Superfluidity and geometry of Bloch bands[1] SEBASTIANO
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University School of Science — In flat Bloch bands the critical temperature for
superconductivity is linear in the coupling constant rather than exponentially sup-
pressed as in conventional BCS theory. I will present our ongoing work on flat-band
superconductivity and superfluidity. We show that in the flat-band limit the super-
fluid weight D_s is not controlled by the effective mass, but by a geometric invariant,
the quantum metric [2], namely the gauge-invariant part of the Marzari-Vanderbilt
localization functional for Wannier orbitals. The quantum metric is related to the
Berry curvature, as a consequence we obtain the inequality $D_s \geq |C|$ between su-
perfluid weight and Chern number C [2]. This effect is important in a number of
lattice models relevant for material science and ultracold gases [2-5]. References:
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M. Tovmasyan, SP, P. Törmä, S. D. Huber, arXiv:1608.00976; 5) L. Liang, T. I.
Vanhala, SP, T. Siro, A. Harju, and P. Törmä, in preparation.

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