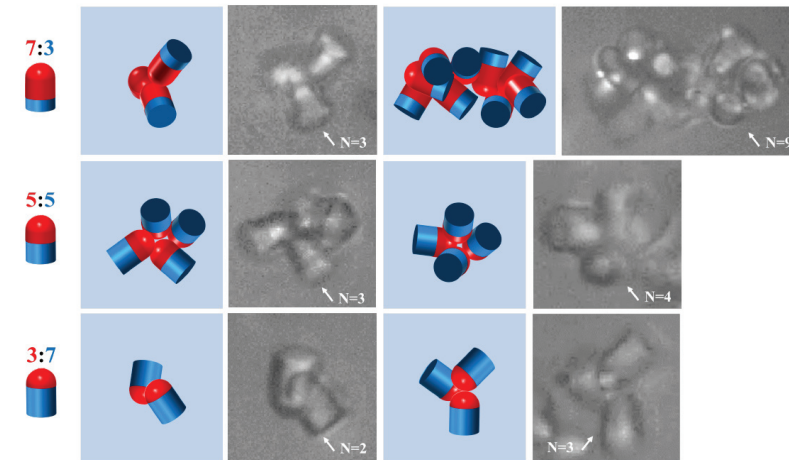
### ACE-T1 (Chang-Soo Lee *et al.*)

Removing sedimentation, convection, and particle jamming by experimenting with Janus particles in microgravity enables new understanding and insights in both fundamental science and in colloidal engineering, important for deep-delivery of drugs and cosmetics.

#### 2D Self-Assembly on Earth

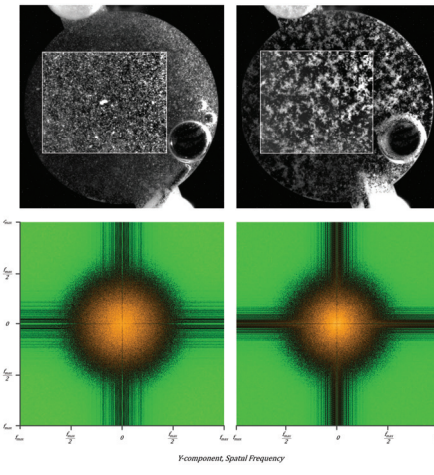


#### 3D Self-Assembly in Microgravity



### ACE-H2 (Stuart Williams *et al.*)

ACE-H2 is investigating the impact that charged nanoparticles have on the stability of a colloidal solution. The addition of nanoparticles may extend the shelf life of colloidal suspensions as well as enable their use in commercial applications (i.e., surface coatings). These images show two colloidal samples, one stable and the other unstable, at the end of the 6-week observation on the ISS along with their 2D discrete Fourier transform, a measure of pattern size and shape used to quantify the degree of aggregation among the colloids.



### ACE Cell Launches

Cell	Science Team	Organization	Launch Date	Hardware Ready
M1	Lynch	P & G		
M2	Weitz	Harvard		
M3	Chaikin	NYU		
H1	Yodh	UPenn		
H2	Williams	UK		
T1	Lee	CNU	3/3/16	Mar-16
T9	Marr	CSM	11/16/16	Nov-16
MB1	DeLucas	UAB		Feb-16
MB3	Snell	HWMRI		Feb-16
<b>Confocal Available</b>				
T6	Lynch	P & G	11/16/16	Nov-16
M2	Weitz	Harvard	10/24/16	Nov-16
MB	Vekilov	UH		Nov-16
T7	Chaikin	NYU	2/8/17	Apr-17
T2	Schall	Uva	2/8/17	Apr-17
T4	Yodh	UPenn	2/8/17	May-17
T5	Mohraz	UC Irvine	5/10/17	Aug-17
T10	Piazza	Milan	8/24/17	Nov-17
E1	Chaikin	NYU		Sep-18
E2	Khusid	NJIT		Oct-18
E3	Marr	CSM		Oct-18
E4	Williams	UK		Oct-18
B1	DeLucas	UAB		2022
B2	Vekilov	UH		2022
B3	Snell	HWMRI		2022

### ACE and MMB Science Teams, Mission, and Science Objectives (Pictured)

Matthew Lynch  
Procter & Gamble (P & G)  
Principal Scientist

ACE-M1 results; observing size dependence of depletants

David Weitz  
Harvard

Peter Lu  
Harvard

ACE-M2 results; spinodal decomposition at the particle level

Ned Seeman  
New York University (NYU)

Andy Hollingsworth  
NYU

Paul Chaikin  
NYU

Stefano Sacanna  
NYU

Dave Pine  
NYU

Soft Matter  
Self assembly of colloidal super cubes

Arjun Yodh  
U. Penn

Rearrangements in colloidal glasses

Stuart J. Williams  
UL, Science PI

Suzanne Smith  
UK, Managing PI

Gerold Willing  
UL, Co-I

Hemali Rathnayake  
WKU, Co-I

Janet Lumpk  
UK, Co-I

Looking for nano-particle haloing

Roberto Piazza  
U. Milan-Italy

Stefano Buzzaccaro  
U. Milan-Italy

Luca Cipelletti  
U. Montpellier-France

Processes in ordered and disordered structures

David Marr  
Colorado School of Mines

Ning Wu  
Colorado School of Mines

Michael Solomon  
U. Michigan

Building blocks fabricated using an electric field

Chang-Soo Lee  
Jongmin Kim  
Seong-Geun Jeong  
Chungnam National University (CNU)-S. Korea

Self-assembly with Janus building blocks

Ali Mohraz  
University of California Irvine (UCI)

Confocal microscopy image of a bijet

Boris Khusid  
New Jersey Institute of Technology (NJIT)

Formation of cellular pattern using an electric field

Peter Schall  
University of Amsterdam (UvA)

Tom Kodger  
University of Amsterdam (UvA)

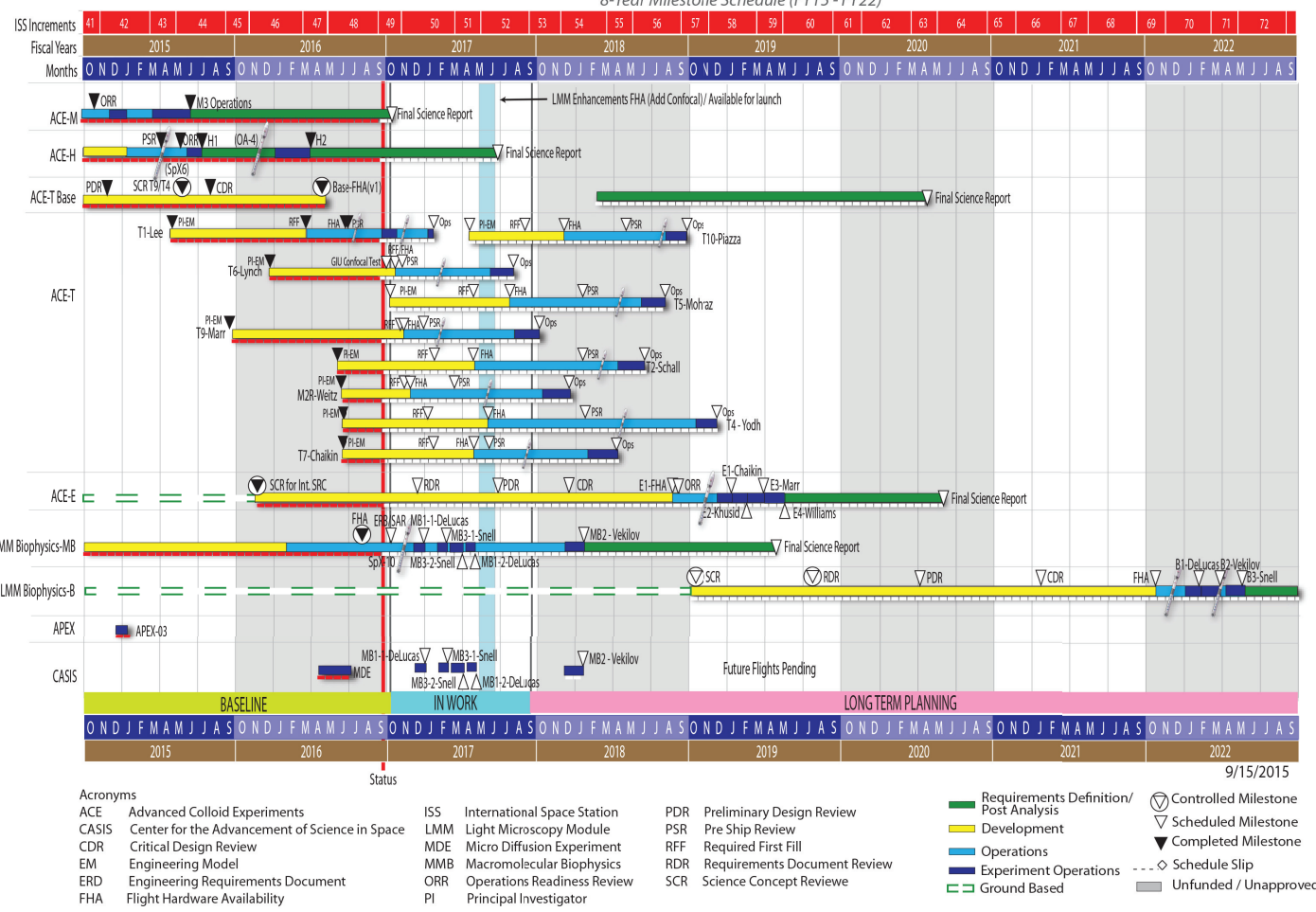
Marco Potenza  
University of Milan

Critical Casimir effect

### GRC ISS Physical Sciences Research Schedule

Complex Fluids, Macromolecular Biophysics, & CASIS

8-Year Milestone Schedule (FY15-FY22)



### Points of Contact

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