Preface

IN CELEBRATING the two hundred and fiftieth anniversary of the birth of its late Fellow, Benjamin Franklin, the American Academy of Arts and Sciences held a Symposium on January 11, 1956, at which the papers reproduced in this volume were presented and discussed. From the many facets of Franklin's full and productive life the Academy chose to honor him through a delightful and informative account of his life in France by Professor Morris G. Bishop, a performance on a replica of Franklin's glass armonica by E. Power Biggs, and the scientific symposium.

Franklin was one of America's first and greatest scientists. His scientific observations and theories are all the more remarkable today in the light of the tremendous scientific advances of the past two centuries. Of the many scientific topics that he considered, none attracted his interest more than electricity and its manifestations in the atmosphere. He observed, and presented theories on, many other atmospheric phenomena, including "northeasters" and the aurora borealis. It was natural to select atmospheric electricity as one of the topics of the symposium. The upper atmosphere was chosen as the second subject, not only in view of Franklin's interest in the aurora, but because he would certainly have been intrigued by the often exotic phenomena of the high atmosphere that have been revealed by recent researches.

Because of a necessary preoccupation with the business of earning a living, Franklin's active interest in science did not begin until he was in his forties. His experiments with electricity were initiated with the receipt of a small electrostatic machine from his friend Peter Collinson of London. He discovered that there were two kinds of electricity, positive and negative, and correctly identified lightning as a form of electricity. His studies of the efficacy of pointed bodies in drawing off the "electrical fire" led to his invention of the lightning rod and to practical rules for the avoidance of lightning strikes.

Franklin stated that thunderclouds are most commonly negatively charged but occasionally carry positive charges. These important results have been rediscovered only in the present century by investigators equipped with complex instruments and a knowledge of modern electrical theory. This is an outstanding example of Franklin's amazing scientific intuition and his skill as an observer.

During the 1750s Franklin submitted three papers on electricity to the Royal Society in London. At first they were all rejected as not worthy of publication in the Society's Transactions. Franklin's theories were at such variance with the current ideas of electricity that it was assumed they must be erroneous. Later, the Royal Society not only published the papers but awarded Franklin its Copley Medal for his discoveries.

Franklin was particularly interested in the vortical motions of waterspouts and whirlwinds. He describes how he followed a whirlwind for some distance on horseback until it entered a dense forest, scattering small branches about him.

Engaging in another of his scientific pursuits, astronomy, Franklin was unable to observe a lunar eclipse in Philadelphia because of the clouds and rain of an extensive storm. By correspondence, he found that the eclipse had been visible in Boston which was subsequently visited by a northeaster. From this scanty information, Franklin deduced that the storm had traveled from the southwest towards the northeast, even though the wind was in the opposite direction. He computed the speed of travel of the storm as 100 miles per hour, a probable overestimate due to his lack of data from other localities. On the basis of such very limited observations, Franklin drew the remarkably accurate conclusions that such storms probably originated in the Gulf of Mexico and that they were similar in structure, though of much larger size, to the water spouts and whirlwinds he had studied at close range.

In 1779 Franklin proposed a theory of the aurora borealis. He con-

sidered that the aurora was an electrical discharge in the high atmosphere where the low pressure would result in an increased electrical conductivity. Although his ingenious explanation has proved to be incorrect, it included a meridional circulation at high levels in the proper direction.

Historians have recorded Franklin's accomplishments in science in proper context with the many and varied activities of his full and fruitful life. In paying tribute to a distinguished colleague, scientists offer their best in the form of their own contributions to science. Thus, the papers in this little volume are not historical treatises on Franklin's works and time but, rather, represent the latest and best current developments and ideas in the fields discussed. Without exception the authors have distinguished themselves in their chosen topics. No pretense is made that the coverage of the subjects is complete; this could have been accomplished only at the cost of superficiality. This is particularly true in the case of the upper atmosphere concerning which many important phenomena, including the aurora borealis, are not mentioned at all. An effort was made here to present the points of view of the physicist and the meteorologist, each of whom looks at this vast area with glasses of a different hue. In an age of specialization we must continually stress the basic unity of all the physical sciences, and this purpose is aided here by a common laboratory, the upper atmosphere.

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