TRANSMUTATIONS OF ATOMIC NUCLEI

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It has been pointed out on an earlier occasion\(^1\) that in order to understand the typical features of nuclear transmutations initiated by impacts of material particles it is necessary to assume that the first stage of any such collision process consists in the formation of an intermediate semi-stable system composed of the original nucleus and the incident particle. The excess energy must in this state be assumed to be temporarily stored in some complicated motions of all the particles in the compound system, and its possible subsequent breaking up with the release of some elementary or complex nuclear particle may from this point of view be regarded as a separate event not directly connected with the first stage of the collision process. The final result of the collision may therefore be said to depend on a competition between all the various disintegration and radiation processes from the compound system consistent with the conservation laws.

A simple mechanical model which illustrates these features of nuclear collisions is reproduced in Fig. 1, which shows a shallow basin with a number of billiard balls in it. If the bowl were empty, then a ball which was sent in would go down one slope and pass out on the opposite side with its original energy. When, however, there are other balls in the bowl, then the incident one will not be able to pass through freely but will divide its energy first with one of the balls, these two will share their energy with others, and so on until the original kinetic energy is divided among all the balls. If the bowl and the balls could be regarded as perfectly

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\(^1\) Abstract of lectures given in the spring of 1937 at various universities in the United States. The illustrations are reproductions of three slides shown in these lectures.

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