

FOREWORD

In October 1978 the International Committee for Future Accelerators (ICFA) and Fermilab organized at Batavia, under the chairmanship of Lee Teng, the First Workshop on Possibilities and Limitations of Accelerators and Detectors. The participants were divided among seven groups under the Convenors listed in Table 1.

Table 1

## Working Groups of the First Workshop

Group	Convenor
I. Electron accelerators and storage rings	J. Rees
II. Proton accelerators	V. Yarba
III. Colliding beams pp, $p\bar{p}$ , and ep	E. Keil
IV. Neutrino experiments	U. Amaldi
V. Hadron experiments	R. Diebold
VI. Lepton and photon experiments	B. Barish
VII. Particle detectors	G. Charpak

The meeting was a success, as attested by both the satisfaction of the participants and the contents of the proceedings. This was recognized by ICFA, who immediately after the meeting decided to hold near CERN a second Workshop on the same subject. I was asked to chair the Organizing Committee. In discussions with J.B. Adams, Chairman of ICFA, it was decided to concentrate the second Workshop on the subjects not fully covered by the first one, with the intention of completing the work initiated in Fermilab. M.C. Crowley-Milling, G. Charpak, E. Keil, P. Musset and M. Vivargent accepted to be members of the Organizing Committee, with W.O. Lock acting as Secretary of the Committee and Miss D.A. Caton as Organizing Secretary for the Workshop.

In February 1979 the Organizing Committee reviewed the work done at Fermilab and prepared a provisional list of problems to be tackled, subdividing them among eight working groups (Table 2).

Since most of the entries in Table 2 are self-explanatory, a few remarks will be sufficient to complete the information. The study of proton-antiproton colliders was attributed to Group II because during the First Workshop the definition of a magnetic lattice common to the synchrotron and the proton-antiproton collider could not be tackled. In Fermilab it became clear that the main problems of a superconducting proton synchrotron are connected with beam losses and extraction. This justifies the setting up of Group III. The

Table 2

## Working Groups of the Second Workshop

Group	Open problems indicated by the Organizing Committee
I. Electron-positron colliders	<ul style="list-style-type: none"> <li>a) Scaling of <math>e^+e^-</math> storage rings and limitations</li> <li>b) Colliding linacs</li> <li>c) Multiple interaction regions in colliding linacs</li> <li>d) Polarization in electron-positron colliders</li> </ul>
II. Proton accelerators and proton-antiproton colliders	<ul style="list-style-type: none"> <li>a) Common lattice for synchrotron and colliders</li> <li>b) Terrain following and shielding problems</li> <li>c) Losses during acceleration and effects on superconducting magnets</li> </ul>
III. Extraction and external beams	<ul style="list-style-type: none"> <li>a) Beam extraction for multi-TeV synchrotrons</li> <li>b) Fast dumps, external dumps, beam splitting, and targets</li> <li>c) Secondary-beam problems</li> </ul>
IV. Electron-proton interaction regions and experiments	<ul style="list-style-type: none"> <li>a) Problems in designing ep interaction regions</li> <li>b) Scaling of ep experiments</li> <li>c) Experiments integrated in the machine lattice</li> </ul>
V. Experiments on $e^+e^-$ and $p\bar{p}$ colliders	<ul style="list-style-type: none"> <li>a) Scaling of <math>e^+e^-</math> and <math>p\bar{p}</math> experiments with energy</li> <li>b) Experimental areas and background at <math>e^+e^-</math> colliding linacs</li> <li>c) Effects of bunch structure in <math>p\bar{p}</math> colliders</li> <li>d) Possible scenarios for <math>e^+e^-</math> and <math>p\bar{p}</math> physics</li> </ul>
VI. Deep inelastic experiments with lepton beams	<ul style="list-style-type: none"> <li>a) Future neutrino experiments</li> <li>b) Scaling of muon experiments</li> <li>c) Beams of <math>\nu_e</math>'s (also from storage rings for muons)</li> <li>d) Physics comparison between ep collisions and neutrino and muon physics</li> </ul>
VII. Hadron and photon experiments at fixed target machines	<ul style="list-style-type: none"> <li>a) Examples of hadronic experiments</li> <li>b) Scaling of lepton-production experiments</li> <li>c) Use of beams of short-lived particles</li> <li>d) Physics interest of photon experiments</li> </ul>
VIII. Detectors and data handling	<ul style="list-style-type: none"> <li>a) Survey of the open problems in particle identification</li> <li>b) Measurement of flow of energy</li> <li>c) Spatial and time limits of detectors</li> <li>d) New architecture of data acquisition systems</li> </ul>

First Workshop did not consider the possibilities and the limitations of the experiments to be performed at the future colliders. For the Second Workshop this task was divided between Group IV, which had also to design the corresponding electron-proton interaction region, and Group V, which was asked to consider both  $e^+e^-$  and  $p\bar{p}$  experiments that use very similar techniques. Because of the common physics, muon and neutrino experiments were assigned to a single group, the sixth. Groups VII and VIII were given problems very similar to the ones considered during the First Workshop by Groups V and VII.

During March 1979 the Convenors were chosen, and each group was assigned a member of the Organizing Committee as the person responsible for detailed contacts (Table 3).

Table 3

Convenors of the Second Workshop

Group	Convenor	Contactman within the Organizing Committee
I. Electron-positron colliders	A.N. Skrinsky	E. Keil
II. Proton accelerators and $p\bar{p}$ colliders	L.C. Teng	M.C. Crowley-Milling
III. Extraction and external beams	B. de Raad	M.C. Crowley-Milling
IV. Electron-proton interaction regions and experiments	G. Weber	U. Amaldi
V. Experiments at $e^+e^-$ and $p\bar{p}$ colliders	B. Barish	M. Vivargent
VI. Deep inelastic experiments with lepton beams	G. Barbiellini	P. Musset
VII. Hadron and photon experiments	Yu.D. Prokoshkin	U. Amaldi
VIII. Detectors and data handling	D.R. Nygren	G. Charpak

At the beginning of April the members of ICFA were informed about the detailed organization of the Workshop and were required to select delegates from their region by the end of May. More than twenty people from each large region were asked, in order to have a wide spectrum of competence, so that most of the problems listed in Table 2 could be tackled during the Workshop. As soon as the indications arrived, the delegates were assigned to the groups and their agreement was requested. In some cases changes of group were allowed, and in others the names of new delegates indicated to the ICFA members; this was to add some specific competence to the Working Groups. By the end of June this preparatory work was almost completed, so that the Convenors could receive a preliminary list of the participants in each group. Groups I, II, and III were formed by machine physicists, whilst there were both machine physicists and experimentalists in Group IV. Experimentalists and theorists were listed in Groups V, VI, and VII, and experimentalists and computer experts formed Group VIII. The Convenors were required to add to or subtract subjects from the list of problems assigned to their group, by taking into account the competence of the participants. It was suggested to them to contact immediately, at least those participants who were geographically nearer, so as to divide up the preparatory work, receive suggestions, and start organizing the work to be done at Les Diablerets. The final list of the delegates (see Table 4) was circulated around mid-August, with a request to the Convenors to contact in writing all the participants in their group in order to subdivide among them the subjects to be treated. It must be recognized that the efforts made to organize the work before the start of the meeting were not fully successful. In most cases, contact with the geographically nearer participants was established, while only few Convenors succeeded in contacting

Table 4

The working groups of the Second ICFA Workshop  
(The numbers in parenthesis indicate to which other group the person contributed)

GROUP	WESTERN EUROPE AND CERN	JAPAN	USA	USSR AND JINR	CHINA
I. $e^+e^-$ colliders [E. Keil <sup>1)</sup> and A.N. Skrinsky]	U. Amaldi A. Hutton G. Saxon K. Steffen (IV)		B. Richter R. Steining M. Tigner	V. Balakin	
II. p accelerator and $\bar{p}p$ (L.C. Teng)	N.M. King		E.D. Courant C. Pellegrini (I) A.V. Tollestrup	V.P. Dzhelepov I.A. Shukeilo V.A. Yarba	Ho Lung
III. Extraction & External beams (B. de Raad)	N. Doble J.C. Schnuriger P. Sievers			Yu.S. Fedotov	
IV. Electron proton (G. Weber)	K. Hübner P.G. Innocenti R. Turlay E.J.N. Wilson	Y. Kimura Y. Yamaguchi	S. Conetti <sup>2)</sup> W.A. Wenzel	I.A. Savin (VI)	Fang Shou-Hsien
V. $e^+e^-$ and $\bar{p}p$ experiments (B. Barish)	M. Banner J. Ellis G. Flügge G. Wolf	S. Orito	D. Cline D. Ritson		
VI. Deep inelastic experiments (G. Barbiellini)	A. de Rújula C.H. Llewellyn Smith H. Montgomery P. Musset W. Venus		H. Anderson S. Mori N. Samios	V. Kaftanov D. Kiss R. Leiste V.I. Savrin	
VII. Hadron and Photon Experi- ments [Yu.D. Prokoshkin (VIII)]	A.N. Diddens J.-M. Gaillard		R. Diebold J. Pilcher	Yu. Galaktionov S.S. Gerstein R. Sosnowski	
VIII. Detectors & Data Handling (D.R. Nygren)	G. Charpak T. Ekelöf (VII) F. Sauli P. Zanella	Y. Watase	M. Breidenbach W.J. Willis	B. Dolgoshein (VI) I. Golotvin (VI) K. Lanus	

1) Owing to the late arrival of A.N. Skrinsky, E. Keil acted as convenor during the first part of the Workshop.

2) Canadian Institute of Particle Physics, Canada.

all the members of their group. However, also because of the contact already established by the members of the Organizing Committee, at their arrival at Les Diablerets on 3 October, 1979, a large majority of the delegates had at least an idea of the problems they were supposed to tackle and had brought with them the required background information.

The nice atmosphere of the Eurotel and the good food certainly helped the participants to produce an impressive amount of work in a few days, essentially from Thursday 4 to Saturday 6 plus Monday 8. Sunday was left free for excursions. At a "feedback" session on Monday evening the various groups started to present their results to all the participants with the aim of both checking together the conclusions of the Workshop and preparing the Open Meeting of 10 October at CERN. The feedback session continued on Tuesday morning and greatly contributed to the homogeneity of the presentation of the results.

At CERN the Open Meeting was held in a crowded auditorium, starting at 10.30 a.m. on Wednesday 10 October. Its program is shown in Table 5. The written versions of the reports of the Convenors constitute the backbone of these proceedings. They are printed according to the numbering of the groups, each followed by the relevant contributed papers.

Table 5

Program of the Open Meeting held at CERN  
on 10 October to present the results of the Workshop

	Speaker	Title
MORNING	J.B. Adams (Chairman of ICFA)	Opening remarks
	A.N. Skrinsky	Very high-energy electron-positron colliders
	L.C. Teng	Many TeV proton accelerators and proton-antiproton colliders
	B. Barish	Extrapolation of experiments at electron-positron and proton-antiproton colliders
	B. de Raad	Extraction and external beams from a many TeV accelerator
AFTERNOON	G. Barbiellini	Deep inelastic experiments with lepton beams of a few TeV
	G. Weber	Electron-proton interaction regions and experiments
	Yu.D. Prokoshkin	Hadron and photon experiments at fixed target machines
	D.R. Nygren	Possibilities and limitations of detectors and data handling
	U. Amaldi	Concluding remarks

The material collected in these Proceedings refers to machines and experiments to be realized far into the future -- after the construction and the exploitation of the accelerators which either have been approved only recently or are still under discussion. Given

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this long time-scale, one may legitimately ask whether the great effort involved in the two ICFA Workshops is justified. My answer is Yes, because our field requires long-term investments, and to remain on the right track we need to know where we have come from and where we are going to. By looking far into the future we will have a better understanding of the needs of tomorrow and a clearer perception of the lines to be developed from now on.

At the end of the volume we reproduce a sample of photographs that should help the reader to recall or imagine the pleasant atmosphere of the Workshop, whose success was due both to the active collaboration of the participants and to the perfect organization by Miss D.A. Caton and her collaborators, Mrs. M. Compoint and Miss D. Lajust. I am very grateful to the CERN Publications Group for the preparation of these proceedings.

Ugo Amaldi