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# This Week's Citation Classic®

**Cameron A G W.** Abundances of the elements in the solar system.
*Space Sci Rev.* **15**:121-46, 1973.
[Belfer Graduate School of Science, Yeshiva University, and Goddard Inst. for Space Studies, NASA, New York, NY]

Estimates of the relative abundances of the elements in the solar system played an important role in establishing the major processes of stellar nucleosynthesis Subsequently, it became legitimate to use nucleosynthesis methods to interpolate poorly known elemental abundances, but the experimental database has steadily improved and interpolation is less necessary now [The *SCI*® indicates that this paper has been cited in over 525 publications since 1973]

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In 1956, Suess and Urey[1] published a very important paper in which they tried to deduce the relative abundances of the elements in the solar system using data from a variety of sources, including meteorites, the Earth, the Sun, and some of the stars. Many of these data were of very poor quality. They introduced a purely *empirical* criterion for adjusting the abundances of many of the elements relative to those of their neighbors, requiring that abundances of odd-mass-number isotopes should vary smoothly with mass number. This was an inspired assumption.

With this abundance table as a basis, it was possible to identify[2,3] a half-dozen separate processes in nuclear physics likely to occur in the interiors of stars during their evolutionary lifetimes, often in the last spectacular moments of a supernova explosion. With several processes contributing to the abundance of a given odd-mass-number isotope, abundances should in general vary smoothly, but occasionally (e.g., at closed neutron shells) the abundances should change rapidly with mass number. Hence, the *identified* processes of nucleosynthesis provided an improved basis for interpolating poorly known abundances among neighboring elements.

This formed the rationale for my first compilation of elemental abundances,[4] intended to improve upon Suess and Urey. At intervals of every few years, I issued an updated table, but usually these updates were done very informally (for example, one of them was distributed as part of a set of privately produced lecture notes). The paper discussed here as a *Citation Classic* was prepared at the time an International Symposium on Cosmochemistry was held at the Harvard and Smithsonian Observatories, in 1972. This paper was not presented at the symposium, but it seemed appropriate to include it in the issue of *Space Science Reviews* that contained the papers from the symposium.

With the passage of time, the accuracy of determination of elemental abundances in all relevant sources has improved. It is now possible to base the abundances of most elements not only on measurements in meteorites, but particularly in *carbonaceous* meteorites (of Type I). These measurements now agree very well with solar abundance determinations. I issued one more update,[5] but not long afterward, Anders and Ebihara[6] doubled the number of carbonaceous measurements and issued a new abundance table based on these measurements and on my interpolation procedures. This is now the standard source for abundances.

These abundance tables have been popular because departures from a standard abundance distribution in natural materials often suggest mechanisms of formation for that material; thus, people like to have such a standard.

1 **Suess H E & Urey H C.** Abundances of the elements *Rev Mod Phys* **28** 53-74, 1956 (Cited 385 times )
2 **Burbidge E M, Burbidge G R, Fowler W A & Hoyle F.** Synthesis of the elements in stars *Rev Mod Phys* **29** 547-650, 1957 (Cited 840 times )
3 **Cameron A G W.** *Stellar evolution, nuclear astrophysics, and nucleogenesis* Chalk River, Canada Atomic Energy of Canada Limited, 1957 Report CRL-41
4 --------------. A revised table of abundances of the elements *Astrophysical J* **129** 676-99, 1959 (Cited 120 times )
5 --------------. Elementary and nuclidic abundances in the solar system (Barnes C A, Clayton D D & Schramm D N, eds ) *Essays in nuclear astrophysics* Cambridge, England Cambridge University Press, 1982 p 23-43
6 **Anders E & Ebihara M.** Solar-system abundances of the elements *Geochim Cosmochim Acta* **46**·2363-80, 1982

 