FORMAL WEAK-INTERACTION THEORY
INTRODUCTION

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The session was organized into four parts. The first part dealt with the dispersion relation approach to high-energy weak interactions. Valentin Ivanovich Zakharov gave a comprehensive survey of this field, which was pioneered by Pomeranchuk and has been actively pursued by the Moscow school of Okun and collaborators and by Appelquist and Bjorken, among others.

The remaining parts all dealt with one or another aspects of unified gauge theory of weak and electromagnetic interactions. The second part was devoted to the exposition and discussion of the renormalizability, regularization, and anomalies. Bruno Zumino gave the main lecture for this part, followed by a more specialized discussion of William A. Bardeen. Bardeen gave a hitherto unpublished result of his on the dimensional regularization and the Ward-Takahashi identity anomalies. Bardeen also gave a compact algorithm for dimensional regularization of Feynman integrals with any number of loops which is apparently due to Lautrup. Zumino's lecture was extremely comprehensive and up-to-date on this rather complicated subject.

The third part actually consisted of two subjects both of which were presented by J. D. Bjorken. The first subject was the phenomenology of heavy leptons required by some models of gauge theory of weak interactions. He has ably summarized the results of C. H. Llewellyn-Smith and himself. I did not ask him for their manuscript since it will soon be published. This was followed by his detailed analysis of model building along the strategy of spontaneously broken-gauge symmetry and his discussion of very new results of Pati and Salam, Bars et al., and Coleman et al.

Last, Joel R. Primack gave a definitive survey of all existing higher-order calculations in any of these models. He emphasized various physical constraints imposed on model building by consideration of higher-order effects such as the anomalous magnetic moment of the muon, K_L-K_S mass difference and induced strangeness changing neutral current effects.

Each part was followed by comments and questions from the floor. No record was kept of these discussions, but one discussion following Zumino's presentation, made a deep impression on me. (The following is my understanding of what was said.) The discussion had to do with the Adler-Bell-Jackiw anomaly and the view that while it will destroy renormalizability, its physical effects will occur, for instance, in order e^6, and models with anomalies should not be rejected just for this account. André Martin registered exception to this view, emphasizing that one need introduce an infinite number of counterterms beyond this order to specify a complete theory. Bjorken countered this argument saying (according to my interpretation) that the occurrence of anomalies may have to do with the breakdown of the asymptotic expansion in coupling constant, so that (1) the first few finite terms may still be an excellent approximation to the real answer and

(2) it would be unjustified to reject a perfectly sensible theory on the ground that the power series expansion in coupling constant breaks down at some high order. Nothing was resolved by this exchange, but we had an explication of two important opposing views.

Each speaker in this session graciously agreed to provide a written text of his talk, and all have fulfilled their pledges. I am grateful to them for their exemplary acts and I am happy to have their texts reproduced in this tome.