The backward $p-d$ scattering is studied. In the GeV region in addition to the simple $N$-exchange quite a lot of $I = 1/2$ $N$-exchanges are expected. Though each separate $N$-contribution to the $pd \rightarrow dp$ process is small, the existence of a fairly large number of such $N$ states produces a sufficiently large constructive interference of the individual resonance contributions.

The problem of nucleon ($N$) – deuteron ($d$) scattering is perhaps one of the simplest three-body problems to receive the earliest attention in this new phase of three-body activity which is only a few years old. I used the word “new” on purpose to emphasize the fact that the role of the three-body problem as a traditional “nuclear” means of obtaining more information about the properties of a two-body potential off the energy shell is not much younger than the subject of nuclear physics itself. The Faddeev theory which has opened a new mathematical window on the three-body problem gives it an elegance and clarity which was not perhaps available in the traditional nuclear description. Yet the physical motivations of the new approaches are perhaps not that different from those of the old one which boil mainly to one sentence: We would like to learn more about the structure of two-body potentials or interactions through the various three-body effects that they produce. For the purpose of this talk I distinguish the high energy problem from one in the MeV region which has received much attention in these years, and continues to receive attention as we have had evidence at this Conference. In the very low energy region the bound state counterpart of the $N-d$ system plays an important role [1]. The theoretical emphasis in this type of study has been on a numerically exact solution of the Faddeev equations with the help of separable potentials or equivalent names. From the nuclear point of view such studies can reveal much information on the role of different varieties of the $N-N$ potential, including the tensor force and the repulsive core, each of which seems to be important for an understanding of the properties of the low energy $N-d$ system [2]. In this type of study the $n-d$, rather than the $p-d$ system, has received the main attention because of its freedom from Coulomb effects. At a somewhat higher energy range ($> 10$ MeV), above the break-up threshold, corresponding studies made only with $s$-wave forces show on the whole satis-
factory agreement with the data [3], leaving more or less open the question of the sensitivity of the \( N-d \) system to the finer features of the \( N-N \) potential at these energies.

In this talk I shall try to present a study of the \( N-d \) system when its energy scale is extrapolated far beyond the MeV range all the way to the GeV range. Of course the validity of a nuclear study in this range may be immediately questioned. The apriori answer to such a criticism is perhaps to advocate an open mind on the issue after taking certain elementary precautions, the most important one being that appropriate consideration must be given to the importance of relativistic kinematics for such a range of energies. Such precautions apart, one may even expect considerable simplifications over a corresponding treatment at lower energies. Thus the distinction between the \( nd \) and \( pd \) system is now much less important, as long as one is not interested in very small angle scattering. Secondly, the role of the bound \( n-d \) state is expected to be almost negligible for this energy range which is far above the corresponding "pole". Thus in the GeV region, the emphasis need no longer be on an "exact solution" of the Faddeev equations, be it with separable or non-separable potentials, but that the formulation should be directed towards an adequate "high-energy mechanism" for the description of the process. Specifically we shall be interested in backward scattering where the \( u \)-channel exchanges hopefully represent the dominant mechanism. In conventional nuclear physics this goes by the name of the so-called "pick-up" process, the opposite of the Oppenheimer—Phillips process, which was first applied to \( pd \) scattering more than two decades ago, by Chew and Goldberger [4]. In the GeV region, one would expect a greater validity of this mechanism than in the MeV range, provided that the different types of possible \( u \)-channel exchanges are adequately taken into account. We prefer to skip the few hundred MeV region where the effects of many more complicated diagrams may come into play.

The first application of the \( u \)-channel mechanism to the \( pd \rightarrow dp \) process in the GeV region was made by Kerman and Kisslinger [5] who found the contribution of nucleon \( (N) \) exchange alone to be about three times smaller than the experimental value. They made the interesting suggestion that this contribution should be augmented by that of \( N^* \)-exchange, a natural candidate for which they found in the \( F_{15} \) (1688) resonance, which is supposed to be the first Regge recurrence of \( N \) (938). This appears entirely reasonable since the GeV range of energies is indeed the region of resonances. However their actual implementation of this interesting idea lacked an adequate quantitative basis. First, they considered a static model for the high derivative coupling of \( F_{15} \) to the \( nd \) system where one would expect large non-adiabatic effects. Secondly, they simulated the \( F_{15} \) effect through a Reggeised \( N \)-exchange, a mechanism too optimistic even for the 1 GeV region, considering the scale of masses.