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Cracks in the Mirror: Saga of a 36 Hour Experiment

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The history of the fall of parity, mirror symmetry, emerges from a puzzle in the behavior of particles (T-Θ puzzle). This stimulated the Lee-Yang paper of mid-1956 questioning the validity of parity in the weak interactions. They specifically raised the issue of the weak decays $\pi^{\pm} \rightarrow \mu^{\pm} + \nu$ and $\mu^{pm} \rightarrow e^{\pm} + 2\nu$. In subsequent detailed discussions between C.S. Wu and T.D. Lee, Wu designed a collaborative experiment with physicists from the Bureau of Standards in Washington D.C. which examined the decay of Co^{60}, an easily polarizable nucleus. Early positive results of the Wu experiment were discussed at a Friday lunch traditionally "chaired" by T.D. Lee. The precise date was the Friday of the first working week after the New Year, 1957. Here, for what was probably the first time, the possibility was raised that the failure of parity conservation could be a large effect. The conversation at the very traditional Chinese lunch was exciting. This new concept stirred me in my drive from Columbia to home in Irvington, actually a short walk to the NEVIS laboratory where Columbia's 400 MeV synchrocyclotron lab was housed. The events of the next few days are the substance of my paper. By Tuesday noon, the word had spread around the world that parity conservation was dead. By that time we had a 20 σ effect and many of the essential tests of validity of our experiment were done. Some of the consequences important to that time, and some still relevant in 2006 will be presented.