
THE NATURAL OCCURENCE OF THE 92 ELEMENTS ON PLANET EARTH -- TO BE USED AS A REFERENCE GUIDE IN CHECKING THE TRACE MINERALS IN DIFFERENT SOURCES OF ROCK DUST FOR AGRICULTURAL USE.

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A1374 A NOT-EQUAL A 07/12/93 TELCOMM
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THE "A NOT-EQUAL A" COMPLETENESS PRINCIPLE

Abstract. The formula "A NOT-EQUAL A" is proposed by Carlos Aliaga Uria, Cochabamba, Bolivia, as a fundamental principle. An example from soil nutrition is discussed as a test of the principle. Examples from six different fields of science will be needed to test the principle. This first example shows how a search for the major chemical elements needed for plant nutrition can result in an incomplete answer unless the study of "A" is conducted in a way to look for all the 92 chemical elements with the natural abundance of each element used as a reference level for that component.

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History of Fertilizers. Over a hundred years ago in Europe farmers used natural sources of fertilizers such as manure, composted vegetable matter, and rock dust. With the advance of modern science, chemists analysed the occurance of different elements in plants in a search to see what synthetic chemicals could be used for fertilizers.

Liebig found that the most essential elements for fertilizer were NPK. This led to the development of chemical fertilizers which replaced the natural fertilizers.

In Figure 1 the abundance of elements are plotted against the atomic number of the elements. Abundances in the plots are relative to Si (Silicon) which has been given a value of 10000 (4 on the logarithmic scale of the attached plots). Note that some plots and tables of the abundance of elements use a reference level of one million (1,000,000).
The abundance of each element is indicated by symbols below the code for the element. The following symbols are used:
@, *, ##, #, +, X.

Definitions are noted on the figures. "Ø" implies no known relationship to nutrition in the references cited.

The logarithmic ranges of occurance of different elements in the different groups are:

Photosynthesis related elements,	log +8.3 down to 5.0
NPK elements,	log +4.3 down to 1.5
Macronutrients,	log +4.0 down to 1.3
Micronutrients,	log +3.0 down to -2.3
Essential nutrients, no RDA(as of 1984)	log +3.8 down to -1.7

If "(A)" is the set of essential nutrients, and "(A')" is a measured set of essential nutrients going down to logarithmic ratio 1.5, then

(A') is not equal to (A).

(A') is an incomplete set of nutrients.

By running tests down to an abundance of log -4 and testing for all 92 elements, one could get an (A') = (A).

This exercise shows that the theorem of Carlos Aliaga Uria,

(A) IS NOT EQUAL TO (A)

applies to a set of soil nutrients where the tests are not run down to a low enough abundance level to obtain completeness. It is suggested that this theorem be tested in six different fields to test for generality.

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p. 122, Ch. 5: Soil and Fertilizer Nitrogen.
p. 189, Ch. 6: Soil and Fertilizer Phosphorus.
p. 243, Ch. 7: Soil and Fertilizer Potassium, Magnesium, Calcium, and Sodium.
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p. 144, Ch. &: Minerals...
I. Macronutrients essential at levels of 100 mg. or more per day: "#" ON FIGURE 1 OF A1374C

- Calcium
- Phosphorus
- Magnesium
- Sodium
- Chloride
- Potasium
- Sulfur

II: Micronutrients essential at levels of a few milligrams. "+" ON FIGURE 1 OF A1374C

- Iron
- Zinc
- Copper
- Iodine
- Manganese
- Flouride
- Molybdenum
- Cobalt
- Selenium

.... Now known to be essential but no RDA or ESADDI established (1984). "X" ON FIGURE 1 OF A1374C

- Arsenic
- Tin
- Nickel
- Vanadium
- Silicon

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Ref: Cambridge Encyclopedia of Earth Sciences.
Left vertical scale: Abundance of the Elements (logarithm)

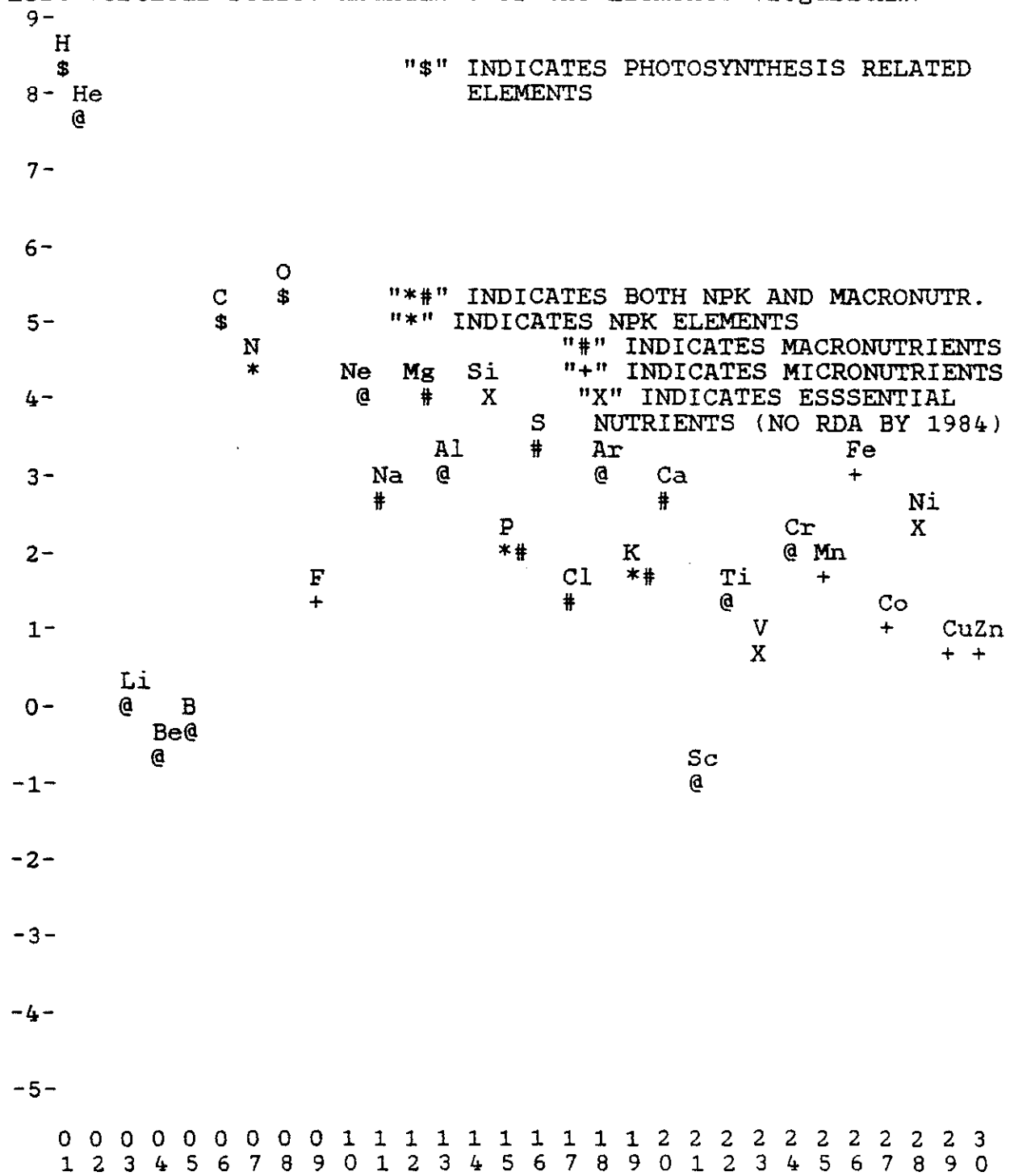

Figure 1, Part A

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Ref: Cambridge Encyclopedia of Earth Sciences.

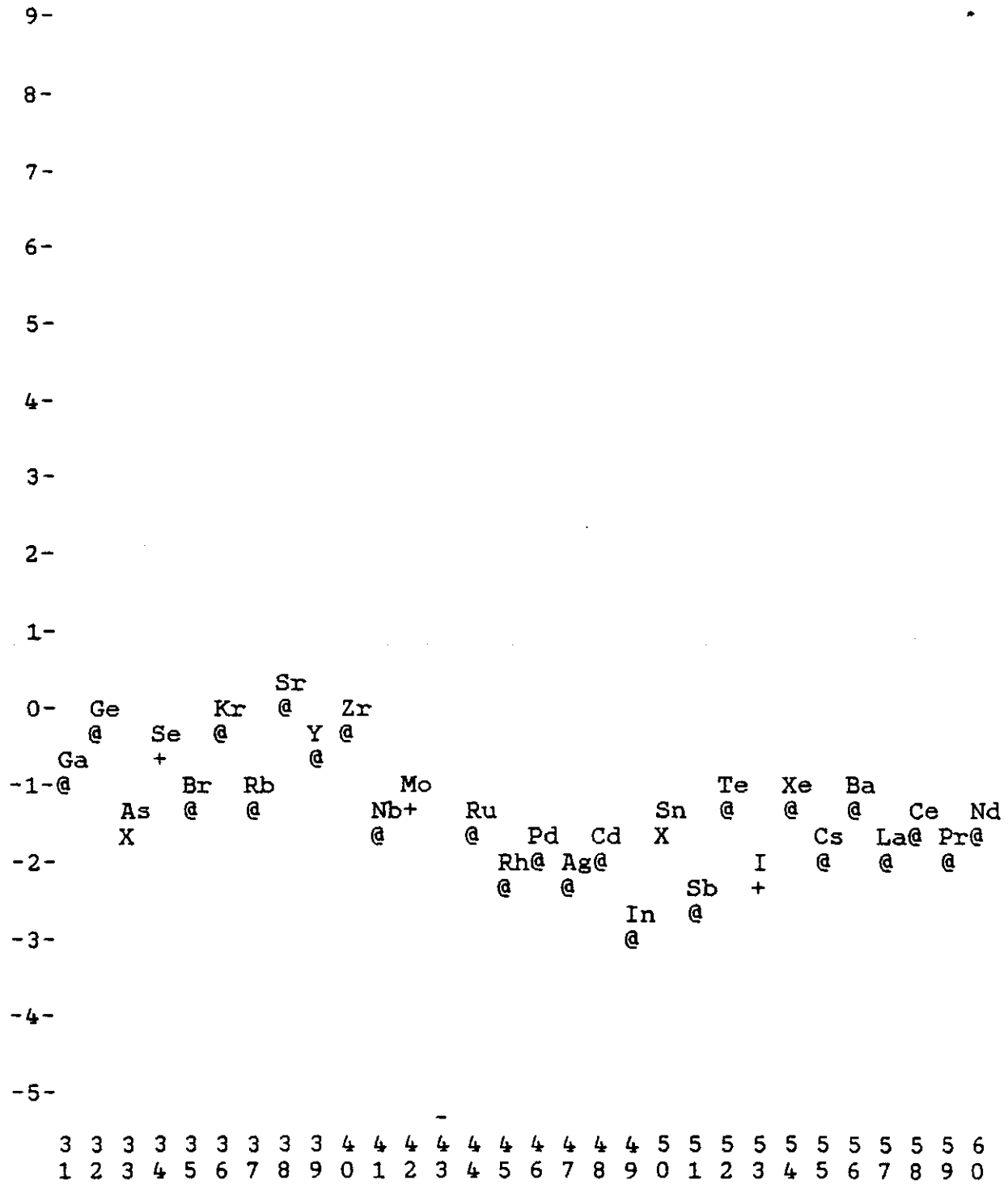

Figure 1, Part B

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Ref: Cambridge Encyclopedia of Earth Sciences.

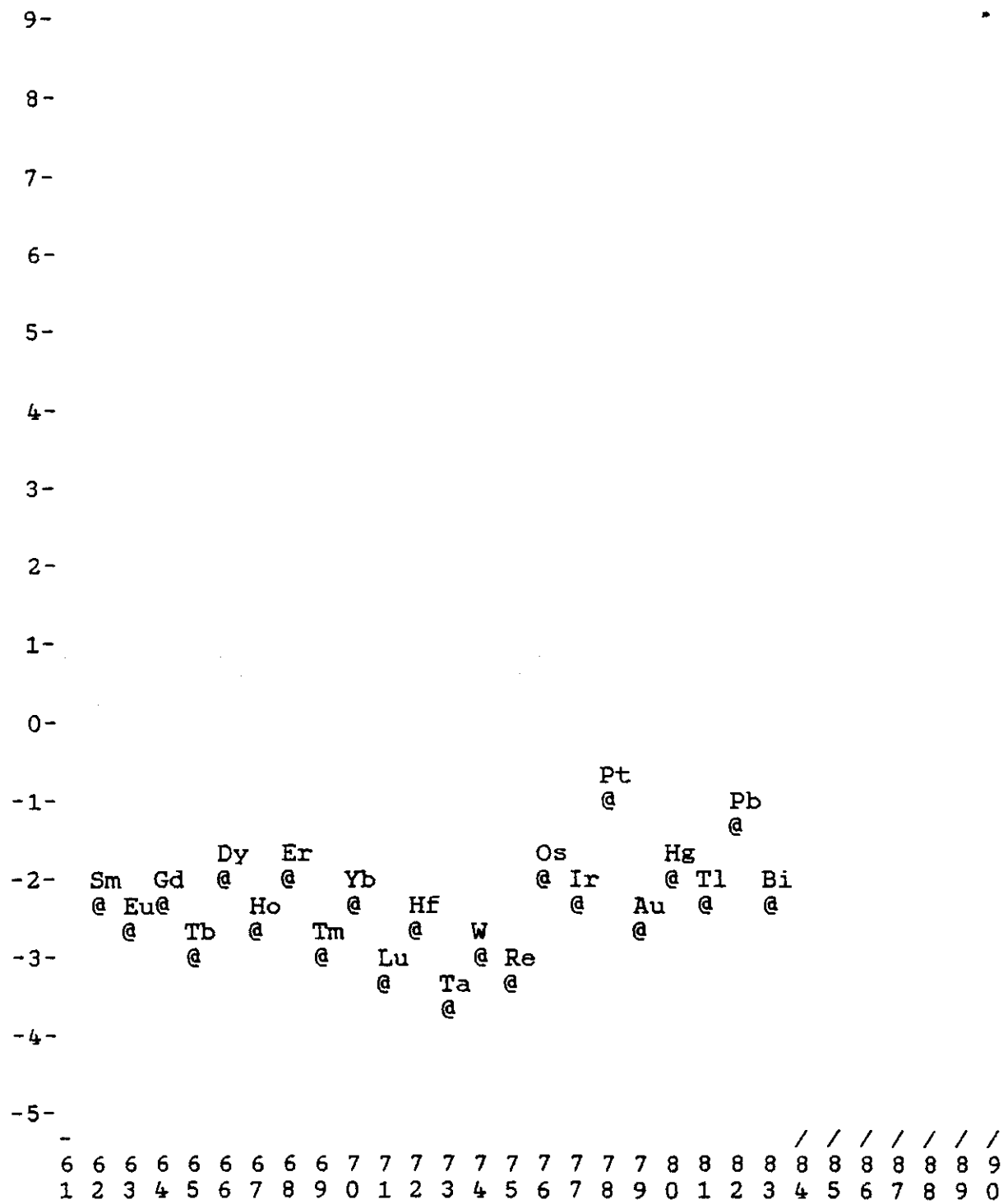

Figure 1, Part C