INTRODUCTION

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In May of 1989, two hundred physicists from a dozen countries gathered in Stanford, California to work on the particle physics and accelerator physics of a tau-charm factory. They met in plenary sessions and in small working groups; they talked and calculated and argued. There were collider designers and builders, some optimists and some pessimists in thinking about high luminosity, electron-positron, storage rings. There were researchers in tau physics frustrated by their slow progress in the last few years. There were experimenters and theorists in charm physics looking for ways to make precise and probing measurements. There were experts on ψ/J and ψ' and other aspects of charmonium physics, discussing what they could do with very large sets of data.

On Saturday, May 27, the talks, discussions, explorations, arguments and calculations were summarized with the following conclusions:

- ELEMENTARY PARTICLE PHYSICS

Using the tau-charm factory, elementary particle research in the ψ/J, tau, and charm energy regions will be broad and deep. Wide areas of new particle physics will be explored and there will be very many substantial contributions to Standard Model areas of particle physics. During the Workshop the foreseeable range of particle research continued to expand with emphasis on four research tools provided by the tau-charm factory:

- large statistics
- control of systematic errors
- ability to move off the energy production point to measure backgrounds
- use of threshold kinematics to enhance particle identification and background rejection.

- COLLIDER

The consensus of the accelerator designers and builders is that a two-ring collider with a luminosity of 10^{33} cm^{-2} s^{-1} can be designed now and built now in the ψ/J $-\tau$ - charm energy region. The design will be based on our present knowledge of collider technology and accelerator physics. There are five additional conclusions:

- Speedy and smooth attainment of the 10^{33} cm^{-2} s^{-1} luminosity requires that substantial care be taken in the design and construction.
- Efficient use of this high luminosity requires a dedicated e^+ and e^- injector.
- Efficient use of this high luminosity also requires that design and construction emphasize high reliability in collider operation.
- Two areas in the design require special consideration because of the projected 0.5 A beam currents: multibunch instabilities and ion trapping by the e^- beam.
- After a half decade or so of use the tau-charm factory luminosity might be increased to 5×10^{33} cm^{-2} s^{-1} or more using some of the advanced collider concepts discussed at the Workshop.

- DETECTORS

The achievement of the particle physics goals requires a new detector, but the design and construction of such new detectors will be based on existing and proven technology.

- One basic detector configuration was developed which satisfied all the physics requirements. Detailed engineering and Monte Carlo studies will be carried out.
- The high rate trigger can be designed using existing technologies already employed in hadron colliders.
- More generally the issue of push-pull usage of a single interaction region and the issue of several interaction regions require further study.

Before the reader turns to pages of these Proceedings I want to remind you of the history of the concept of a tau-charm factory. That history begins with the pioneer accelerator physics and particle physics of the first generations of electron-positron storage rings: ACO,

ADONE, CEA, DCI, DORIS, SPEAR, and the early VEPP machines. The history continues with the upgrading of some of these storage rings and with the higher energy colliders: CESR, PEP, PETRA, TRISTAN, VEPP4. And now the newest circular colliders are operating: BEPC and LEP. These two decades of invention, experience, and knowledge provide a solid basis for the design and construction of very high luminosity, electron-positron, circular colliders.

Jasper Kirkby and John Jowett built upon this foundation. The particle physics insights of Kirkby and the seminal tau-charm factory design of Jowett introduced the tau-charm factory concept to the rest of us; in turn our increasing interest led to this Workshop.

During the Workshop, and since then, interest has continued to grow. Plans for a tau-charm factory are now being discussed in at least five countries: France, Japan, Spain, the United States, and the Soviet Union, in addition to the initial proposal to CERN. Just a glance through these Proceedings shows why there is so much interest.

The Organizing Committee wishes to thank the participants for their enthusiastic work at the Workshop and their fine contributions to these Proceedings. We thank Burton Richter for providing the facilities of the Stanford Linear Accelerator Center and for financial support from the Center. We thank W.K.H. Panofsky for his advice and encouragement.

We are very grateful to Lydia Beers and Sharon Haynes for leading the organization and operation of the Workshop. We are also very grateful to Nina Adelman Stolar and Neil Strand.

Turning to these Proceedings, we thank William Kirk for his guidance and help and we thank the Publications staff for their publishing of this volume.

Most of all we are indebted to Lydia Beers for editing these Proceedings, for producing an outstanding volume in a very short time.

SCHEDULE OF TAU-CHARM PLENARY TALKS

Tuesday - May 23, 1989

Auditorium

Tuesday Morning (9:00 - 12:30):	**Machine Physics**	
Chair:	**Karl Brown**	
Scientific Secretary:	**Ted Fieguth**	
Welcome	B. Richter	
Tau-Charm Overview	M. Perl	20'
Outline of Tau-Charm Factory Design Parameters	J. Jowett	40'
KEK Tau-Charm Facility Design	S. Kamada	30'
Possibility of Crab-Crossing at a Tau-Charm Collider	G. Voss	30'
High Luminosity e^+e^- Circular Colliders	R. Siemann	40'

Tuesday Afternoon (2:00 - 5:30):	**Tau Physics**	
Chair:	**Paul Tsai**	
Scientific Secretary:	**Mary King**	
Overview of τ Studies	P. Burchat	30'
The Tau Neutrino Mass and Leptonic Decays	J. Gomez-Cadenaz	30'
Status of 1-Charged Particle Decay Mode Problem	K. Hayes	20'
Topics in τ-Physics	M. Voloshin	30'
Rare τ-Decays	B. Barish	30'

Tuesday Evening (5:30 - 5:45):	Working Group Organization

SCHEDULE OF TAU-CHARM PLENARY TALKS

Wednesday - May 24, 1989

Auditorium

Wednesday Morning (9:00 - 12:15):	**D and D_s Physics**	
Chair:	**Abe Seiden**	
Scientific Secretary:	**Jon Labs**	
Overview of D and D_s Physics	R. Schindler	35'
Mixing and CP Violation in D Decays (Theory)	I. Bigi	45'
Mixing and CP Violation in D Decays (Exp.)	G. Gladding	30'
Rare Charm Decays	R. Willey	30'

Wednesday Afternoon (2:00 - 5:30):	**J/Ψ and Charmonium Physics**	
Chair:	**Michael Chanowitz**	
Scientific Secretary:	**Minzu Wang**	
Overview of J/Ψ and Charmonium Physics	W. Toki	40'
Glueballs, Hybrids and Exotics	F. Close	40'
Charmonium and Light Quark Spectroscopy	N. Isgur	40'
Data Analysis in High Statistics Experiments	W. Dunwoodie	30'

Wednesday Evening (7:30 - 10:00):	**Tau-Charm Factories**	
Chair:	**Charles Prescott**	
Scientific Secretary:	**Jon Labs**	
Status of the SLC and the Mark II Program	T. Barklow	20'
A Tau-Charm Factory in Spain	J.A. Rubio	30'
A Tau-Charm Factory in the United States	D.H. Coward	30'
The Frascati Program on Accelerators and Physics	M. Piccolo	20'

SCHEDULE OF TAU-CHARM PLENARY TALKS

Thursday and Saturday - May 25 & 27, 1989

Auditorium

Thursday Morning (9:00 - 9:45):	**Theoretical Perspectives**	
Chair:	**Michael Peskin**	
Scientific Secretary:	**Jon Labs**	
Issues in Tau-Charm Physics	A. DeRujula	45'

Parallel Working Groups Begin after Coffee Break
See Individual Schedules

Saturday Morning (9:00 - 12:30):	**Workshop Summary**	
Chair:	**Sidney Drell**	
Scientific Secretary:	**Jon Labs**	
Summary of Accelerator Physics Issues	J. Jowett	40'
The Particle Physics of Tau-Charm	A. Seiden	40'
Issues of Trigger Design and Data Aquisition	J. Thaler	20'
Issues of Tau-Charm Detector Design	J. Kirkby	30'
Next Steps	M. Perl	10'