I. INTRODUCTION

The preponderance of the evidence, obtained in the many investigations of the path of the upward movement of minerals in plants, seems to indicate that this movement occurs primarily in the xylem. However, rather extensive experimental results have been interpreted as indicating that this movement occurs chiefly in the phloem.

The principal investigations of this problem have been by means of experiments in which some sort of mutilation has been employed. Bark or wood has been removed, or bark and wood have been separated. There can be no assurance that after such treatment the remaining tissue or tissues function normally. Any such treatment must inevitably affect many processes in the plant, and it is difficult, if not impossible, to appraise the effects of this on the normal mechanism of transport. Consequently, serious question must exist as to whether evidence obtained from such experiments can properly be considered as revealing the path of movement under normal conditions, in intact plants.

Apparently the only investigations of this problem that have been conducted with intact plants are ones in which minerals not normally occurring in plants (e.g. Br, Li, Ce) or radioisotopes have been employed and their rate

of movement into leaves or their distribution among the various leaves determined. Rapid movement has been interpreted as indicating xylem transport. This evidence is far from conclusive; we know that rapid movement of the transpiration stream can and does occur in the xylem, and we would expect that minerals would be carried in this stream, but we do not know that equally rapid movement of minerals cannot occur in the phloem. Greater concentration in the apical than in the basal leaves has also been interpreted as indicating movement in the xylem. This is based upon the established fact that transpiration is generally more rapid in the apical than in the basal leaves. These results are certainly suggestive of xylem transport, but they too are far from conclusive. One would like to know something about the actual transpiration rates of the leaves involved rather than to rely on the proposition that apical leaves generally transpire more rapidly. But more important, these experiments in no way exclude the possibility that the accumulation in the apical leaves may be the result of secondary movement, redistribution, rather than of a faster rate of delivery from the roots.

These researches were undertaken to investigate the upward movement of minerals in intact plants. It was thought that if a satisfactory method could be devised of measuring the radioactivity in leaves of intact plants