production and decay of a $t\bar{t}$ system, and inconsistent with the properties expected of the dominant backgrounds. Although compelling, this observation was statistically limited and the possibility that it arose from a background fluctuation could not be ruled out.

In this report, I will focus on the first results to come from the DØ and CDF top quark searches using data collected in 1994 and early 1995. Both collaborations have acquired over three times more data in the last year, and have now reported conclusive evidence for top quark production [10]. I will describe the analyses performed by both collaborations and compare the two results. I believe an extremely persuasive case has been made that the top quark has been found.

2 Production and Decay of Heavy Top

The production of heavy quarks in 1.8 TeV $p\bar{p}$ collisions is predicted to take place through the two leading-order quantum-chromodynamic (QCD) diagrams

$$q\bar{q} \rightarrow Q\bar{Q} \tag{2}$$
$$gg \rightarrow Q\bar{Q}, \tag{3}$$

with the relative rate of these two processes dictated largely by the mass of the heavy quark (Q), parton distribution functions of the proton and phase space. Top quark pair-production is expected to dominate the production rate; the production of single top quarks through the creation of a virtual W is much smaller and expected to oocur in a relatively small part of phase space (all heavy top quark searches have therefore ignored single top production). The next-to-leading order corrections to processes (2) and (3) are relatively small for heavy quark masses greater than of order 50 GeV/c^2 [11]. More recently, these estimates have been revised taking into account the effects of internal soft-gluon emission [12].

These cross sections are shown in Fig. 1 plotted as a function of the heavy quark mass. The uncertainty in these estimates reflects the theoretical uncertainty in this calculation, which is believed to be the choice of renormalisation scale. For top quark masses above 100 GeV/c^2, the primary contribution to the cross section comes from quark annihilation. This reduces the uncertainties arising from our lack of knowledge of the parton distribution functions of the proton, as these have been accurately measured at large Feynman x, the kinematic region that would dominate very heavy quark production.

Top quark pair production will generate a top quark and anti-top quark that are recoiling against each other in the lab. The production diagrams favour configurations where both top quarks are produced isotropically in the lab frame. The relative motion of the $t\bar{t}$ system is expected to be small in comparison to the transverse momentum[2] (P_T) distribution of the top quark itself [13]. The expected P_T distribution for a heavy top quark has a peak around half the top quark mass with a

[2] I will employ a coordinate system where the proton beam direction defines the $\hat{z}$ axis, and