

Abstract Submitted  
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**From the discovery of direct-single- $e^\pm$  from charm in 1974 to a fundamental test of the Higgs Yukawa coupling in Heavy Ion Collisions<sup>1</sup>**

MICHAEL TANNENBAUM, Brookhaven National Laboratory — Searches for the intermediate boson,  $W^\pm$ , the heavy quantum of the Weak Interaction, via its semi-leptonic decay,  $W \rightarrow e + \nu$ , in the 1970's instead discovered unexpectedly large hadron production at high  $p_T$ , notably  $\pi^0$ , which provided a huge background of  $e^\pm$  from internal and external conversions. Methods developed at the CERN ISR led to the discovery of direct-single- $e^\pm$  in 1974, later determined to be from the semi-leptonic decay of charm which had not yet been discovered. The same methods—i)  $\geq 10^5$  charged hadron rejection; ii) minimum of material in the aperture to avoid external conversions; iii) zero magnetic field on the axis to avoid de-correlating conversion pairs; v) precision background determination in the direct-single- $e^\pm$  signal channel by adding external converter—were used at RHIC to make precision measurements of heavy quark production in p-p and Au+Au collisions, leading to the puzzle of apparent equal suppression of light and heavy quarks in the QGP. If the Higgs mechanism gives mass to gauge bosons but not to fermions, then a proposal that all 6 quarks are nearly massless in a QGP, which would resolve the puzzle, can not be excluded. This proposal can be tested with future measurements.

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