2019 Winter Study Plan and Records

Xiaodong Hu

- SPT (Chen X, Gu ZC, Liu ZX, Wen XG. PRB. 87(15), 155114.)
- Eduardo Fradkin *Field Theories of Condensed Matter Physics* chapter 1-7.
- Alexander Altland&Ben Simons *Condensed Matter Field Theory* path integral and renormalization group.
- Subir Sachdev teaching notes.
- Alexei M. Tsvelik *Quantum Field Theory in Condensed Matter Physics* Part I and II.
- Time-reversal symmetric and Non-time reversal symmetric Topological Insulators.
- Mikio Nakahara *Geometry, Topology and Physics* chapter 9-12.
- Joseph J. Rotman *An Introduction to Homological Algebra* chapter 1-3.

Date/Data	**Study Plan and Expected Time Costs**	**Achievements**	**Difficulties Encountered**
Jan-2	• Go Combat with Father (1.2h) • Quantum Many-Body Physics Reconstruction: Multi-particle States and Operators (1.5h), Fock Space (<1h) and Coherent States (1h)	White win by $3\frac{3}{4}$	
	• General Picture of Classification, Background on Entanglement and LU: Symmetry protected topological orders and the cohomology class of their symmetry group (2h)	100%(2h20min)	• How to grasp the concepts of "local" and "piercewise" and how can we connect distinct phases with whether it could be connected by a LU transformation
	• Basics of Hubbard Model: Field Theories of Condensed Matter Physics (2h) • Tensor Product of Category: Quantum Invariants of Knots and 3 Manifolds (1h)	100%(1h50min)	
7-10 4.0/10.2	• Guqin Lease and Class Arrangement (2h) • Travel Plan to Yunnan (1h) • Basics of Hubbard Model: Field Theories of Condensed Matter Physics (2h) • Quantum Many-Body Physics Reconstruction: Multi-particle States and Operators (1.5h), Fock Space (<1h) and Coherent States (1h) • Go Combat with Father (1.2h) • Strict Monoidal Tensor Category and Maclane Coherence Theorem: Quantum Invariants of Knots and 3 Manifolds (1h)	100%(2h22min) 100%(1h34min)	

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7-17	• Guqin Fingering Gou Tiao Practice and Record (40min) • Basics of Hubbard Model: Field Theories of Condensed Matter Physics (2h) • Quantum Many-Body Physics Reconstruction: Multi-particle States and Operators (1.5h), Fock Space (<1h) and Coherent States (1h) • Go Combat with Father(1.2h) • Strict Monoidal Tensor Category and Maclane Coherence Theorem: Quantum Invariants of Knots and 3 Manifolds (1h)	100% (1h23min) White win by $1\frac{3}{4}$	• 「勾」时手腕未随琴面弧度适当变形，「挑」时食指第一指节弯曲不足
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7-21	• Quantum Many-Body Physics Reconstruction: Multi-particle States and Operators (1.5h), Fock Space (<1h) and Coherent States (1h) • Basics of Hubbard Model: Field Theories of Condensed Matter Physics (2h)		
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8-9	• CFT: Global Conformal Transformation and Conformal Groups for $d > 2$ (1.5h) • Altland&Simons: Topology and Geometry in CMP (2.5h) • Chinese Literature: 长安十二时辰 (1h)		