Abstract. The Ginzburg-Landau equations play a fundamental role in various areas of physics, from superconductivity to elementary particles. They present the natural and simplest extension of the Laplace equation to line bundles. Their non-abelian generalizations - Yang-Mills-Higgs and Seiberg-Witten equations - have applications in geometry and topology.

Of a special interest are the least energy (per unit volume) solutions of the Ginzburg-Landau equations. Though the equations are translation invariant, these turned out to have a beautiful structure of (magnetic) vortex lattices discovered by A.A. Abrikosov. (Their discovery was recognized by a Nobel prize. Finite energy excitations are magnetic vortices, called Nielsen-Olesen or Nambu strings, in particle physics.)

I will review recent results about the vortex lattice solutions and their relation to the energy minimizing solutions on Riemann surfaces and, if time permits, to the microscopic (BCS) theory.