I. INTRODUCTION

The immediate context of the discovery of nuclear fission in late 1938 is connected with the experimental investigations of Otto Hahn and Fritz Strassmann at the Kaiser Wilhelm Institut in Berlin. The theoretical interpretation and experimental verification of fission was provided jointly at that time by Otto Robert Frisch and Lise Meitner while they were living in Copenhagen and Stockholm respectively. The discovery was totally unexpected and spectacular, but accepted immediately by scientists everywhere.

In view of the enormous experimental and theoretical advances accomplished in nuclear physics prior to late 1938, it has seemed worthwhile to examine in some detail the historical circumstances that might have served to set the stage for the discovery of fission. Unfortunately, there seems to be virtually no evidence, barring hindsight, to support the view that nuclear theory, in 1938, was prepared to accommodate anything akin to nuclear fission. Nor do we find, even after the discovery, that a convincing theoretical rationale for the phenomenon was forthcoming except in an ad hoc and makeshift way. At most, it is conceivable to maintain that nuclear theory served, in some subterranean or poking way, to influence the direction that experimentation took, which then brought to light the phenomenon of nuclear fission.

An examination of the reciprocity that maintains between experiment and theory in the pre-history, and discovery, of nuclear fission, provides the historian of science with a case study singularly skewed toward the dominant significance of experiment over theory. The objective in this inquiry is to show that the circumstances associated with events and discoveries leading to nuclear fission were predominantly related to questions of experimental strategy, instrumental feasibility, and the styles and modes of research practiced in various national laboratories. At most, adjacent theoretical endeavors provided no more than rhetorical stance or epistemological claim. At that time, they mostly seemed to be irrelevant or at least peripheral to what was going on at the frontier of the discipline. Sometimes they simply evaporated.

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as experimental advances were made. The essential point, however, is not to overlook or obscure the fact that the theoretical advances that were being made were of seminal importance for the discipline; and this in spite of the historical evidence that the correlation of experiment with theory in the 1930's seemingly got nowhere. The nucleus, one might say, turned out to be a harder nut to crack than the experiments or the theory showed, and certainly more complex than any books or papers written on the subject.

We shall see that the discovery of new information concerning the nucleus, was to fall heavily upon laboratory training and expertise, experimental finesse, and a knack for the invention and ability to design and re-design instruments that would provide answers to specifically focused empirical questions.

The experimentalists, mostly, lived in an intellectual and geographical space of their own making. It was a world dominated by their own inventions, and one which, so-to-speak, revealed from within itself the possibilities and challenges that were manageable, or almost so. That is, hurdles were manageable, provided enough ingenuity and craftsmanship were at hand to conceive, build, and put together the necessary equipment. It was a microcosm in which what had been accomplished served as the driving force for what might be accomplished. Puzzlements and resolutions spontaneously just led to new puzzles. The Austrian dramatist Franz Grillparzer has provided the bon mot for our experimentalist: "where riddles led me on to further riddles; to them the truth was quite precisely known."

II. NUCLEAR PHYSICS BEFORE 1930

An historical investigation of events in nuclear physics that would cover the decade of the 1930's, in a creditable way, is too ambitious an undertaking on this occasion. Accordingly, only the most pertinent and most actively studied experimental and theoretical problems have been touched upon that are covered by the literature until about the mid-1930's. It was at that time that neutron-irradiation experiments with the heaviest elements—that eventually led to the discovery of nuclear fission—were hotly pursued, but not resolved, in various laboratories around the world. An analysis of the details, intricacies, and contextual circumstances that culminated in the discovery, itself, necessarily will have to be treated on another occasion.

The pre-history of this branch of nuclear physics and chemistry is an inordinately complex and untidy subject. Even after the discovery of fission had been made, verified, and universally