



Cosmic Dust Courier



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Curator/Cosmic Dust

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NASA/Johnson Space Center

Houston, Texas 77058 USA

Telephone (713) 483-3274



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The Discovery of Particle "Clusters" on JSC Collectors

Dr. Donald E. Brownlee (University of Washington, Seattle) and others have previously emphasized the potential importance of relatively large, friable cosmic dust particles which, upon collector impact, break into many small fragments. We routinely survey our flown collectors for these and other types of special particles and have recently discovered several possible fragmented "clusters" on collection flags W7025 through W7029. The most spectacular occurrences examined to date occur on flag W7029. Volume 2 of the Cosmic Dust Catalog will document particles from W7029. However, the large "clusters" remain on the flag pending sample requests and suggestions for possible consortium studies. Preliminary examination data for two such "clusters" are summarized in Figs. 1 and 2.

The largest "cluster" is approximately 100 microns in size (Fig. 1) and consists of irregular, mostly opaque particles with ragged outlines and transparent zones which suggest porous structures. One of the smaller outlying members of the cluster (particle marked with arrow, Fig. 1a) was removed from the flag for preliminary examination. It was found to be approximately 11x15 microns in size, opaque, dark gray to black with a dull to submetallic luster and a porous aggregate-type structure. Its morphology, as determined by SEM (Fig. 1b), and its elemental composition, including abundant Fe and S and significant Ni as determined by energy-dispersive x-ray analysis (Fig. 1c), suggest that the particle is of extraterrestrial origin. By inference, the large cluster from which it was sampled is also extraterrestrial. Larger members of the same cluster may approach sizes of about 40-50 microns, thereby introducing the opportunity for other types of analyses (INAA, volatile elements, etc.) which might be included in a consortium study of the cluster.

A second cluster on W7029 appeared initially to be a single opaque, though probably porous, irregular particle of approximately 50-60 micron size (particle marked with arrow, Fig. 2a). However, attempts to remove the particle from the flag for examination revealed that it was a fragile aggregate of smaller particles. Several of these small constituent particles were removed for preliminary examination. One such particle, about 12x13 microns in size, was found to be opaque and black with a dull to subvitreous luster. Its morphology, as revealed by SEM (Fig. 2b), indicated a complex composition involving at least two phases. Its bulk elemental composition, which includes abundant Fe and S (Fig. 2c), also suggests an extraterrestrial origin. Other particles from the same "cluster" displayed similar or even greater degrees of complexity, suggesting that the parent "cluster" (Fig. 2a) is, in fact, a large heterogeneous extraterrestrial particle. It, too, might be profitably studied by a consortium approach.

We encourage interested investigators to organize scientific consortia for the study of these comparatively large particles. We will be glad to provide further information and to assist in planning for such work.

Sample Requests

All sample requests should be made in writing to "Curator/Cosmic Dust" at the address given in the newsletter letterhead. Each request should contain enough information to permit evaluation of the proposed experiment and the adequacy of the requester's facilities. All necessary information should probably be condensable into a well-written one- or two-page letter. Prospective sample requesters may contact us regarding details.

Guidelines for preparing cosmic dust sample requests and policies for reviewing such requests are currently being formulated. However, the current review system, which is centered around the Lunar and Planetary Sample Team (LAPST), has already considered a total of 9 requests for samples. Allocations have been made for several of the approved requests and are in progress for others.

Brief History of the NASA/JSC Cosmic Dust Program

Since 1974, D. E. Brownlee has led a limited effort to collect extraterrestrial dust samples from the stratosphere using impactors mounted on NASA U-2 aircraft. In order to increase the number of such samples available to the scientific community, JSC began, in May of 1981, a program dedicated to the systematic collection and curation of cosmic dust for scientific investigation. Stratospheric collections have been successfully made using NASA WB57F aircraft and have recently been extended to include U-2 collectors. Similar collection efforts using NASA ER-2 aircraft are expected to begin later this year.

Catalogs of data which summarize preliminary examinations of particles are compiled and distributed to interested recipients. We have mailed (January/March, 1982) our first Cosmic Dust Catalog in two installments (Volume 1, Numbers 1 and 2) to approximately 900 individual scientists, scientific organizations and libraries. Future catalogs will be sent to those recipients who indicated that they wished to remain on the distribution list. Volume 2 is expected to be published in April, 1982.

Goals and Distribution of the Cosmic Dust Courier

Although the Cosmic Dust Catalogs will probably remain the most complete summaries of information regarding the nature of particles available for study, the present newsletter will be the first of a series of bulletins intended to more quickly alert interested readers to timely developments in the Cosmic Dust Program. The newsletter will be published as often as needed to publicly summarize our progress. Initially, distribution will be made to those persons or organizations which have requested continued receipt of Cosmic Dust Catalogs. Additions or corrections to our mailing list can be made by contacting us at the address or telephone number given in the letterhead.

Figure 1a



Figure 1b

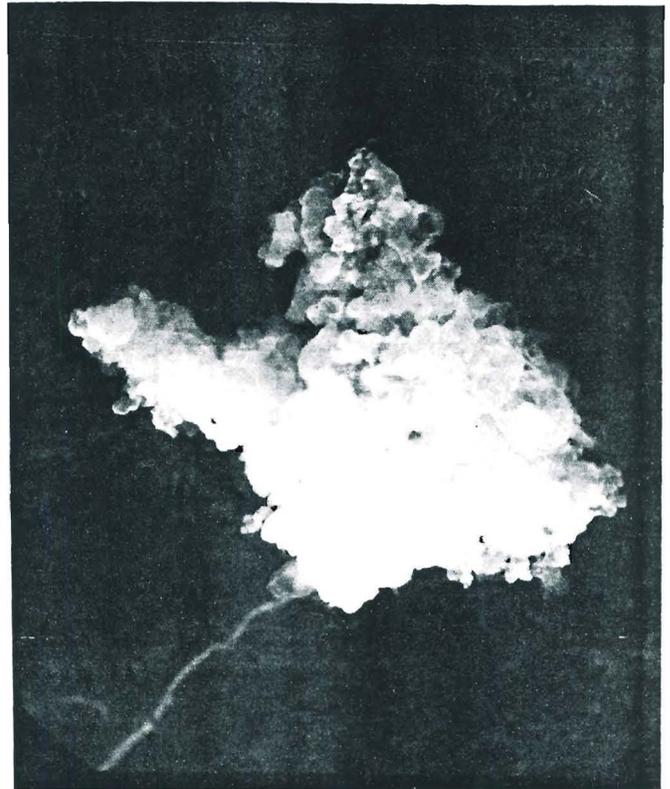


Figure 1c

Note: Stray electrons induce copper x-radiation from some SEM internal parts. Thus, the peak labelled "CU" may include contributions from both sample and instrument. The SEM is being modified to remove the machine artifact.

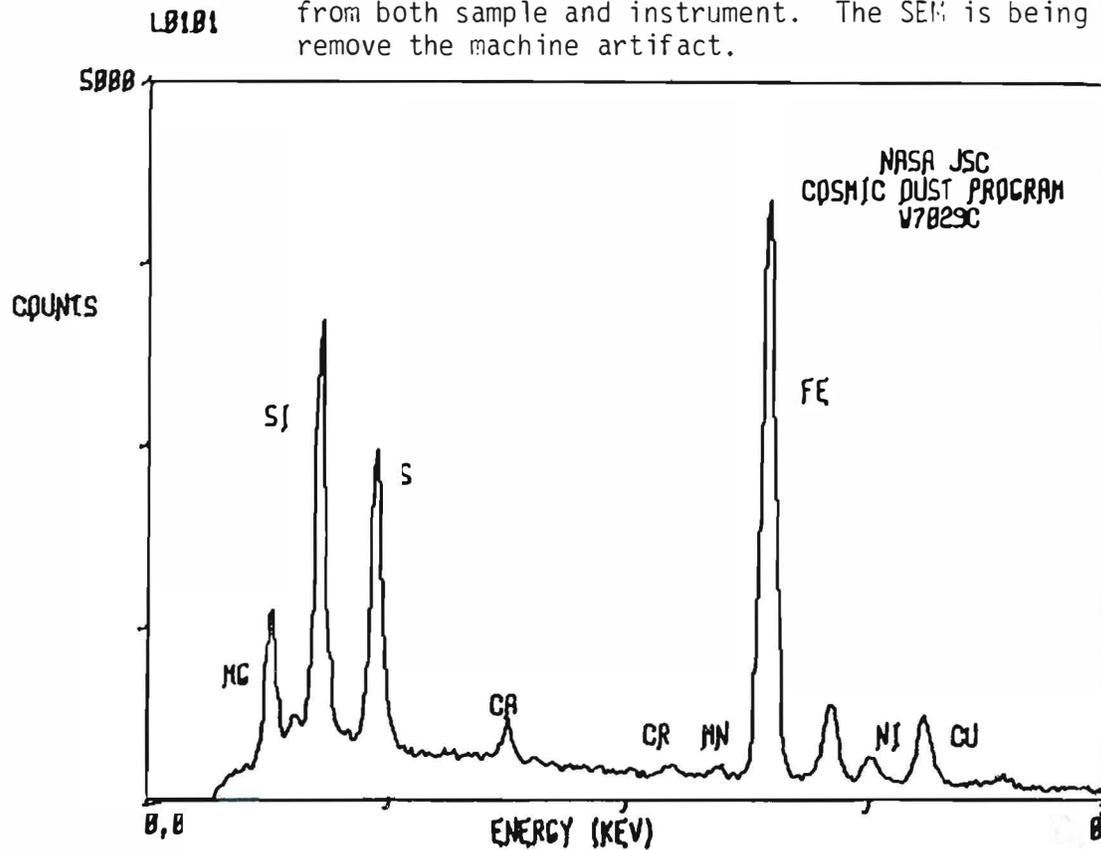


Figure 2a

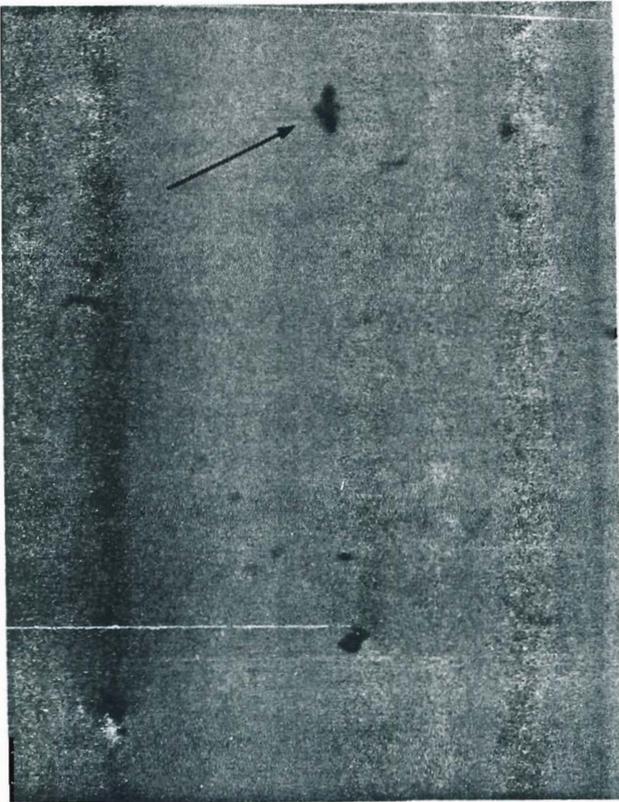


Figure 2b

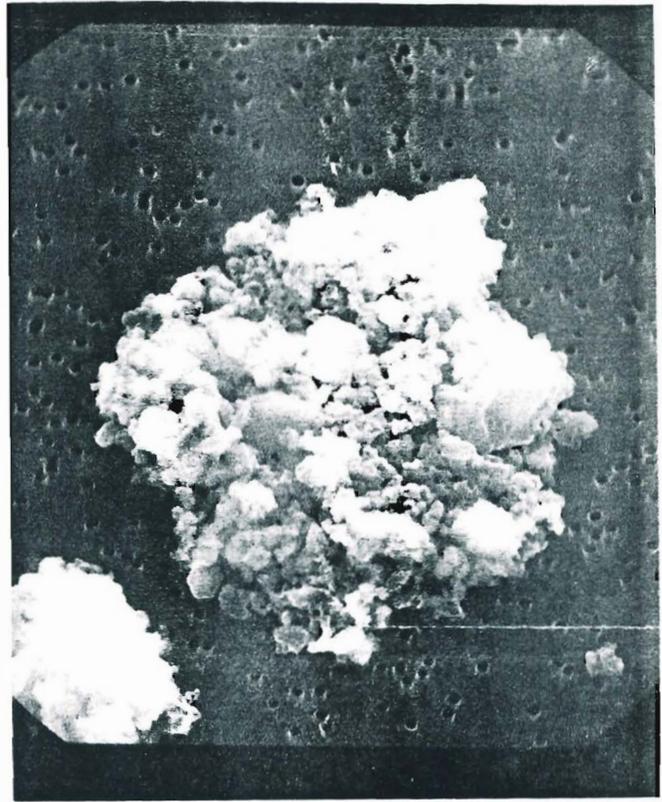


Figure 2c

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