FINAL DISCUSSION

compiled by R.H. Giese

By the end of the meeting a final discussion took place to identify unsolved problems and to collect suggestions for future activities. To start this event a panel of few participants was asked to summarize personal views. Then the discussion was extended to involve the other outstanding experts fortunately being present in the auditory. Discussion sheets were kindly provided by Drs. Grün, Lamy, McDonnell, Parkin, Singer, Weinberg, and Zook. From these notes and records of many oral contributions hopefully the most important items were compiled in the following list. It is arranged in sections representing the different methods and within each section or subsection in an order ranging from near future to later and more demanding tasks. The list includes both, items, which have been already investigated but which still need more thorough treatment and projects which are far from implementation but strongly desired in the future. As a general trend it clearly turned out, that an interdisciplinary and synoptic view of the problems by combination of information from different fields is the most promising way to complete our knowledge of the interplanetary dust cloud and to relate it to the exciting problems of Astrophysics.

LIST OF FUTURE TASKS

I. OBSERVATIONS

Structures in ZL (bands, rings, fine structure)
Time variation (short and long time) of Zodiacal Light (ZL)
More Infrared (IR) and Ultraviolet (UV) measurements (Balloons, Rockets, e.g. INTERZODIAK, Shuttle)
F-corona, Inner ZL
- 1988 solar eclipse (balloon, IR imaging)
Improvement of Doppler measurements

II. SPACE INVESTIGATIONS

Large capture cells (e.g. Shuttle, Space Station)
Observations of comets, asteroids from orbiting telescope
Distribution of m, v and time variations of possible Beta meteoroids,

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collisions in the inner solar system
Space coronograph (V,IR,Imaging, 20R , long time observations)
- brightness, color, polarization, thermal radiation
- time variations
- transient phenomena (transients, grazing comets)
Further flux- and/or optical measurements (e.g. cooperative NASA/ESA)
- out of ecliptic
- beyond Asteroid belt and Jupiters orbit
- in the inner solar system (0.3 AU)
- deep in planetary gravitational fields
Active space experiments for
- dust or plasma releases
- study of EM radiations effects (Poynting-Robertson, spin up)
Comet and/or asteroid rendezvous for
- investigation of production of submicron and meteoroid sized particles
- active experiments for in-situ analysis
- sample return
Use of spacecraft
- LDEF
- SHUTTLE (or free flying platforms)
- GIOTTO
- GALILEO
- ULYSSES
- SPACE TELESKOPE
Use of future space missions
- SPACE STATION
- GIOTTO 2
- CRAFT
- AGORA
- COBE
- CASSINI ORBITER
- SUN PROBE

III. LABORATORY

Analysis of collected grains (stratosphere, deep sea), and lunar samples
- analysis of more samples of extraterrestrial particles
- improvement of discrimination from space debris, how representative are collected particles (selection effects)?
- application of analytical methods used for atmospheric particles to deep sea spherules
- monitoring of variations of dust influx and big meteor events over millions of years by analysis of deep sea clay/antarctic ices
- same for past solar flare activity (flare tracks)
- search for products of astrophysical nuclear reactions
Scattering experiments (microwave, laser)
- further experiments to test theoretical approaches to agglomerates

- color effects (structure, microroughness)
- absorption and radiation pressure on irregular particles
- measurements on real interplanetary particles

Collisions of grains
Plasma-grain-interactions

IV. THEORY

Further analysis of existing data base (Pioneer 10/11, Helios 1/2, Hawaii, South Africa data, IRAS, Japanese baloon experiments)
Advanced analysis, including IR and UV data, to obtain
- variations with heliocentric distance
- size, material, number densitsy
- optical properties (albedo, polarization, colour)
- three dimensional structure of the zodiacal cloud (combination of optics and dynamics)

Analysis of inner zodiacal light
Explanation of optical properties (advanced theory of agglomerates)
Search for evidence of and interrelations to interstellar dust
Dust-plasma-gas interactions
Dynamics
- collisions (break up laws, production/destruction rates)
- destruction rates by Poynting-Robertson effect, erosion)
- production of meteoroid sized particles from comets
- evolution and dispersion of meteor streams to sporadic background
- planetary perturbations (including Jupiter as possible barrier)
- nongravitational forces changing orbital elements (e.g. inclination)
- explanation of belt structures (IRAS), swarms (Heos) and terrestrial dust belts (Electron 1,3)
- long time stability of zodiacal cloud

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