Though the possibility of the existence of neutrons inside nuclei had been first hinted by Rutherford as early as 1910, the importance of these particles, as a tool for investigation of the nuclear phenomena, was realised by workers in the field all over the world only after the publication of Chadwick's classic investigations leading to an unambiguous determination of the identity of this particle. The neutrons being uncharged particles, however, presented a difficult problem for their detection and early investigations of their properties in fact employed variants of the methods used earlier to establish their identity. As a result of these studies it was revealed that neutrons were capable of inducing a variety of reactions which could profitably be used for their efficient detection.

While these studies on the neutrons were being carried out in various laboratories of the world, Cosmic-Ray workers, particularly in Germany, began a search for this particle in Cosmic-Radiation. Though the cloud chamber pictures of Cosmic-Rays obtained by Locher, indicated the existence of neutrons in Cosmic-Rays quite early it remained for Bünfer to make the first ever systematic study of Cosmic-Ray neutrons. It is now known that the Cosmic-Ray neutrons are secondary particles produced in the nuclear interactions of the primary Cosmic-Rays and their subsequent energetic
secondaries and tertiaries. It is also known now that, though the nuclear disintegrations are of different types, low energy neutrons are always emitted in all these nuclear interactions. And this fact makes it possible to study these nuclear interactions induced by energetic Cosmic Rays with the help of these disintegration neutrons.

The present work reported here has been divided into two parts. Part I is concerned with the construction and studies of neutron counters prepared in the Physical Laboratories of Aligarh Muslim University. In this part various techniques of neutron detection, with a view to utilizing them in Cosmic Ray neutron studies, have been briefly discussed, followed by certain considerations which fix the design parameters of the neutron counters. The constructional details of Boron Trifluoride counters have been adequately discussed in this part. Though Boron Trifluoride counters have been constructed elsewhere, no attempts at getting them made in the country efficiently on a large scale have really been made. Considering their usefulness and their non-availability in India it was felt desirable, using the material available in the country, to evolve a design and a constructional procedure that would facilitate the construction of a good number of neutron counters of good, stable and reproducible characteristics. The characteristics of the few counters constructed by the author are given in this part. The temperature dependence of the characteristics of these counters which was studied for one of them is also presented here. The phenomena
observed in this temperature study have been discussed and a tentative explanation put forward.

Part II of this work deals with the investigations on nuclear disintegration phenomena in Cosmic Radiation carried out at the Gulmarg Research Observatory, Gulmarg (9000 ft.) Kashmir. The following properties of the $N$-radiation, as this component of the Cosmic Rays is generally called, have been investigated:

1. The interaction mean free path and the absorption mean free path of the $N$-radiation.

2. Existence of a transition effect of this radiation in lead.

3. Change in the disintegration-producing property of the $N$-radiation when it is filtered through an absorber of 280 gms./sq. cms. of Lead.

The results obtained from these investigations have been compared with those obtained by other workers using similar or different techniques. A tentative explanation for the existence of the transition effect has been put forward.