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Quantum liquid crystals

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Stellingen

belonging to the thesis

“Quantum Liquid Crystals”

1. The dual vortex condensate must be treated as a relativistic entity since its second sound propagates with the spin-wave velocity. As a consequence, the propagating excitations in the Mott insulating state show the two-fold degeneracy associated with helicity 1 particles.

Chapter 2.

2. The glide constraint, whose origin is mass conservation, protects compressional rigidity against the dual Higgs mechanism responsible for the difference between quantum solids and liquids. If dislocations were allowed to both glide and climb, the isotropic nematic phase would be incompressible, while in the ordered nematic phase in 2+1-dimensions, two out of the three modes would acquire a gap leaving behind a single massless mode of mixed shear and compressional character.

Chapter 3.

3. The number of Goldstone modes is not necessarily equal to the number of broken global symmetries. It can be less, provided that in the long-wavelength limit modes become indistinguishable. A typical example is given by a solid where the number of phonons is counted according to the breaking of translational symmetries, seemingly ignoring the broken rotational symmetries

Chapter 4.

4. The quantum isotropic nematic phase as identified in this thesis can be viewed as the topological nematic phase where the ‘Burgers sector’ is treated classically in the sense of neglecting the higher order terms in Eq. (4.117) in this thesis.

Chapter 4.

5. Fluctuating order, if present in the superconducting phase of cuprates, will leave a signature in the electromagnetic response functions. This signal is, however, very weak as compared to the plasmon while it completely vanishes in the long-wavelength limit probed by light.

Chapter 5.

6. An example of a 'temporal dislocation' is offered in the context of time zones on Earth. Measuring local time relative to local noon to avoid discontinuities where the time zones change, the North and South poles appear as 24h-singularities. The Volterra cut connecting this pair of 'opposite charge' monopoles is given by the International Date Line.
7. Interesting questions regarding the quantum measurement problem will be answered when the interference experiments of *Zeilinger* advance to the point that they can be performed with ensembles of nano-camcorders. It would be even more interesting to execute these interference experiments with cats or humans.
8. It appears as if the Dutch government tries to reduce the immigration flux by a preferential hiring policy aimed at the lowest tier of graduates of Dutch law schools to fill up the positions at the I.N.D. (Dutch immigration service). While this method has the gross effect of producing inconveniences that make the Netherlands an unattractive destination for skilled professionals, it also renders the Netherlands more penetrable to the malicious immigrants against whom these measures were originally intended.
9. Money carries negative entropy.

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