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Electron pairing in pure Niobium and Niobium alloy clusters ANTHONY LIANG, XIAOSHAN XU, SHUANGYE YIN, JOHN BOWLAN, WALT DE HEER, Georgia Institute of Technologies — Electrons in pure niobium and in niobium alloy clusters are ferroelectric at low temperatures. The ferroelectric effect is enhanced for niobium clusters doped with non-magnetic metals and reduced when doped with magnetic atoms. The effect is enhanced (reduced) for clusters with an even (odd) total number of valence electrons. For specific alloy clusters the ferroelectric state persists up to room temperature. Ferroelectricity in these clusters and superconductivity in the corresponding bulk appear to be related, with similar transitions temperatures and similar responses to specific impurities. The spontaneous polarization of a ground state involving a Cooper pair explains the observations.

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