Investigating Charm Quark Decays

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Charm quarks are never seen by themselves — they’re always hidden by the strong force in bound states, whose behavior is difficult to predict \textit{a priori} and must instead be measured.

To count the number of charm quarks you produce, you generally need to count the number of $D$ mesons (charm + lighter quark), and you have to understand how those decay.

The bottom $\to$ charm decay rate is important for understanding matter-antimatter asymmetry.

Even exotic measurements, like the Higgs boson decaying to charm, need to understand $D$'s.

CLEO-c is a “$D$ factory” and can make these measurements better than anyone has before.
We count the number of $D$'s decaying in a given manner by finding the area under the peaks.

Involves sophisticated understanding of the peak shapes and anything extra that may lie under the peaks.
These results are spring ’05; we are updating to a 5× larger dataset.
This measurement of $D$ decay probabilities is just one component of the CLEO-c flavor physics program.

CLEO-c expects to greatly improve critical uncertainties the $B$-factories encounter when extracting weak interaction parameters, and enable them to make new measurements, by:

- Understanding charm quark behavior,
- Testing the theory used for $B$ physics with $D$’s.