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# Summary Report on the Tau-Charm Physics Workshop

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## Tau-Charm Physics - Facility Space

- Important physics
- Physics needed to build the world picture
- Physics that will lead to new directions

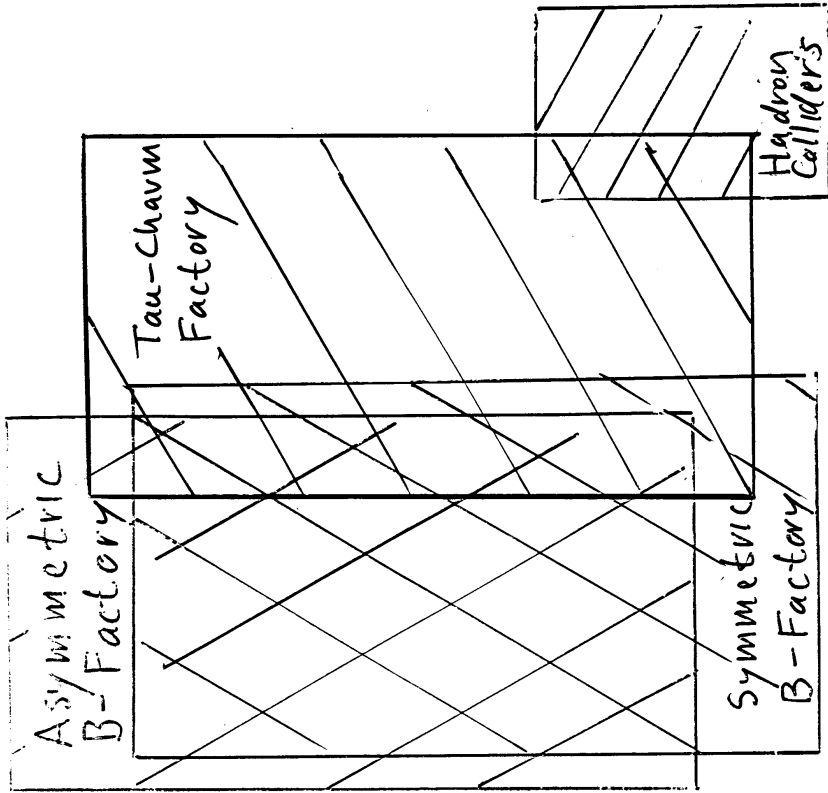
Discovery potential

= World class physics

- Requires TCF
- Best done with TCF
- Can be done at TCF or BF
- Best done with BF

The Tau-Charm Factory is a  
facility for research on  
the tau-quark-gluon  
elementary particles

up quark  
down quark  
strange quark  
charm quark



Initial Motivation  
First research  
directions

← New  
idea

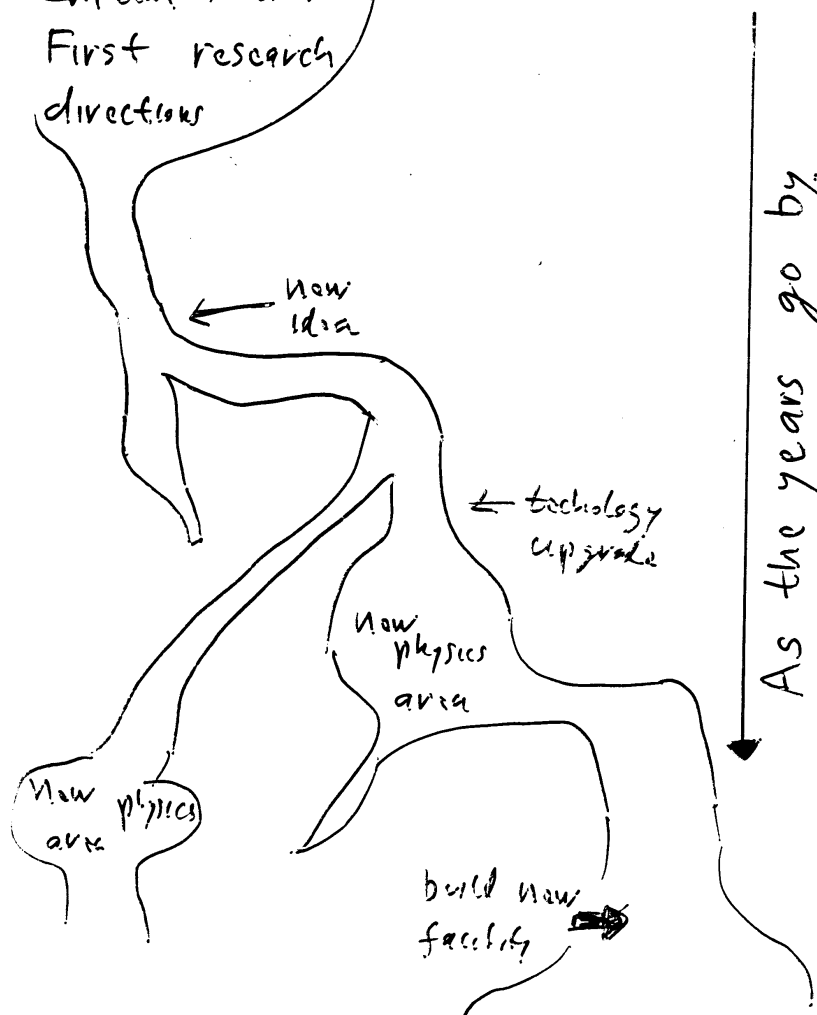
← technology  
upgrade

New physics  
area

New  
area physics

build new  
facility →

As the years go by.



# Physics Requires TCF

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- Physics coming from  $J/\psi$  and  $\psi'$ ,  
in particular the great question  
of GLUEBALL reality
- Steady improvement of precision  
of some  $T$  physics studies:  
leptonic modes  
 $\psi$  mass,  $T$  mass
- Radiative  $T$  decays  
Substantial progress in  $D^0-\bar{D}^0$  mixing  
measurements
- Check that hadronic background  
is not source of unusual  $T$   
behavior

More requires TCF

→ R. ( $e^+e^- \rightarrow \text{hadrons}$ ) at low energy with  
precision, tests of GCD,

# Physics Best Done With TCF

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With polarized  
beam

$\bar{T} \rightarrow M\gamma$  and other forbidden  
decays

Use polarized beam to search  
for new physics in  $T$  decay

Some  $D$  and  $D_s$  decays

Study of low mass mesons using  
2 virtual-photon channel!

Study of QCD in low mass mesons  
and baryons

Physics That Can Be Done  
with TCF or BF

Some types of searches for  
CP violation in  $T$  decay with  
or without polarization

$D$  and  $D_s$  decays in some cases

Further studies of CP violation  
in  $e^+e^- \rightarrow \tau^+\tau^-$



## Physics Best Done at BF

Study of semi-hadronic decays  
of  $T$

Known method for studying  
CP violation in  $T$  decay

## Building the collider

$\mathcal{L}_{TCF} = 10^{33}$  can be done

$\mathcal{L}_{TCF}$  can follow  $\mathcal{L}_{BF/2013}$

Stimulating technology

## Building the detector

May be only advanced detector to be built

Stimulating R&D

Stimulating technology