fragments are plotted. The lighter fragments exhibit forward-peaked angular distributions; but, as the fragment mass increases, there is a systematic enhancement of the yields at backward angles near the target elastic recoil axis. Both the angular distributions and the associated energy spectra are consistent with a picture in which the light fragments originate largely from high deposition-energy events, whereas the heavier fragments are associated with simple cascade processes followed by statiscal decay involving smaller amounts of excitation energy.

These data will be used to examine existing cascade-evaporation codes[1] and total reaction cross section predictions.[2] In addition they are of interest to problems related to galactic cosmic ray transport through the interstellar medium and to microcircuit upsets in semiconductor devices aboard space satellites.

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ANALYZING POWER OF THE PROTON CONTINUUM FOR 150 AND 200 MeV POLARIZED PROTONS ON ^{12}C AND $^{58,62}Ni$

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The inclusive neutron and charged-particle continuum spectra induced by the bombardment of many target nuclei by medium energy protons have been well studied.[1,2] One common feature of the energy spectra is that the yields to the continuum are large and very forward peaked. Efforts in the past few years have concentrated on attempting to understand the major nuclear reaction mechanisms by which the incident proton dissipates its energy to the target nucleus, resulting in the continuum part of the energy spectra.

Two major competitive mechanisms have been proposed; (1) the quasifree nucleon-nucleon (QFNN) scattering mechanism and (2) the collective multipole, excitation mechanism. The evidences in support of these two mechanisms, although numerous, are in some cases, only suggestive.

One experiment which can shed some light on the importance of the QFNN scattering mechanism is to measure the $(\vec{p},p')$ analyzing power, $A(E,\theta)$, of the continuum as a function of the detection angle. It is expected that if the QFNN scattering mechanism is indeed an important mechanism, the measured $A(E,\theta)$ for the (p,p') continuum should be predictable from the free p-p and p-n analyzing powers, appropriately folded with the momentum distribution of the struck nucleons in the target nucleus and corrected for the mean field effects.

Initial measurements of the analyzing powers of outgoing protons, deuterons and tritons for 150 and 200 MeV polarized proton beams on ^{12}C and $^{58,62}Ni$ targets have been made. At 150 MeV, the outgoing particles were detected with two identical telescopes, located symmetrically on both sides of the beam. Each telescope consisted of a 100 μm (or 60 μm) and a 1 mm silicon surface barrier ΔE-detector followed by a 2"×3" NaI(Tℓ) E-detector. Such a symmetric geometry, combined with a fast spin-flip of the beam polarization, eliminates many systematic errors to first order. At 200 MeV, only one telescope, consisting of a 100 μm and a 1 mm silicon ΔE-detector followed by a 5" deep NaI(Tℓ) E-detector, was used. Therefore, only spin-up and spin-down measurements were made and were used in the calculation of analyzing powers.

Figures 1-5 show the preliminary results for $^{12}C(\vec{p},p')$ at E_p = 150 and 200 MeV. Similar data were obtained for $^{58,62}Ni$ targets at both energies (Fig. 6).

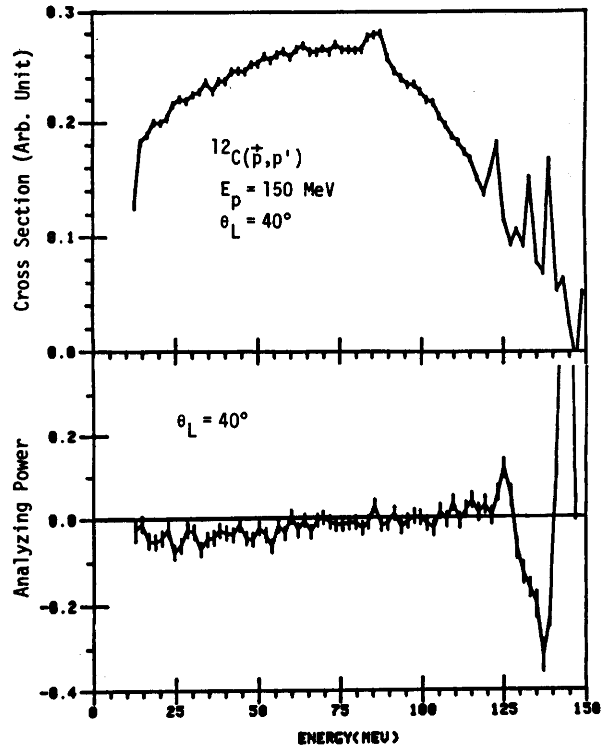

Figure 2. Cross sections and analyzing powers for the reaction $^{12}C(p,p'x)$ at θ_L=40° and E_p = 150 MeV.

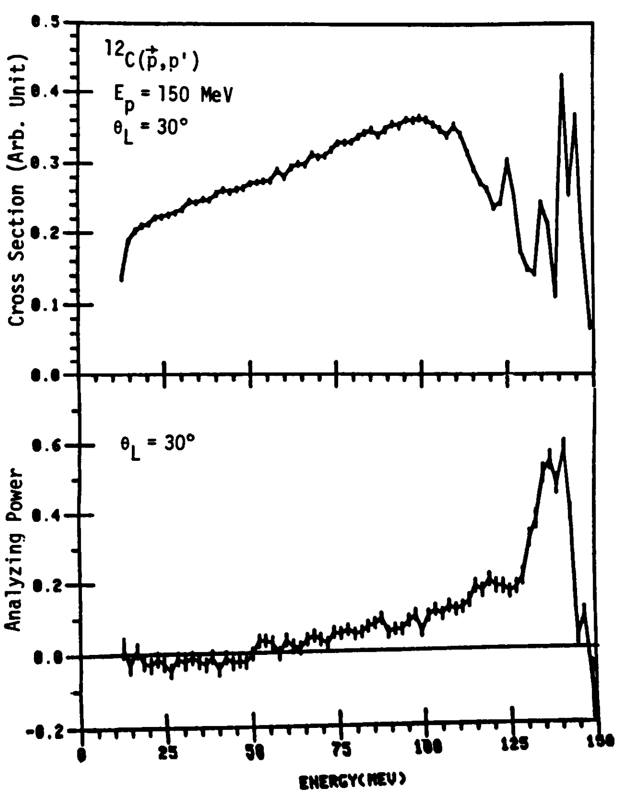

Figure 1. Cross sections and analyzing powers for the reaction $^{12}C(p,p'x)$ at θ_L=30° and E_p = 150 MeV.

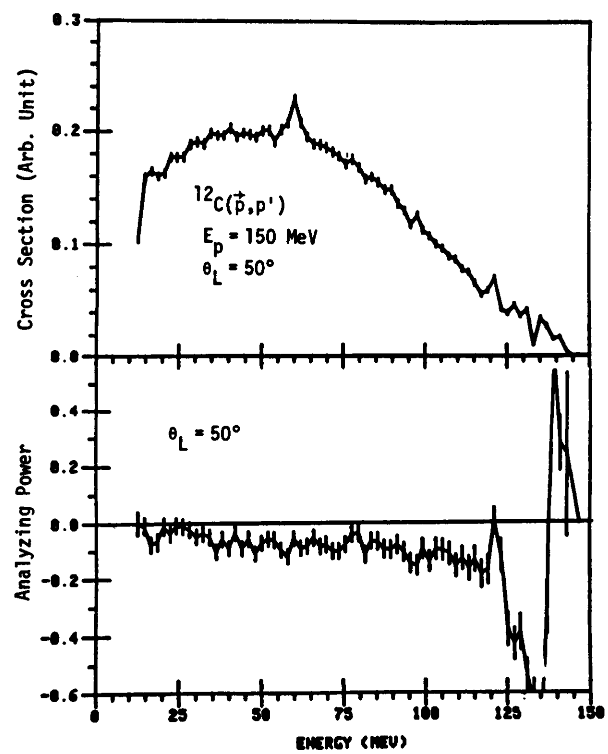

Figure 3. Cross sections and analyzing powers for the reaction $^{12}C(p,p'x)$ at θ_L=50° and E_p = 150 MeV.

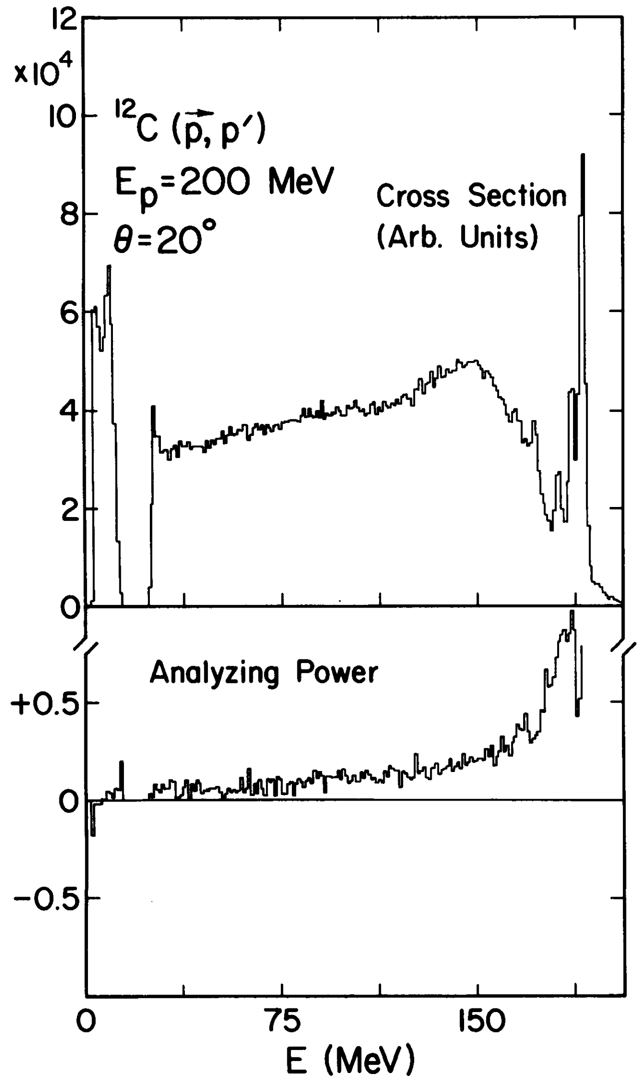

Figure 4. Cross sections and analyzing powers for the reaction $^{12}C(p,p'x)$ at $\theta_L=20°$ lab. and $E_p = 200$ MeV. (The gap at ~20 MeV is due to the dead layer on the NaI detector. An energy dependent correction that increases with energy remains to be made to the cross section.)

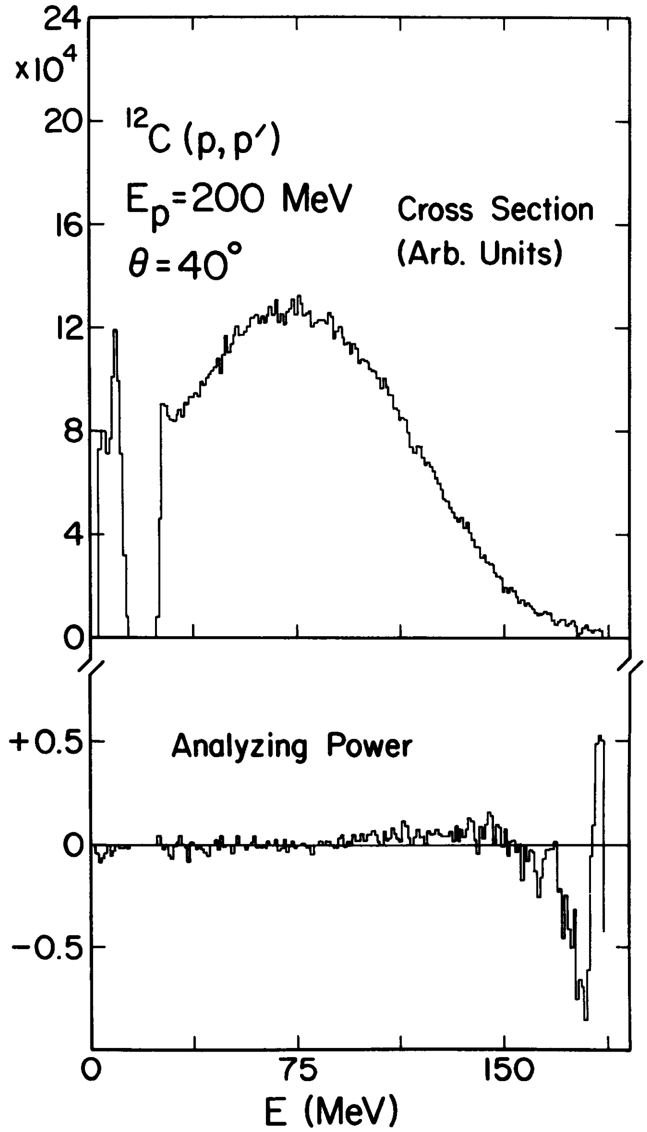

Figure 5. Cross sections and analyzing powers for the reaction $^{12}C(p,p'x)$ at $\theta_L=40°$ lab and $E_p = 200$ MeV.

For all targets, the analyzing powers are positive for $\theta_L<40°$, near zero for $\theta_L=40°$, and become negative and smaller for $\theta_L>40°$. At the high energy (or low excitation energy) end of the spectra, erratic analyzing powers were observed because of the contributions of different excited states and multipole excitation.

If the QFNN scattering mechanism is indeed a dominant mechanism for energy dissipation of the incident proton, the measured $(\vec{p},p')$ analyzing powers of the continuum should be positive for $\theta_L<45°$ (loosely speaking, this corresponds to nucleon-nucleon center-of-mass scattering angles less than 90°), near zero for $\theta_L=45°$, and negative for $\theta_L>45°$. The observed

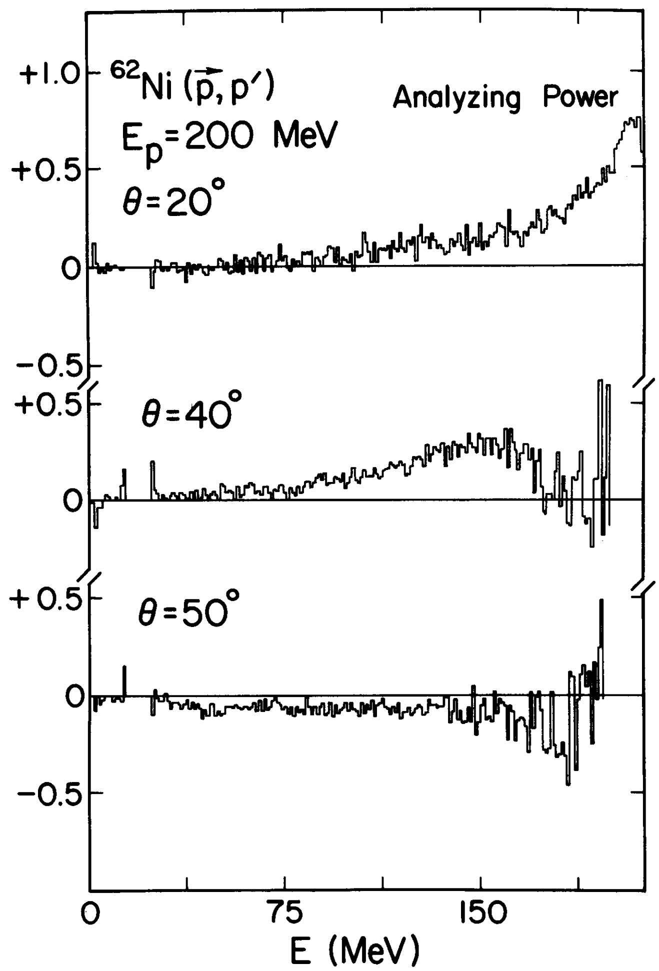

Figure 6. Analyzing powers for the reaction $^{62}Ni(p,p'x)$ at θ_L=20°, 40° and 50° and E_p = 200 MeV.

picture, although the collective excitation mechanism cannot be ruled out completely, especially for the spectra near the high energy end.

The analyzing powers at backward angles measured in this experiment are vastly different from those obtained at E_p = 65 MeV. At E_p = 65 MeV, the analyzing powers at large angles are large, especially at low excitation. These large analyzing powers at low excitation regions might be due to collective excitations.

Calculations are now being carried out in which the plane wave impulse approximation (PWIA) expression for quasifree nucleon knockout is integrated over the direction of the undetected outgoing nucleon. In the near future, distorted-wave impulse approximation calculations of the quasifree mechanism as well as collective excitation will also be performed.

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2) B.A. Anderson et al., Phys. Rev. Lett. 46, 226 (1981).

THE ROLE OF NUCLEON-NUCLEON INTERACTIONS IN PROTON-INDUCED REACTIONS ON ^{58}Ni AT 200 MEV

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As part of an effort to study the importance of the quasifree nucleon-nucleon (QFNN) scattering as a dominant process in dissipating the incident proton energy, a series of particle-particle coincidence studies were previously carried out at Maryland using 100 MeV protons on ^{58}Ni.[1] It was found that the major component of the charged-particle coincidence yield is associated with the emission of at least two fast protons. Furthermore, it was observed that the secondary proton energy spectra at various angles, detected in coincidence with primary protons emitted at 15° with energies between 30 and 50 MeV, have the same