stretched states for these two cases would be $31/2^-$ and $37/2^+$, estimated[6] to lie at $E_x \sim 4.6$ and 6.4 MeV, respectively, in $^{145}$Gd and $^{209}$Po.

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## $(p,\pi^-)$ SPECTROSCOPY in the sd SHELL

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The potential usefulness of the $(p,\pi^-)$ reaction for nuclear spectroscopy results from two features of the reaction that have been inferred from recent IUCF experiments:[1,2]

1) the dominance of a two-nucleon reaction mechanism (at least for certain transitions), and
2) the preferential population of high-spin final states (because of the large momentum transfer).

Consequently, the reaction should be useful in identifying high-spin states having a simple 2p-1h configuration with respect to the target nucleus, which may not be easily seen or identified by other means.

The striking selectivity of the $(p,\pi^-)$ reaction for high-spin 2p-1h states was first observed for a number of targets in the C, Ca and Zr mass regions.[1] Recently, Brown et al.[3] have shown that the main features of the relative cross sections in the Ca region can be qualitatively understood within the context of the $(1f_{7/2})$ shell model, together with only general assumptions about the reaction mechanism. The spectra are dominated by an "$\ell$-window" created on the lower side by the momentum mismatch in the reaction and on the higher side by the maximum angular momentum transfer available for three particles in the fp-shell.

A similar selectivity of the $(p,\pi^-)$ reaction has been observed[4] for sd-shell targets: $^{18}$O and $^{26}$Mg. The qualitative correspondence between some of the main features of the $^{18}O(p,\pi^-)^{19}Ne$ and $^{26}Mg(p,\pi^-)^{27}Si$ spectra and the full sd-shell model calculations of Wildenthal[5] is encouraging evidence that the $(p,\pi^-)$ reaction can provide useful spectroscopic information, and that further studies of the $(p,\pi^-)$ reaction on other sd-shell nuclei would be timely.

Fig. 1 shows the results of a preliminary survey of $(p,\pi^-)$ spectra from several Mg and Si isotopes. Further studies in the sd-shell are planned.

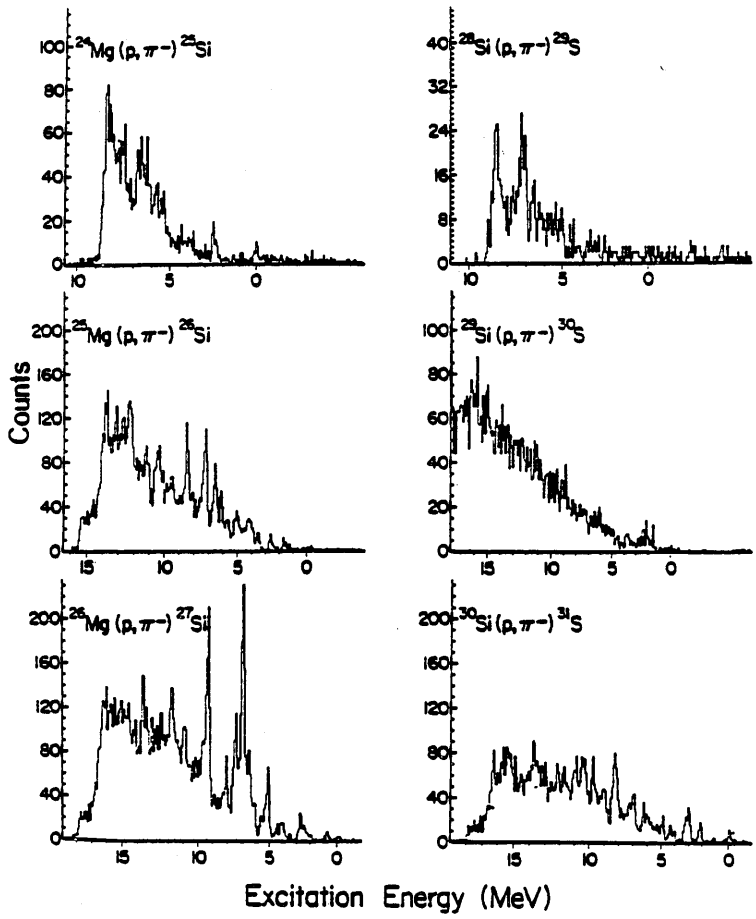


Figure 1. Energy spectra taken during a $(p,\pi^-)$ survey of Mg (left) and Si (right) targets at $T_p$ = 190 MeV and a laboratory angle of 30°. $T_p^{lab}$ = 190 MeV for all spectra except $^{29}Si(p,\pi^-)$ for which $T_p^{lab}$ = 201 MeV.

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