forthcoming article on XO_3 groups in crystals (which I shall be much interested in doing) and he has read one of mine on "Principles Determining the Arrangement of Atoms and Ions in Crystals," to be published soon in the Journal of Physical Chemistry, as well as the articles of Pauling's mentioned, we can come to a better mutual understanding.

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Stanford, California,
April 9, 1931.

Evidence of the Detection of Element 85 in Certain Substances

With a magneto-optic method of analysis (Allison and Murphy, Jour. Amer. Chem. Soc. **52,** 3796 (1930); Phys. Rev. **36,** 1097 (1930)) we have made a search for element 85 in various substances in which its presence might be suspected. Out of a considerable number of substances examined, we have found evidence which seems to us to indicate, to a high order of probability, the presence of element 85 in the following: sea water, fluorite, apatite, monazite sand (Brazilian), kainite (Stassfurt), potassium bromide, hydrofluoric acid and hydrobromic acid. The evidence is presented in the data displayed in the accompanying graphs, and is supported by certain chemical reactions.

In Fig. 1 are plotted the atomic weights of the halogens against the scale readings of the minima of light intensity characteristic of several of their compounds, increasing scale readings representing decreasing time lags. These acids as do other inorganic acids which we have studied, produce each two characteristic minima, while the salts, as do other inorganic salts, produce in general minima equal in number to the known isotopes of the metallic element of the salt.

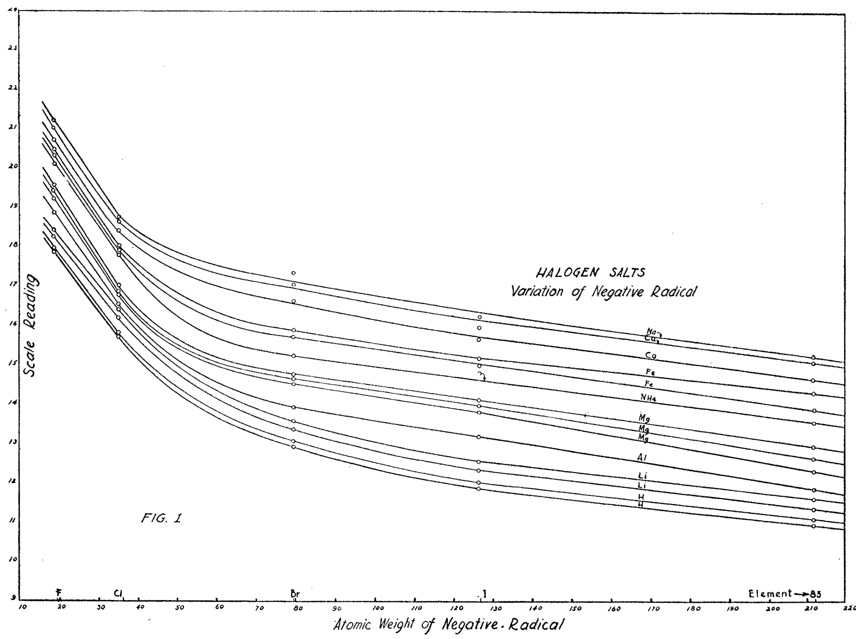

Fig. 1.

The two lower curves (Fig. 1) show our observations for hydrofluoric, hydrochloric, hydrobromic, hydriodic acids and what we will call provisionally "85" acid, each acid forming two minima of light. The other curves, in order, exhibit the data obtained for the halides of lithium, aluminum, magnesium, ammonium, iron, calcium, and sodium. It will be seen that we find minima in each case appropriate to an "85" salt, that the number of these minima is without exception the same as that of the other halides and that they lie well on the extended curves.

The same data are shown somewhat differently in Fig. 2, in which the chemical equivalents of the isotopes of the metallic radicals are plotted against the scale readings of the characteristic minima of the compounds. The upper curve represents the fluorides of hydrogen, lithium, aluminum, magnesium, ammonium, iron, calcium and sodium. The next three curves represent, respectively, the chlorides, the bromides and the iodides, while the last curve represents what we have termed the "85"-ides, of the same elements. We have not as yet extended our observations for the five series beyond sodium, except in the case of the chlorides, because of the difficulties introduced by the overlapping in these regions of the scale of the minima produced by the halogen salts of the heavier elements.

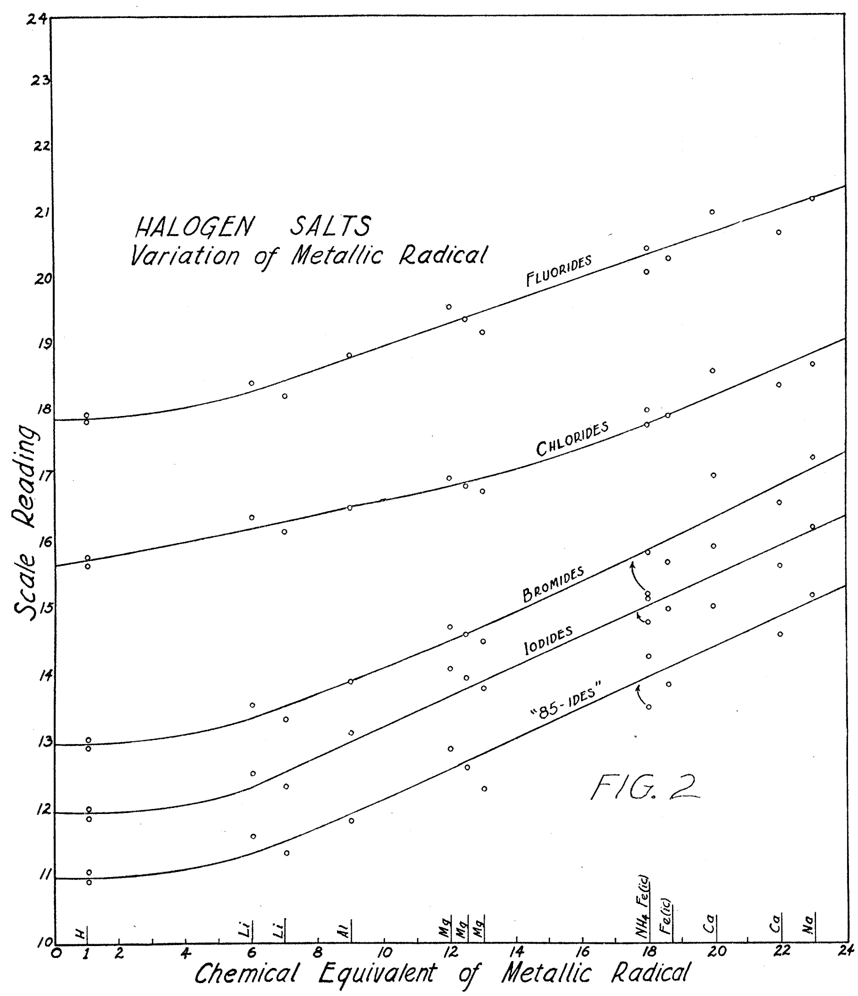

Fig. 2.

According to our quantitative estimates, the greatest abundance of the element found in any of the above mentioned substances, in unconcentrated form, is of the order of 1 part in 10.[9] Concentrations in the form of Li85, using monazite sand as a source, are now in progress and have already met with considerable success. The characteristic minima of H85 disappear on the addition of aqua regia, bromine or iodine to the solution. These minima are restored by the addition of sulphur dioxide or stannous chloride. These are the only oxidizing and reducing agents which have been tried. All reagents used gave negative tests for H85.

These investigations have been under way since the middle of the past summer. More recently they have been repeated and extended by one of us (F.A.) in a somewhat more precise manner, while the chemical investigations have been carried on by two of us (E.R.B. and A.L.S.).

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Edgar J. Murphy
Edna R. Bishop
Anna L. Sommer
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Alabama Polytechnic Institute,
April 3, 1931.

The Principle of Continuity and Regularity of Series of Atom Nuclei (Atomic Species)

While what may now be called the principle of continuity and regularity of the series of atomic species, has been used by the writer in the prediction of isotopes, and has been presented in the form of diagrams for 10 years, the complexity of the diagrams seems to have prevented the recognition of this principle by others. It therefore seems important to give a name to the principle and to illustrate it by simple drawings.

The first figure is taken, with five minor changes which do not affect the general pattern, from a diagram of the helium-thorium series which was used to predict numerous isotopes, most of which have now been found or shown to be probable. The maximum number of isobaric species given in this 1923 figure (J. Franklin Inst. **195,** 554) is 3, as is shown in Fig. 1.

The uranium series (Fig. 2) exhibits at

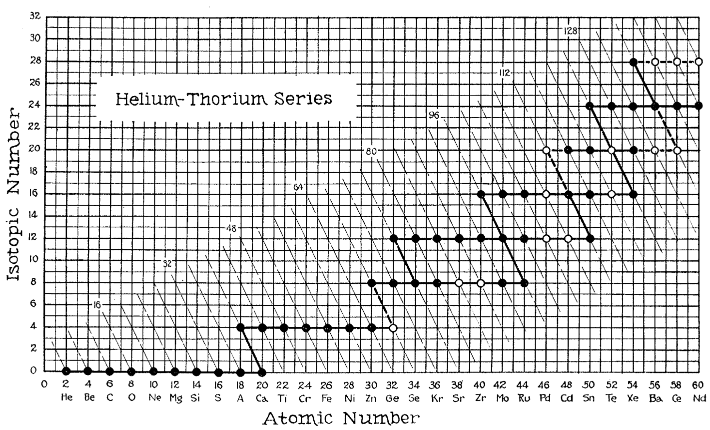

Fig. 1.

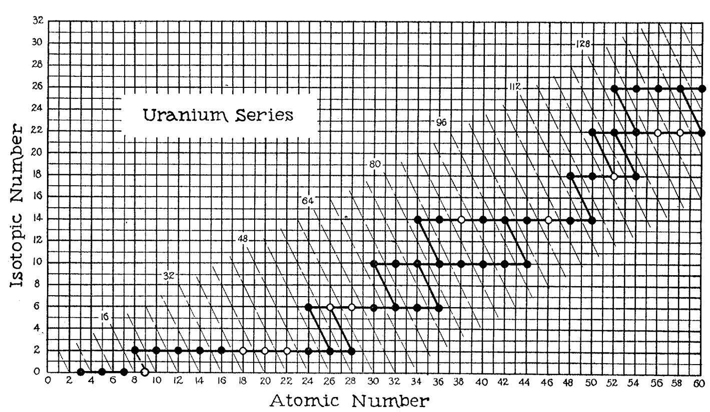

Fig. 2.