



THEORY FRONTIER

COMMUNITY PLANNING 2021

Shufang Su

University of Arizona

Theory Frontier Organization



Nathaniel Craig
UCSB



Csaba Csaki
Cornell



Aida El-Khadra
UIUC

Topical Group		Topical Group co-Conveners			
TF01	String theory, quantum gravity, black holes	Daniel Harlow	Shamit Kachru	Juan Maldacena	
TF02	Effective field theory techniques	Patrick Draper	Ira Rothstein		
TF03	CFT and formal QFT	David Poland	Leonardo Rastelli		
TF04	Scattering amplitudes	Zvi Bern	Jaroslav Trnka		
TF05	Lattice gauge theory	Zohreh Davoudi	Taku Izubuchi	Ethan Neil	
TF06	Theory techniques for precision physics	Radja Boughezal	Zoltan Ligeti		
TF07	Collider phenomenology	Fabio Maltoni	Shufang Su	Jesse Thaler	
TF08	BSM model building	Patrick Fox	Graham Kribs	Hitoshi Murayama	
TF09	Astro-particle physics and cosmology	Dan Green	Joshua Ruderman	Ben Safdi	Jessie Shelton
TF10	Quantum information science	Simon Catterall	Roni Harnik	Veronika Hubeny	
TF11	Theory of Neutrino Physics	André de Gouvêa	Irina Mocioiu	Saori Pastore	Louis Strigari

Theory Frontier Liaisons

Energy Laura Reina (Florida State U)	Neutrino Physics Irina Mociouiu (Penn State U) & Kaladi S. Babu (Oklahoma State U)
Rare Processes and Precision Alexey Petrov (Wayne State)	Cosmic Flip Tanedo (UC Riverside)
Theory	Accelerator Lian-Tao Wang (U Chicago)
Instrumentation	Computational Steven Gottlieb (Indiana U)
Underground Facilities	Community Engagement Devin Walker (Dartmouth)

Theory Frontier Parallels

TF Parallels are *outward-facing*.

Summarizing TF developments for entire Snowmass community; everyone is welcome & encouraged to attend.

Wednesday 7/20

TF09 (Astro-particle physics & cosmology)

TF11 (Theory of neutrino physics)

08:00	Fundamental Physics from Cosmic Surveys 214, HUB	Benjamin Wallisch 08:00 - 08:25
	Cosmological Bootstrap 214, HUB	Austin Joyce 08:25 - 08:50
09:00	TBD 214, HUB	Masha Baryakhtar 08:50 - 09:15
	TBD 214, HUB	Joshua Foster 09:15 - 09:40
10:00	Coffee Break 214, HUB	09:40 - 10:15
	Neutrino Theory and Particle Physics 214, HUB	Prof. Lisa Everett 10:15 - 10:50
11:00	Neutrino Theory and Nuclear Physics 214, HUB	Michael Wagman 10:50 - 11:25
	Neutrino Theory and Astrophysics & Cosmology 214, HUB	Evan Grohs 11:25 - 12:00
12:00		

Thursday 7/21

TF02 (Effective field theory)

TF05 (Lattice gauge theory)

08:00	EFTs for Dark Matter Phenomenology 111, JHN	Zhengkang Zhang 08:00 - 08:35
	Naturalness in Effective Field Theory 111, JHN	Nathaniel Craig 08:35 - 09:10
09:00	UV Constraints on IR Physics 111, JHN	Prof. Claudia De Rham 09:10 - 09:45
10:00	Coffee Break 111, JHN	09:45 - 10:15
	Lattice Gauge Theory for HEP: Overview 111, JHN	Zohreh Davoudi 10:15 - 10:25
	Quark and Lepton Flavor Physics 111, JHN	Oliver Witzel 10:25 - 10:44
11:00	Nucleons and nuclei for BSM searches and neutrino physics 111, JHN	Michael Wagman 10:44 - 11:03
	Hadron structure for HEP 111, JHN	Huey-Wen Lin 11:03 - 11:22
	Lattice for BSM exploration 111, JHN	Ethan Neil 11:22 - 11:41
	Computational Trends in LGT 111, JHN	TBD 11:41 - 12:00
12:00		

Theory Frontier Parallels

Friday 7/22

TF04 (Scattering amplitudes) **TF06** (Theory for precision physics)
TF07 (Collider phenomenology)

08:00	Overview of scattering amplitudes <i>Zvi Bern</i>	08:00	Precision Theory for HEP: Overview <i>Radja Boughezal</i> 111, JHN 08:00 - 08:09
	Modern approaches to amplitudes <i>Henriette Elvang</i>		Theoretical Developments in SMEFT Beyond Dim-6 <i>Frank Petriello</i> 111, JHN 08:09 - 08:41
	Applications of Amplitudes for Colliders <i>Fernando Febres Cordero</i>		Theory Perspectives on the W mass <i>Joshua Isaacson</i> 111, JHN 08:41 - 09:13
09:00	Applications of Amplitudes for Gravitational Waves <i>Enrico Herrmann</i>	09:00	TBA <i>r Isabel Garcia Garcia</i> 111, JHN 09:13 - 09:45
			Coffee Break 111, JHN 09:45 - 10:15
		10:00	New Observables for Precision Collider Physics <i>Ian Moult</i> 111, JHN 10:15 - 10:50
			Calculational Challenges for High-Energy Colliders <i>Fabio Maltoni</i> 111, JHN 10:50 - 11:25
		11:00	Machine Learning for Collider Theory <i>Claudius Krause</i> 111, JHN 11:25 - 12:00
		12:00	

Saturday 7/23

TF08 (BSM model building) **TF01** (String theory & quantum gravity)
TF10 (Quantum information) **TF03** (CFT & formal QFT)

08:00	Dark Matter and Dark Sectors <i>Jonathan Feng</i> 210, Kane Hall 08:00 - 08:35	08:00	Particle Physics and String Theory <i>Mirjam Cvetič</i> 238, MGH 08:00 - 08:35
	New Ideas in Baryogenesis <i>David McKeen</i> 210, Kane Hall 08:35 - 09:10		Black Holes and Quantum Gravity <i>Prof. Xi Dong</i> 238, MGH 08:35 - 09:10
09:00	Model Building Into the Future <i>Hitoshi Murayama</i> 210, Kane Hall 09:10 - 09:45	09:00	Some New Ideas in QFT and Condensed Matter Physics <i>Prof. John McGreevy</i> 238, MGH 09:10 - 09:45
	Coffee Break 210, Kane Hall 09:45 - 10:15		Coffee Break 238, MGH 09:45 - 10:15
10:00	Quantum Simulation <i>Natalie Klco</i> 210, Kane Hall 10:15 - 10:50	10:00	The Bootstrap <i>Prof. Silviu Pufu</i> 238, MGH 10:15 - 10:50
	Quantum Sensors <i>Asher Berlin</i> 210, Kane Hall 10:50 - 11:25	11:00	Generalized Symmetries <i>Shu-Heng Shao</i> 238, MGH 10:50 - 11:25
	Formal Aspects of Quantum Information <i>Prof. Thomas Faulkner</i> 210, Kane Hall 11:25 - 12:00	11:00	The Quest to Define QFT <i>Mykola Dedushenko</i> 238, MGH 11:25 - 12:00
		12:00	

Cross-Frontier Activities

Day		Title	Frontiers
Mon 7/18	8am-noon	CEF Feedback	All
Tue 7/19	8am-noon	Energy Frontier Theory	EF, TF
	8am-noon	Dark Matter Complementarity	CF, EF, RF, TF
Thu 7/21	8am-10am	Flavor Anomalies and Exotics at Colliders	RF, EF, TF
Fri 7/22	10am-noon	Hadrons as Production Probes	RF, EF, TF
	10am-noon	Quantum Information Science	CompF, TF
Sat 7/23	8am-noon	Cosmic Frontier Theory	CF, TF
	10am-noon	Neutrino Theory Network	NF, TF
Sun 7/24	10am-noon	High Energy & Ultrahigh Energy Astrophysical Neutrinos	NF, CF, TF

Theory Frontier Plenaries

**Monday 7/18
Lattice QCD**



16:00	Enabling precision quark- and lepton-flavor physics with lattice QCD <i>130, Kane Hall</i>	<i>Andreas Kronfeld</i> 15:35 - 16:05
	Uncovering new-physics signals in nucleons and nuclei with lattice QCD, <i>130, Kane Hall</i>	<i>Zohreh Davoudi</i> 16:05 - 16:35
17:00	Questions and discussion <i>130, Kane Hall</i>	16:35 - 17:00

**Friday 7/22
Theory Visions**



16:00	Recent developments and future vision for formal theory <i>130, Kane Hall</i>	<i>Shamit Kachru</i> 15:30 - 16:15
17:00	Recent developments and future vision for particle theory <i>130, Kane Hall</i>	<i>Jesse Thaler</i> 16:15 - 17:00

Theory Frontier Documents

First drafts of topical group summaries and frontier summaries are available now.

Frontier and topical group summaries

<https://bit.ly/3cnOT2Y>



Feedback on summaries

<https://bit.ly/3altHEc>



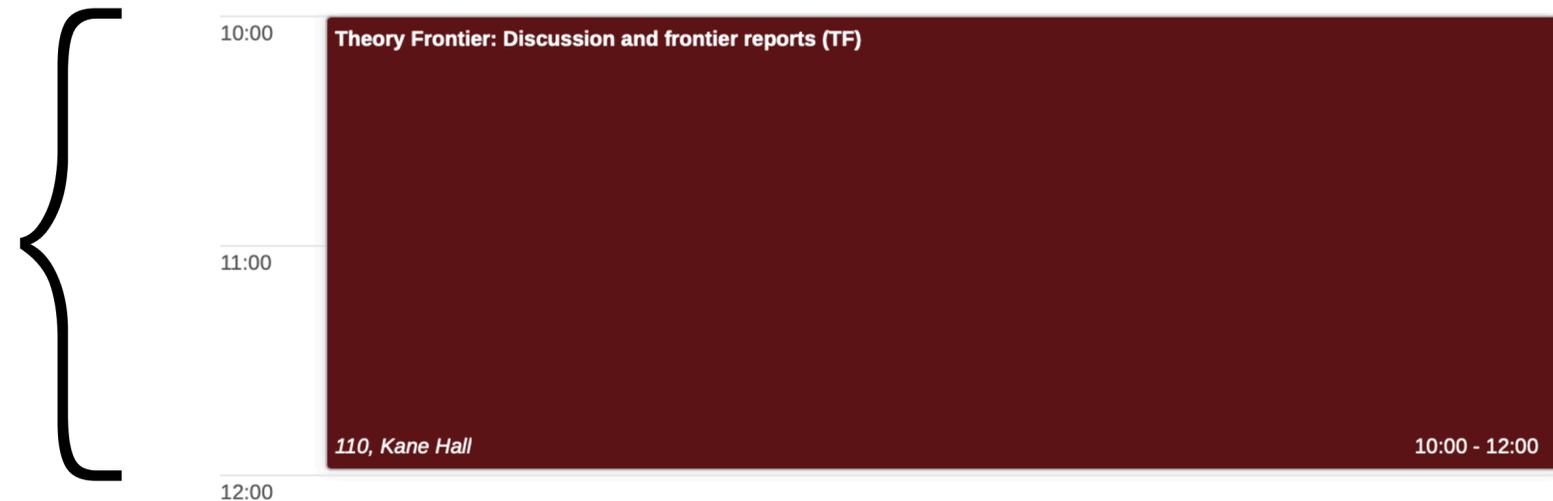
Frontier summary planned to be available prior to Sunday's TF Discussion

Theory Frontier Input

Email Aida, Csaba, and Nathaniel

<https://snowmass21.org/theory/start>

**Sunday 7/24
10am-12pm:
TF discussion &
frontier reports**



Feedback on summaries:

<https://bit.ly/3altHEc>



Snowmass Slack

[#theory_frontier_topics](#)



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Thank you!