

[NOTE: Due to a communication problem the following report was not received in time for inclusion in the previous volume of Transactions.]

COMMISSION 22 - METEORS AND INTERPLANETARY DUST
(METEORS ET LA POISSIERE INTERPLANETAIRE)

Report of Meetings, 3 and 9 August 1988

PRESIDENT: P. B. Babadzhanov

SECRETARY: D. Olsson-Steel

3 August 1988

I. WELCOME AND TRIENNIAL REPORT

The President welcomed 22 members and participants to the meeting and expressed pleasure that P. M. Millman a long-standing member of the Commission, was able to be present.

The President called on members to stand in silence to honour the memory of deceased members of the Commission: J. Hoppe and R. H. Giese. J Weinberg noted that the death of Professor Giese was also a great loss to Commission 21.

The President presented the report of the Commission for the triennium and thanked members for their contributions. He noted many achievements, including a second GLOBMET meeting (Kazan, USSR, 1988), and a symposium on Asteroids, Comets and Meteors II in Uppsala, Sweden in 1985. Much had been done in the investigation of the evolution of meteoroid streams, the physics of meteors, the origin of tektites and the distribution of interplanetary dust.

II. APPOINTMENT OF NEW MEMBERS AND CONSULTANTS.

Nine new members were confirmed: S. V. Clube, S. Djorgovski, R. Hawkes, V. Kruchinenko, W. Napier, D. Olsson-Steel, I. Shestaka, J. Swestka, Wang De-Chang.

Seven consultants were confirmed: G. V. Andreev, M. Dubin, G. Eichhorn, M. Koseki, J. Mason, Yu. V. Obrubov, E. T. Rusk, W-X Wang.

III. PROPOSALS FOR INCOMING OFFICERS.

The President proposed the names of C. S. L. Keay as incoming President and J. Stohl as Vice-President which were endorsed unanimously.

The Organising Committee for the next triennium was proposed and endorsed as follows: P. B. Babadzhanov, W. J. Baggaley, O. Belkovich, Z. Ceplecha, E. Grün, I. Hasegawa, J. Jones, C. Koeberl, D. Revelle, I. Williams.

IV. RESOLUTION

The following Resolution was unanimously approved by the meeting:

That Commission 22 commends the Lund Meteor Data Centre for the quality of the archived meteor data and strongly recommends continued financial support by the IAU.

(Financial support has been included in the current IAU budget.)

In supporting the resolution, J. A. O'Keefe asked whether the meteor orbit data had been searched for evidence of lunar ejecta. The associated problems were discussed and none present knew of any such search.

V. GENERAL BUSINESS

J. Stohl proposed a Joint Symposium should be held in Czechoslovakia in 1992, the title to be "Meteoroids - Their Dynamics, Physics, Chemistry and Sources". C. S. L. Keay agreed to seek the support of Commission 15, 20 and 21 and find an acceptable date for the Symposium.

C. S. L. Keay, as nominated President for 1988-91, sought the guidance of the members present on matters to be pursued during the triennium. P. M. Millman and I. Williams considered that the existing Commission structure was satisfactory and that there was no case for change as far as Commission 22 was concerned. J. A. Nuth pointed out that there was some difficulty for new IAU members in knowing which Commission to apply to join, as such information was not widely available. J. Stohl relayed a comment in absentia from L. Kresak (President of Commission 15) who had received the suggestion from H. Fechtig that small overlapping Commissions such as 15, 21, and 22 should be amalgamated in view of the small attendances at some General Assemblies. Kresak did not agree with this point of view but considered that there should be closer cooperation between the three Commissions.

C. S. L. Keay also drew to the attention of the Commission the widespread concern at the level of pollution of all kinds in near-Earth space, and urged the Commission to give thought to the prospect of increasing pollution in interplanetary space, since interplanetary dust was a major subject of the Commission. Keay argued that this topic should be addressed while there was a chance to do so before it became serious, unlike the post-hoc concern over Earth-orbit pollution. He suggested that a working group should be set up and, through correspondence, draw up recommendations for a joint IAU/COSPAR Panel on Interplanetary Pollution. G. Eichhorn, P. M. Millman, J. Weinberg, J. O'Keefe, D. Olsson-Steel, R. Soberman and N. Misconi spoke strongly in favour of the proposal. It was agreed that I. Williams should act as convener of a Working Group comprising R. Soberman, J. Weinberg, P. B. Babadzhanov, D. Olsson-Steel and the Presidents and nominees from interested IAU Commissions and COSPAR. D. Kessler, S. Fred Singer, V. N. Lebedinets, H. Fechtig, G. Schwehm and I. Kapisinsky are to be invited to participate, and the Convener is to have power to co-opt. All nations with launch-vehicle capability should be represented.

There was some discussion of the sphere of interest for the Working Group. It was generally felt that the Group should be concerned with space operations in cis-lunar space and beyond, as the polluted state of near-Earth space was the subject of the IAU Colloquium 112 in Washington from August 13-16, 1988, on Light Pollution, Radio Interference and Space Debris - The Increasing Environmental Impacts on Astronomy. C. S. L. Keay suggested that, inter alia, topics of concern should include propellants, explosives and discarded materials. J. A. Nuth added that mass-transfer schemes should also be of concern.

9 August 1988

VI. SCIENTIFIC PRESENTATIONS

P. B. Babadzhanov, N. Mahmudov and Yu. V. Obruchov:
Meteoroidal Complex of the Comet Encke.

P. B. Babadzhanov discussed the meteoroidal complex produced by comet P/Encke on the basis of differing ejection velocities, following the effects of planetary perturbations over 5000 years, and showed that the various showers in this complex are explicable in this way.

I. P. Williams: Origin and Evolution of the Geminid Stream.

I. P. Williams considered the formation of the Geminid stream and showed that the mechanism whereby 3200 Phaethon liberates meteoroids may be a radiative-equivalent of the Roche lobe: This would apply only to parent objects like Phaethon which have very small perihelion distances.

B. McIntosh and M. Simek: The Structure of the Geminids.

B. A. McIntosh reported on observations of the Geminid shower with radars at Ottawa and Ondrejov which show a skewed profile and a notable lack of large meteoroids.

B. McIntosh (with J. Jones) also discussed numerical integrations of the orbits of Halleyid meteoroids, and showed that the Eta Aquarid shower mainly consists of meteoroids released about 500 years ago, with The Orionids being rather older (particles released about 4000 years ago).

P. B. Babadzhanov, A. Hajduk, Yu. V. Obruchov and A. N. Pushkarev:
Orbital evolution of particles
released from comet Halley.

P. B. Babadzhanov additionally reported upon integrations of Halleyid meteoroids over eleven millenia for differing ejection velocities, and found that very little dispersion occurs in the elements: The orbits of the meteoroids and the comet are very stable.

I. Kapisinsky and J. Stohl: On Lifetimes of the Taurid
Meteoroids.

J. Stohl presented some ideas upon the erosion of meteoroids, particularly those in the Taurid complex, and showed that the Poynting-Robertson lifetimes may be reduced by a factor of ten in this way.

M. Dubin and R. K. Soberman: Particles Jetting as Explanation for
Anomalous Optical Measurements of
Interplanetary Particulates from
Pioneer 10/11

R. K. Soberman reported upon a recent re-analysis of the data from the meteoroid optical detectors on Pioneer 10 and 11. Their new interpretation of the 283 events observed indicates the existence of jetting of gas and fine dust from a large population of small (size about 5 cm) low-albedo comet-like objects which they term 'cosmoids'.

Ch. Koeberl: Recent Developments in Impact Cratering and Textite Research.

Ch. Koeberl reviewed recent developments in the study of Tektites, in particular the Muong-Nong tektites from Laos. These are part of the Australasian strewn field, and may be from an oceanic impact site in Indochina. A terrestrial origin for tektites on the basis of their chemistry was emphasized.

J. A. O'Keefe: Textites and Biological Extinctions.

J. A. O'Keefe argued for a lunar origin of tektites, and discussed the implications for life on Earth if a debris ring was formed in this way.

D. Olsson-Steel: On the Interrelationship of Comets, Asteroids and Meteors

D. Olsson-Steel reported on a re-analysis of radar meteor orbit data gathered as part of the Adelaide, Harvard, Obninsk and Kharkov surveys. Strong evidence exists for meteoroid streams associated with several Apollo asteroids including 2201 Oljato, 1982 TA, 1984 KB, 1566 Icarus, and 5025 P-L.

D. Olsson-Steel: On Recent Meteor Observations by 2, 6 and 54 MHz radars.

Olsson-Steel also presented the results of recent radar observations in the HF band which show that VHF meteor radars previously used have only been able to detect a few percent of the terrestrial influx of microgram-milligram particles: This has implications for the supply of such particles from comets and asteroids.

V. Porubcan, J. Stohl: The Taurid Meteor Complex and its Cometary and Asteroidal Associations

J. Stohl discussed the various meteor showers in the Taurid complex and their relationship to comet P/Encke and various Apollo asteroids. A search for Taurid fireballs is currently underway, and the orbit/radiant database is also being examined to more fully understand this long-duration shower complex.

K. Ohtsuka: Possible Association of December Monocerotids with Periodic Comet Mellish (1917 I).

K. Ohtsuka presented recent Japanese photographic observations of the December Monocerotid meteors which has enabled this stream to be definitely linked to comet P/Mellish.

I. Hasegawa: Meteors Associated with Halley's Comet observed by Members of the Nippon Meteor Society.

I. Hasegawa reviewed the activities of the Nippon Meteor Society, including visual, telescopic, photographic, FM radio and television observations. Rate plots for the Eta Aquarid shower from 1982-87 show no increase coinciding with the return of the parent comet, as expected.

Y. Taguchi: Four-colour Observations of Persistent Meteor Trains.

Y. Taguchi reported four-colour photographic observations of a persistent meteor train. Strong red emission detected was not due to the sodium D lines, but might be due to molecular oxygen or nitrogen.

COMMISSION 22 - METEORS AND INTERPLANETARY DUST
(METEORS ET LA POISSIERE INTERPLANETAIRE)

Report of Meetings, 1991 July 26, 27 and 29

PRESIDENT: C.S.L. Keay

SECRETARY: D.I. Steel

1991 July 26

I. WELCOME

The President welcomed 15 members and several consultants and members of other commissions to the meeting.

Those present were requested to stand in silence to honour the memory of deceased members of the Commission: E.I. Fireman, B.J. Levin and P.M. Millman.

II. INCOMING OFFICE BEARERS.

The President proposed the names of J. Stohl as incoming President and I.P. Williams as Vice-President which were endorsed unanimously.

III. PRESIDENT'S REPORT.

The President presented the scientific report of the Commission for the triennium and thanked members for their contributions. He noted with regret the resignation of E. Anders from the commission. The commission membership had fallen to 98. During the last triennium the commission had been requested to consider amalgamation with other commissions. The response from members had been overwhelmingly against any such consolidation on the grounds that the major activities of Commission 22 were unique to the commission.

Support for the Lund Meteor Data Center was being maintained and it was noted that a small but significant allocation for the GLOBMET program had been proposed for the 1992-1994 triennium.

The President referred to initiatives taken at the Baltimore meeting and expressed his gratitude to J. Stohl for his support and for his efforts in preparing for a conference on Meteoroids and their Parent Bodies to be held near Bratislava in early July 1992; D. Meisel for coordinating and producing a report on Professional-Amateur Cooperation in Meteor Science; and I. Williams for assembling information and drafting a Resolution on Interplanetary Pollution Prevention.

IV. METEOR DATA CENTER REPORT (B.A. Lindblad).

The Meteor Data Center in Lund continues to archive, document and disseminate information on meteoroid orbits. Orbital data has been gathered from a large number of sources such as published catalogues, internal observatory reports, data tapes, etc. At present some 5,300 photographic, two-station orbits and more than 60,000 radio orbits are archived. The photographic meteor records in most cases include Earth encounter data, such as velocities, heights and meteor magnitudes.

V. RESOLUTIONS

1. Professional-Amateur Cooperation

The report of the initial Working Group on Professional-Amateur Cooperation (Convener: D. Meisel) was received. It was resolved to set up a continuing Working Group consisting of 6 paired professionals and amateurs to achieve as broad geographical coverage as possible, the Convener to be an IAU member and have a casting vote. Of the 6 amateurs, it was decided that 3 (at least) should be

drawn from the membership of the International Meteor Organization. Appointment of the membership was deferred to the next Business Session to allow informal discussions to proceed.

2. Interplanetary Pollution Prevention

The report of the Working Group on the Prevention of Interplanetary Pollution (Convener: I. Williams), initiated by Commission 22 at the previous General Assembly, was received and the recommended resolution debated. It was passed unopposed after re-wording to make it more widely acceptable.

3. Search for Near-Earth Objects

A resolution originating from Commission 20 to set up a Working Group to facilitate the search for near-Earth objects was discussed at length and approved. Two members of Commission 22 were nominated to serve on the Working Group following adoption of the resolution by the General Assembly. The nominees are D.I. Steel and J. Stohl.

VI. SCIENTIFIC PRESENTATIONS

This session focussed on the subject of the Taurid Complex of Earth-crossing objects and related science. Apart from four well-known meteor showers this complex also includes P/Comet Encke plus several Apollo-type asteroids. The final paper dealt with the solution of a long-standing meteor fireball mystery.

D.I. Steel, D. Asher and V. Clube:

The Taurid Complex.

The origin and evolution of the Taurid Complex was discussed in terms of the breakup of a giant comet 10-20,000 years ago. Using meteor orbits from the IAU Meteor Data Center they identified the gross characteristics of the four meteor showers in terms of orbital parameter dependence upon solar longitude, and found that they can match the trend with a model involving the gradual disintegration of a large parent comet, perturbations due mainly to Jupiter then causing differential dispersion of the meteoroids depending upon their initial orbital elements. Quite large ejection velocities (up to a few km/sec) are required by this model, which may argue for catastrophic disruption of the giant comet, possibly in an asteroid belt collision.

J. Stohl and V. Porubcan:

The Taurid Complex.

A detailed investigation of the full extent of the Taurid Complex has revealed that it is rather more extensive than previously believed. The nighttime Taurid showers appear to continue from October, or earlier, through to at least February. This also argues for the dispersal of a very significant initial source, with the flux and spatial density of particles in previous millenia being much higher than in this epoch.

J. Mason:

Ten-year Analysis of the Taurid Complex

With a low count rate but prolonged activity, the Taurids have proven to be a rather more difficult pair of showers to study than, say, the Geminids with high activity lasting only for a few days. Data gathered by the Meteor Section of the BAA shows evidence of structure within the complex which has not previously been recognized.

D.I. Steel and V. Clube:

Radar Meteors and the Small Comet Hypothesis.

L. Frank and his co-workers claim that small comets strike the Earth at a rate of 20 per minute. They showed an apparent correlation with radar forward scatter meteor rate data. Their selection and interpretation of old forward-scatter data is open to severe criticism. The apparent agreement between

the "atmospheric hole" rates of Frank et al. and the meteor rates disappears if the more extensive, well-controlled, back-scatter data collected later from Ottawa are used. This weakens the case of Frank et al., but it was argued that the small comet phenomenon, if real, might in fact be related to the Taurid Complex with the forward-scatter data preferentially picking up the low-density meteoroids from that stream, the atmospheric hole data having been collected at the Taurid time of year (November-December).

R. Sobermann and M. Dubin:

Cosmoid Meteor Signature.

The anomalous (in terms of standard models) Pioneer 10 and 11 dust data has been reinterpreted in terms of the disruption of largely-volatile meteoroids of mass near 1 kg and near-parabolic or hyperbolic orbits, which are termed "cosmoids". It was suggested that the atmospheric hole phenomenon of Frank et al. and various other enigmatic observations can also be explained in terms of the cosmoid model without contradicting the many counter arguments put up against the Frank model of 100 tonne small comets, such as the lack of a large seismically-detected lunar impact rate.

C.S.L. Keay:

Electroponic Meteor Fireballs.

The long-term problem of electroponic sounds associated with bright fireballs were described. Such sounds have been reported for many years but have usually been discounted as being purely psychological in origin. After analysing many reports of such sounds occurring when a fireball was observed crossing south-eastern Australia in the late 1970's, a model was developed for the propagation and detection of this phenomenon by ELF radio waves generated in the meteor wake. This has recently been verified by two Japanese groups who recorded a burst of ELF radio emission from a bright Perseid fireball which was simultaneously photographed and also heard electrophonically by an observer.

1991 JULY 27

I. SCIENTIFIC PRESENTATIONS.

The unifying theme of this session was meteor streams and surveys.

C.S.L. Keay and L. Rogers:

Newcastle Meteor Radar - First and Last Results.

The Newcastle radar was one of the first to have microprocessor data analysis on-line. Lack of manpower and funding support frustrated its completion and has now forced it to close. Selected data including activity profiles of some southern meteor showers was presented.

D.I. Steel, W.J. Baggaley and A.D. Taylor:

New Zealand Meteor Orbit Radar.

First results from a new meteor orbit radar were presented. Detecting echoes from particles down to 100 microns in size, 133,000 individual orbits have been measured so far, about twice the total number available from all other surveys to date. Certain specific meteor showers associated with known comets have been targeted, and observations made at the times at which showers from Apollo asteroids might occur.

V. Porubcan and J. Stohl:

Burst of Lyrids in 1982.

Radar observations revealed increased Lyrid activity in April 1982, being high above the normal annual counts. This could be interpreted in terms of the Earth passing through a high spatial density grouping within the stream. Since the comet known to be associated with the Lyrid stream (Comet Thatcher) is well away from that position it is suggested that there may be at least one other large cometary fragment in the stream, and that this has released meteoroids during the last few millenia.

J. Mason:

Geminid Results for 1990 and 1980 Compared.

Observations of the Geminid shower in 1980 and 1990 showed how its activity profile has changed due to secular precession. This shower has only been known for a century and a half, and will disappear at some time within another century or two.

I.P. Williams, Z. Wu, P.B. Babadzhinov and D.W.Hughes:

Leonids and Bielids.

The past orbit of P/Comet Biela showed that in 1833 it passed the Leonid meteoroid stream at a distance indistinguishable from zero. The break-up of that comet (the parent of the Bielid/Andromedid shower) in the 1840's may have been caused by high-velocity impacts by the Leonid meteoroids upon the cometary nucleus.

I. Hasegawa:

Meteors Associated with Comet Levy (1991 Q).

Calculations of the theoretical meteor radiants to be expected from meteoroids from P/Comet Levy (1991q), as derived by K.Ohtsuka, were presented. If this comet has released a substantial number of meteoroids, then enhanced activity from a deep southern radiant (RA = 321 deg, Dec = -62 deg) would be expected around the end of August.

1991 July 29

I. BUSINESS SESSION.

The Organising Committee for the next triennium was proposed and endorsed as follows: P.B. Babadzhinov, Z. Ceplecha, I. Hasegawa, J. Jones, C.S.L. Keay, C. Koeberl, R. Soberman, D. Steel, E. Tedesco.

Nine new members were elected, including five new members of the IAU: M. Dubin (USA), B. Gustafson (Sweden/USA), E. Helin (USA), J. Mason (UK), C. Murray (UK), C. Pillinger (UK), Xu Pinxin (China P.R.), V. Quesada (Italy), and M. Sykes (USA).

Nine consultants were appointed: G.V. Andreev (USSR), W. Jones (UK), D.J. Kessler (USA), K. Nagasawa (Japan), H. Nakamura (Japan), Yu. V. Obruchov (USSR), A.A. Voloshchuk (USSR) and H.A. Zook (USA).

The required twelve members of the Working Group on Professional-Amateur Cooperation were appointed:

Professionals (IAU members)

V. Porubcan (Convener)(Czecho-Slovakia)
I. Hasegawa (Japan)
R. Hawkes (Canada)
J. Mason (United Kingdom)
D.I. Steel (Australia)
V. Terentjeva (Russia)

Amateurs

D. Ocenas (Czecho-Slovakia)
K. Ohtsuka (Japan)
P. Brown (Canada)
G. Spalding (United Kingdom)
J. Wood (Australia)
J. Rendtel (Germany).

The 6 amateurs were formally approved as additional Consultants to the Commission.

In response to an official request, the membership of Commission 22 was reviewed, revealing that of its current membership 7 are members of more than the limit of three Commissions. It was considered that this is due largely to the difficulties experienced in resigning from other Commissions. All 7 are active in the field covered by Commission 22 and should remain among its members.