

XVIIth General Assembly

Montreal, Canada

1979

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Générale

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Resolution No. 1

L'Assemblée Générale prend note du soutien des Commissions 4, 7, 8, 19, 20, 24, 25, 26, 33, 36, 37 et 45 pour les programmes astrométriques indépendants et complémentaires proposés pour le Satellite Astrométrique de l'ESA et le Télescope Spatial de la NASA.

The General Assembly notes the support of Commissions 4, 7, 8, 19, 20, 24, 25, 26, 33, 36, 37, and 45 for the independent and complementary astrometric programmes proposed for the ESA Astrometry Satellite and the NASA Space Telescope.

(N.B. This resolution was the result of an amendment to the motion presented by Commission 24 in consequence of the proposal under Agenda Item 11 (e). The amendment was proposed by M.J. Seaton, supported by C.A. Murray, and adopted.)

Resolution No. 2

The International Astronomical Union

Considering

- a) The imaginative proposal by several developing countries to construct and operate, in collaboration, a Giant Equatorial Radio Telescope (GERT) in Africa, near the equator;
- b) the ability of GERT, operated at meter wavelengths, to provide high quality data as essential complement to data obtained elsewhere at cm wavelengths;
- c) the noteworthy utilisation of an equatorial location for obtaining high resolution and sensitivity;
- d) the educational, technological and social benefits expected for the collaborating nations involved in participation at the research front of astronomy and space science;

Recommends that the ICSU take steps to secure UNESCO support for the realisation of the Giant Equatorial Radio Telescope.

L'Union Astronomique Internationale

Considérant

- a) La proposition originale de plusieurs pays en voie de développement de réaliser et de faire fonctionner, en collaboration, un Radiotélescope Equatorial Géant (GERT) en Afrique, près de l'équateur;
- b) La possibilité pour GERT de fournir à des longueurs d'onde métriques des données de haute qualité comme complément essentiel aux données obtenues ailleurs en ondes centimétriques;

- c) La remarquable utilisation d'un site équatorial pour obtenir une bonne résolution et une grande sensibilité;
 - d) Les avantages éducatifs, technologiques et sociaux attendus de la collaboration des pays engagés dans une recherche de pointe astronomique et spatiale:
- Recommande que l'ICSU entreprenne des démarches pour obtenir le soutien de l'UNESCO dans la réalisation du Radiotélescope Equatorial Géant.

Resolution No. 3

The International Astronomical Union

Considering

- a) The value to mankind of the scientific results achieved by radio astronomy through the exploration of the universe;
- b) the increasing use of the radio spectrum, especially by space and air-borne transmitters;
- c) that the CCIR had specified the levels of harmful radio interference in CCIR Report 224-4;
- d) that the CCIR and IUCAF have summarized the needs of the radio astronomy service in their various reports and documents;
- e) that the 1979 World Administrative Radio Conference (WARC) will allocate radio frequencies which can be expected to remain in force for about 20 years;

Recommends that administrations adhering to the IAU, present at the WARC, recognize the following needs of the radio astronomy service:

1. The acquisition and/or maintenance of frequency bands with bandwidths of at least 1-2 per cent at approximately octave intervals throughout the radio spectrum.
2. The acquisition and/or maintenance of narrower bands at frequencies of the astrophysically most important spectral lines having bandwidths appropriate to the scientific investigation.
3. The preservation of these frequency bands free of harmful interference from in-band, band-edge, and out-of-band transmissions.

L'Union Astronomique Internationale

Considérant

- a) l'apport que constituent pour l'humanité les résultats scientifiques obtenus par la Radioastronomie dans l'exploration de l'Univers;

- b) l'utilisation croissante du domaine de fréquences radio surtout par les émetteurs embarqués;
- c) que le CCIR a déterminé les niveaux d'interférence nuisibles dans son rapport CCIR 224-4;
- d) que le CCIR et l'IUCAF ont résumé les besoins de la Radioastronomie dans divers rapports et documents;
- e) que la "World Administrative Radio Conference" de 1979 (WARC) allouera des fréquences radio dont on peut espérer qu'elles seront maintenues pendant environ 20 ans;

Recommande que les administrations adhérentes à l'UAI présentes à la Conférence WARC, reconnaissent les besoins suivants pour la Radioastronomie:

- 1) L'obtention et/ou le maintien de bandes de fréquences ayant des largeurs de bande d'au moins 1-2% à des intervalles d'environ une octave dans le spectre radio.
- 2) L'obtention et/ou le maintien de bandes plus étroites aux fréquences des raies spectrales les plus importantes en Astrophysique, avec des largeurs de bande appropriées pour la recherche scientifique.
- 3) La préservation de ces bandes de fréquences de toute interférence nuisible provenant d'émissions dans la bande, en bord de bande, ou hors bande.

Resolution No. 4

L'Assemblée Générale approuve les recommandations des Commissions 16 et 17 que la Commission 16 (Etude Physique des Planètes et des Satellites) et la Commission 17 (La Lune) fusionnent pour former une nouvelle Commission qui conserve le titre et le numéro de la Commission 16.

The General Assembly approves the recommendations of Commissions 16 and 17 that Commission 16 (Physical Study of Planets and Satellites) and Commission 17 (The Moon) be merged to form a new Commission, retaining the title and number of Commission 16.

Resolution No. 5

The General Assembly approves the following changes in the names of Commissions:

Comm. 5	from	Documentation
	to	Documentation and Astronomical Data
Comm. 14	from	Fundamental Spectroscopic Data
	to	Atomic and Molecular Data
Comm. 44	from	Astronomical Observations from Outside the Terrestrial Atmosphere
	to	Astronomy from Space
Comm. 45	from	Spectral Classification and Multi- band Colour Indices
	to	Stellar Classification

L'Assemblée Générale approuve les changements suivants dans le nom des Commissions:

Comm. 5	de	Documentation
	à	Documentation et Données Astronomiques
Comm. 14	de	Données Spectroscopiques Fondamentales
	à	Données Atomiques et Moléculaires
Comm. 44	de	Observations Astronomiques au-dehors de l'Atmosphère Terrestre
	à	l'Astronomie à partir de l'Espace
Comm. 45	de	Classifications Spectrales et Indices de Couleur à Plusieurs Bandes
	à	Classification Stellaire

Commission 4 (Ephemerides/Ephémérides)

- recognizing (a) that timings of occultations of stars by the Moon will continue to be of value in studies of the lunar motion and figure, the rotation of the Earth, and the stellar reference frame, and
- (b) that it is desirable that the observations should continue to be collected and processed by one organization,
- considering that, beginning with January 1981, HM Nautical Almanac Office, Royal Greenwich Observatory, will no longer be able to act as the international centre for the receipt and processing of timings of occultations,
- recommends that an organization with the appropriate experience and commitment to the occultation programme be requested to take over this important work.

Commission 4

expresses its full support in favour of the proposal of the Space Research Center of the Polish Academy of Sciences, and the Smithsonian Astrophysical Observatory to convene the Second International Colloquium on Reference Systems for Earth Dynamics.

Commission 4 (Ephemerides/Ephémérides), 8 (Positional Astronomy/L'Astronomie Position) 19 (Rotation of the Earth/Rotation de la Terre) and 31 (Time/L'Heure)

Commissions 4,8, 19 and 31

endorse the recommendations given in the Report of the Working Group on Nutation, as set out below, and recommend that they shall be used in the national and international ephemerides for the years 1984 onwards, and in all other relevant astronomical work.

Recommendations of the Working Group on Nutation

Whereas the complete theory of the general nutational motion of the Earth about its centre of mass may be described as the sum of two components, (i) astronomical nutation, commonly referred to as nutation, which is motion with respect to a space-fixed coordinate system, and (ii) polar motion, which is motion with respect to a body-fixed coordinate system, it is recommended that:

(a) astronomical nutation be computed for the "Celestial Ephemeris Pole" using a non-rigid model of the Earth such that there are no nearly diurnal motions of this celestial pole with respect to either space-fixed or body-fixed coordinates, which can be calculated from torques external to the Earth and its atmosphere.

(b) the numerical values given in Table 1 of the complete report be used for computing astronomical nutation of the "Celestial Ephemeris Pole".

Commission 4 (Ephemerides/Ephémérides), 19 (Rotation of the Earth/Rotation de la Terre) and 31 (Time/L'Heure)

considering that it is planned to introduce the IAU (1976) System of Astronomical Constants, the IAU (1979) Theory of Nutation, and the equinox of the FK5 on 1984 January 1,

recommend that (a) the relationship between mean sidereal time and UT1 be modified so that there is no change in either value or rate of UT1, due to a correction to the zero point of right ascensions of the FK4 and to a correction for the motion of the zero point, to be introduced in FK5

(b) the new (provisional) expression for Greenwich mean sidereal time of 0^h UT be -

$$\text{GMST of } 0^{\text{h}} \text{ UT1} = 6^{\text{h}} 38^{\text{m}} 45^{\text{s}}.832 + 8640184^{\text{s}}.628 T_{\text{u}} + 0^{\text{s}}.0929 T_{\text{u}}^2$$

where T_{u} is the number of Julian centuries of 36525 days of Universal Time elapsed since 1900 January 0, 12^h UT1 (JD 2415020.0). This expression is rigorously equivalent to the following:

$$\text{GMST of } 0^{\text{h}} \text{ UT1} = 6^{\text{h}} 41^{\text{m}} 50^{\text{s}}.5529 + 8640184^{\text{s}}.8138 T_{\text{u}} + 0^{\text{s}}.0929 T_{\text{u}}^2$$

where T_{u} is measured from 2000 January 1, 12^h UT1 (JD 2451545.0).

- endorse the proposal of the joint working group on the determination of the rotation of the Earth for a special period of international collaboration in the monitoring of Earth-rotation and in the intercomparison of the techniques of observation and analysis,
- recognize that the responsibility for the organization of this Project MERIT should be shared with the International Union of Geodesy and Geophysics, and
- request that the national and international organizations concerned give full technical and financial support to the development of the proposal and to the implementation of the project.

Commission 4 (Ephemerides/Ephémérides) and 16 (Physical Study of Planets and Satellites/Etude Physique des Planètes et des Satellites)

- endorse the Report of the Joint Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites,
- recommend that the Report be used as the basis for computing the physical ephemerides of planets and satellites in the international and national ephemerides, and
- request that a small working group continues its activity in order to provide improved rotational elements.

Commission 5 (Documentation/Documentation)

- considering the steadily increasing number of publications in the field of Astronomy and Astrophysics,
- recommends the introduction and extensive use of proper key words by authors and publishers of primary journals and other publications in order to facilitate indexing and retrieval work,
- welcomes the initiative of Astronomical and Astrophysical Abstracts (AAA) in preparing a draft vocabulary, and
- invites AAA and other astronomical abstracting services to cooperate in the preparation of an agreed vocabulary.

Commission 5 (Documentation/Documentation)

considering the present unsatisfactory situation of the identification of astronomical objects in astronomical publications,

supported by representatives of Commissions 8, 24, 25, 26, 27, 28, 29, 30, 34, 37, 40, 42, and 45,

requests strongly that

(a) editors of scientific journals and other publications impose stricter standards of object identification upon the authors through appropriate instructions to referees,

(b) catalog abbreviations be made explicit either in footnotes or in the bibliography tables

(c) two identifications be quoted for each object in order to provide a check against errors and misprints, especially for faint objects.

considering the confusion existing at the present time in the literature concerning the abbreviations of catalogues,

supported by representatives of Commissions 8, 24, 25, 26, 27, 28, 29, 30, 34, 37, 40, 42, and 45,

desires that, under IAU auspices, a list of catalogue abbreviations be published. This list should be a new version of the work of Fernandez, Lortet and Spite, revised by IAU Commission representatives and edited by C. Jaschek.

Commission 10 (Solar Activity/Activité Solaire)

recognising that the International Ursigram and World Days Service (IUWDS) has rendered valuable service to the scientific community during the coordination of such international programs as the IGY, the IQSY and the IMS,

that the services provided by the IUWDS are not provided by any other agency and are relevant to the work of several IAU Commissions,

that these services will be particularly important for such programs as the Solar Maximum Year,

and that the IUWDS includes the prompt reporting of geophysical and solar events which will be occurring with increased frequency in the next few years,

recommends that the IAU continue to support the activities of the IUWDS to ensure the continuance of this valuable service.

recognizing that the long series of Relative Sunspot Numbers is a unique link with the course of solar activity in the past

recommends that all institutions that have demonstrated interest and competence in the work of obtaining sunspot numbers should continue the series.

recognizing that the Quarterly Bulletin of Solar Activity has for many years provided a valuable reporting service to the international scientific community,

that this service continues to be relevant to the activities of Commissions 10, 12, 40, 44, and 49 of the IAU,

that the continuation of this service will be of particular value during the coming Solar Maximum Year,

recommends that the IAU support the Quarterly Bulletin of Solar Activity to ensure that this service continue into the future.

recognizing that the 2800 MHz solar flux provides a standard quantitative index of solar activity for use in solar and solar-terrestrial studies,

recommends that those institutions making such measurements should continue to do so.

recognizing the important contribution made to solar physics by very high frequency (greater than 9 GHz) radio flux observations of the sun,

recommends that such observations should continue to be strongly supported during the coming solar maximum.

Commission 10 (Solar Activity/Activité Solaire), 12 (Radiation and Structure of the Solar Atmosphere/Radiation et Structure de l'atmosphère Solaire) and 44 (Astronomical Observations from outside the Terrestrial Atmosphere/Observations astronomiques au-dehors de l'atmosphère terrestre)

draw attention to the coming of Solar Maximum and recommend a sustained and coordinated effort in its study during the next three years.

Commission 15 (Physical Study of Comets, Minor Planets and Meteorites/l'Etude Physique des Comètes, des Petites Planètes et des Meteorites), 20 (Positions and Motions of Minor Planets, Comets and Satellites/Position et Mouvements des Petites Planètes, des Comètes et des Satellites), 21 (Light of the Night Sky/Lumière du Ciel Nocturne) and 22 (Meteors and Interplanetary Dust/Météores et la Poussière Interplanétaire)

recognizing the major significance of comets for the study of the origin and evolution of the solar system in general and the interplanetary solid material in particular,

noting the extreme diversity among individual comets in terms of composition, structure, and physical behaviour, and

conceding that ground-based observations are largely inadequate for establishing unequivocally the nature of the relationship between comets and other objects in the solar system,

recommend that a vigorous programme of space exploration of comets be initiated. To ensure the maximum science return, the programme should include more than one comet and should include fly-by, rendez-vous and, ultimately, sample-return missions. A rendez-vous mission to P/Temple 2 in 1988 with an en-route fly-by of P/Halley in 1985, currently considered by NASA, is regarded as an ideal first step in the programme.

Commission 25 (Photometry and Polarimetry/Photométrie et Polarimétrie
Stellaires) and 45 (Stellar Classification/Classification Stellaire)

- noting the strong support of 12 IAU Commissions for space
astrometric programs,
- recommends that complementary ground-based support in astrometry,
photometry, spectroscopy, etc. should be encouraged.

Commission 26 (Double Stars/Etoiles Doubles)

Commission 26 notes with deep concern that the Sproul Observatory
is in danger of being closed by Swarthmore College.
The termination of the astrometric program would cut
off a highly productive source of double star data
built up over a long period of time. The photographic
plate collection with its continuing growth from the
Sproul refractor is unique and continues to yield
valuable results.

Commission 30 (Radio Velocities/Vitesses Radiales)

- considering the need for optimum combination of independent
series of data
- recommends that the publication of new radial velocity measure-
ments should be accompanied by the following essential
information:

1. For each Series of measurements -

Description (or reference to published description)
of the instrument characteristics, i.e., measuring
principle, resolution, detector, etc.

Measuring technique (for plates)

Stellar lines employed and adopted wavelengths

Average number of lines measured

Measured velocities of IAU standard stars

Period of Observation

2. For each star or other object -

Preferably: individual velocity measures
individual times of observation
mean radial velocity
weighting procedure
external mean error estimated

Minimum: mean radial velocity
period of observation
number of measurements
external mean error estimated

Any previous measurements used in the mean should be clearly identified.

The star should be unambiguously identified, either by catalogue number (catalogues in order of priority recommended by Commission 5), or by precise position (error 1 - 2 arcsec.), or, if necessary, by a finding chart.

Commission 31 (Time/L'Heure)

considérant a) que le temps Atomique International, TAI, est établi par le BIH d'après les données fournies par plusieurs laboratoires où fonctionnent les horloges et étalons de fréquence indépendants

et b) que des données d'autres laboratoires, nécessaires pour améliorer le TAI, ne peuvent pas être utilisées car les liaisons horaires internationales existantes ne conviennent pas,

recommande a) que les laboratoires qui s'occupent du temps et des fréquences en Extrême Orient et Asie, en Afrique, en Australie et en Amérique du Sud, établissent des liaisons horaires internationales de grande exactitude

et b) qu'une aide leur soit apportée par les organismes nationaux et internationaux pour qu'ils puissent utiliser des techniques de grande précision, telles que celles qui impliquent l'usage du LORAN-C, des horloges transportables, des satellites artificiels de la terre, et de l'interférométrie à très longue base.

Commission 37 (Star Clusters and Associations/Amas Stellaires et Associations)

recommends that the designation of star clusters within the Galaxy should be based on the equatorial coordinates (1950.0), prefixed by the letter C. The right ascension element should consist of hours and minutes of time (4 digits) and the declination element by the algebraic sign, followed by degrees and one decimal (3 digits). In both quantities appropriate leading zeros should be inserted. Once a designation has been assigned to a particular cluster it should not be changed, even if later investigations indicate that the coordinates used in the designation differ from the centre of the cluster.

Commission 44 (Astronomical Observations from outside the Terrestrial Atmosphere/Observations astronomiques au-dehors de l'atmosphère terrestre)

takes note of the growing interest in 1-m. class Space Schmidt telescopes and encourages members of the IAU to make their interests known to the Chairman of the Working Group for Surveys from Space in Commission 28.

notes with interest, and encourages participation in, the various efforts to coordinate observations of the Sun near its activity maximum such as the Meudon Flare Buildup Study and the NASA Solar Maximum Mission.

(24)

Whereas the IAU supports the organisation of Regional Astronomy Meetings, Commission 46 recommends that the IAU urge the holding of sessions on teaching of astronomy at these meetings. Members of Commission 46 are available to assist.

Commission 4 (Ephemerides/Ephémérides)

Resolution 1 of Commissions 4 and 16 on cartographic coordinates.

IAU Commissions 4 and 16 endorse the Report of the Joint Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites,

recommend

that the Report be used as the basis for computing the physical ephemerides of planets and satellites in the international and national ephemerides, and

request

that a small working group continues its activity in order to provide improved rotational elements.

Resolution 2 of Commissions 4, 7, 8, 19, 24 and 31 on nutation.

IAU Commissions 4, 7, 8, 19, 24 and 31 endorse the recommendations given in the Report of the Working Group on Nutation (1979 IAU Theory of Nutation), and

recommend

that they shall be used in the national and international ephemerides for the years 1984 onwards, and in all other relevant astronomical work.

Resolution 3 of Commissions 4, 19 and 31 on the expression of UT1 in terms of GMST.

In considering that it is planned to introduce the IAU (1976) System of Astronomical Constants, the 1979 IAU Theory of Nutation, and the equinox of the FK5 on

1984 January 1, it is recommended that:

- (a) the relationship between mean sidereal time and UT1 be modified so that there is no change in either value or rate of UT1, due to a correction to the zero point of right ascensions of the FK4 and a correction for the motion of the zero point, to be introduced in the FK5;
- (b) the new (provisional) expression for Greenwich mean sidereal time of 0^h UT1 be

$$\text{GMST of } 0^{\text{h}} \text{ UT1} = 6^{\text{h}}38^{\text{m}}45^{\text{s}}833 + 8\,640\,184^{\text{s}}628 T_{\text{u}} + 0^{\text{s}}0929 T_{\text{u}}^2,$$

where T_{u} is the number of Julian centuries of 36525 days of Universal Time elapsed since 1900 January 0, 12^h UT1 (JD 2 415 020.0). This expression is rigorously equivalent to the following

$$\text{GMST of } 0^{\text{h}} \text{ UT1} = 6^{\text{h}}41^{\text{m}}50^{\text{s}}5539 + 8\,640\,184^{\text{s}}8138 T_{\text{u}} + 0^{\text{s}}0929 T_{\text{u}}^2,$$

where T_{u} is measured from 2000 January 1, 12^h UT1 (JD 2 451 545.0).

Note: The followings are frequently used quantities which are also affected by the Resolution:

a) The interval of mean sidereal time in a mean solar day becomes

$$24^h + \frac{8\ 640\ 184.628 + 0.185\ 8\ T_u}{36525} = 86\ 636.555\ 362\ 8 + 0.000\ 005\ 087\ T_u,$$

while the current value is $86\ 636.555\ 360\ 5 + 0.000\ 005\ 087\ T_u$.

b) The ratio of a sidereal day of 86400 mean sidereal seconds to this interval becomes

$$\frac{\text{mean sidereal day}}{\text{mean solar day}} = 0.997\ 269\ 566\ 388 - 0.586 \times 10^{-10} T_u,$$

while the current ratio is $0.997\ 269\ 566\ 414 - 0.586 \times 10^{-10} T_u$.

c) The ratio of the mean solar day to the mean sidereal day becomes

$$\frac{86\ 636.555\ 362\ 8 + 0.000\ 005\ 087\ T_u}{86400} = 1.002\ 737\ 909\ 292 + 0.589 \times 10^{-10} T_u,$$

while the current ratio is $1.002\ 737\ 909\ 265 + 0.589 \times 10^{-10} T_u$.

d) Disregarding the inappreciable secular variations, the equivalent measures of the lengths of the days at 1900 are

1 mean sidereal day: $23^h 56^m 04.090\ 536$ of mean solar time,
1 mean solar day : $24\ 03\ 56.555\ 363$ of mean sidereal time,

while the current values are

1 mean sidereal day: $23^h 56^m 04.090\ 54$ of mean solar time,
1 mean solar day : $24\ 03\ 56.555\ 36$ of mean sidereal time.

Resolution 4 of Commissions 4, 19 and 31 on Project MERIT.

IAU Commissions 4, 19 and 31 endorse the proposal of the joint working group on the determination of the rotation of the Earth for a special period of international collaboration in the monitoring of Earth-rotation and in the intercomparison of the techniques of observation and analysis,

recognize

that the responsibility for the organization of this project MERIT should be shared with the International Union of Geodesy and Geophysics, and

request

that the national and international organizations concerned give full technical and financial support to the development of the proposal and to the implementation of the project.

Resolution 5 of Commissions 4, 19 and 31 on the designation of dynamical times.

IAU Commissions 4, 19 and 31 recommend that the time-scales for dynamical theories and ephemerides adopted in 1976 at the 16th General Assembly be designated as follows:

- (1) the time-scale for the equations of motion referred to the barycentre of the solar system be designated Barycentric Dynamical Time (TDB),
- (2) the time-scale for apparent geocentric ephemerides be designated Terrestrial Dynamical Time (TDT).

Resolution 6 of Commission 4 on a Colloquium on Reference Systems.

IAU Commission 4 expresses its full support in favour of the proposal of the Space Research Centre of the Polish Academy of Sciences and the Smithsonian Astrophysical Observatory to convene the Second International Colloquium on Reference Systems for Earth Dynamics.

Resolution 7 of Commission 4 on processing of occultation data.

IAU Commission 4 recognizing

- (a) that timings of occultations of stars by the Moon will continue to be of value in studies of the lunar motion and figure, the rotation of the Earth, and the stellar reference frame, and
- (b) that it is desirable that the observations should continue to be collected and processed by one organization, and

considering

that beginning with January 1981, H.M. Nautical Almanac Office, Royal Greenwich Observatory, will no longer be able to act as the international centre for the receipt and processing of timings of occultations,

recommends

that an organization with the appropriate experience and commitment to the occultation programme be requested to take over this important work.

We request that the following draft resolution be submitted to Commissions 4, 8, 19 and 31, with the view of its being adopted at the Seventeenth General Assembly of the IAU. "The IAU endorses the recommendations given in the Report of the Working Group on Nutation and recommends that they shall be used in the national and international ephemerides for the years 1984 onwards, and in all other relevant astronomical work."

Recommendations

Whereas, the complete theory of the general nutational motion of the Earth about its center of mass may be described by the sum of two components, astronomical nutation, commonly referred to as nutation, which is motion with respect to a space-fixed coordinate system, and polar motion, which is motion with respect to a body-fixed coordinate system, it is recommended that:

- (a) Astronomical nutation be computed for the "Celestial Ephemeris Pole" using a non-rigid model of the Earth such that there are no nearly diurnal motions of this celestial pole with respect to either space-fixed or body-fixed coordinates which can be calculated from torques external to the Earth and its atmosphere.
- (b) The numerical values given in Table 1 of the complete report be used for computing astronomical nutation of the Celestial Ephemeris Pole.

P.K. Seidelmann, Chairman
V.K. Abalakin, H. Kinoshita, J. Kovalevsky, C.A. Murray,
M.L. Smith, R.O. Vicente, J.G. Williams, Ya.S. Yatskiv.

(The complete Report will be published in *Celestial Mechanics*.)

Table 1. Nutation in Longitude and Obliquity referred to Ecliptic of Date

Epoch: J2000.0 (JED 2451545.0), T in Julian centuries, Unit: 0"0001

No.	Period : (days)	Argument					Longitude		Obliquity	
		l	l'	F	D	Ω	coefficient of sine argument		coefficient of cosine argument	
1	6798.4	0	0	0	0	+1	-172058	-174.2T	+92044	+8.9T
2	3399.2	0	0	0	0	+2	+2063	+0.2T	-895	+0.5T
3	1305.5	-2	0	+2	0	+1	+46	0.0T	-24	0.0T
4	1095.2	+2	0	-2	0	0	+11	0.0T	0	0.0T
5	1615.7	-2	0	+2	0	+2	-3	0.0T	+1	0.0T
6	3232.9	+1	-1	0	-1	0	-3	0.0T	0	0.0T
7	6786.3	0	-2	+2	-2	+1	-2	0.0T	+1	0.0T
8	943.2	+2	0	-2	0	+1	+1	0.0T	0	0.0T
9	182.6	0	0	+2	-2	+2	-13152	-1.5T	+5719	-3.1T
10	365.3	0	+1	0	0	0	+1411	-3.4T	+49	-0.1T
11	121.7	0	+1	+2	-2	+2	-515	+1.2T	+224	-0.6T
12	365.2	0	-1	+2	-2	+2	+217	-0.5T	-95	+0.3T
13	177.8	0	0	+2	-2	+1	+129	+0.1T	-70	0.0T
14	205.9	+2	0	0	-2	0	+48	0.0T	0	0.0T
15	173.3	0	0	+2	-2	0	-22	0.0T	0	0.0T
16	182.6	0	+2	0	0	0	+17	-0.1T	0	0.0T
17	386.0	0	+1	0	0	+1	-15	0.0T	+8	0.0T
18	91.3	0	+2	+2	-2	+2	-15	+0.1T	+7	0.0T
19	346.6	0	-1	0	0	+1	-12	0.0T	+6	0.0T
20	199.8	-2	0	0	+2	+1	-5	0.0T	+3	0.0T
21	346.6	0	-1	+2	-2	+1	-5	0.0T	+3	0.0T
22	212.3	+2	0	0	-2	+1	+4	0.0T	-2	0.0T
23	119.6	0	+1	+2	-2	+1	+4	0.0T	-2	0.0T
24	411.8	+1	0	0	-1	0	-4	0.0T	0	0.0T
25	131.7	+2	+1	0	-2	0	+1	0.0T	0	0.0T
26	169.0	0	0	-2	+2	+1	+1	0.0T	0	0.0T
27	329.8	0	+1	-2	+2	0	-1	0.0T	0	0.0T
28	409.2	0	+1	0	0	+2	+1	0.0T	0	0.0T
29	388.3	-1	0	0	+1	+1	+1	0.0T	0	0.0T
30	117.5	0	+1	+2	-2	0	-1	0.0T	0	0.0T
31	13.7	0	0	+2	0	+2	-2260	-0.2T	+972	-0.5T
32	27.5	+1	0	0	0	0	+709	+0.1T	-7	0.0T
33	13.6	0	0	+2	0	+1	-384	-0.4T	+199	0.0T
34	9.1	+1	0	+2	0	+2	-299	0.0T	+128	-0.1T
35	31.8	+1	0	0	-2	0	-157	0.0T	-1	0.0T
36	27.1	-1	0	+2	0	+2	+123	0.0T	-53	0.0T
37	14.8	0	0	0	+2	0	+63	0.0T	-2	0.0T
38	27.7	+1	0	0	0	+1	+63	+0.1T	-33	0.0T
39	27.4	-1	0	0	0	+1	-58	-0.1T	+32	0.0T
40	9.6	-1	0	+2	+2	+2	-59	0.0T	+25	0.0T
41	9.1	+1	0	+2	0	+1	-51	0.0T	+26	0.0T
42	7.1	0	0	+2	+2	+2	-38	0.0T	+16	0.0T
43	13.8	+2	0	0	0	0	+29	0.0T	-1	0.0T
44	23.9	+1	0	+2	-2	+2	+29	0.0T	-12	0.0T
45	6.9	+2	0	+2	0	+2	-31	0.0T	+13	0.0T
46	13.6	0	0	+2	0	0	+26	0.0T	-1	0.0T
47	27.0	-1	0	+2	0	+1	+21	0.0T	-10	0.0T
48	32.0	-1	0	0	+2	+1	+15	0.0T	-8	0.0T

Table 1. (continuation)

No.	Period (days)	Argument					Longitude		Obliquity	
		multiple of					coefficient of		coefficient of	
		<i>l</i>	<i>l'</i>	<i>F</i>	<i>D</i>	Ω	sine argument		cosine argument	
49	31.7	+1	0	0	-2	+1	-13	0.0T	+7	0.0T
50	9.5	-1	0	+2	+2	+1	-10	0.0T	+5	0.0T
51	34.8	+1	+1	0	-2	0	-7	0.0T	0	0.0T
52	13.2	0	+1	+2	0	+2	+7	0.0T	-3	0.0T
53	14.2	0	-1	+2	0	+2	-7	0.0T	+3	0.0T
54	5.6	+1	0	+2	+2	+2	-8	0.0T	+3	0.0T
55	9.6	+1	0	0	+2	0	+6	0.0T	0	0.0T
56	12.8	+2	0	+2	-2	+2	+6	0.0T	-3	0.0T
57	14.8	0	0	0	+2	+1	-6	0.0T	+3	0.0T
58	7.1	0	0	+2	+2	+1	-7	0.0T	+3	0.0T
59	23.9	+1	0	+2	-2	+1	+6	0.0T	-3	0.0T
60	14.7	0	0	0	-2	+1	-5	0.0T	+3	0.0T
61	29.8	+1	-1	0	0	0	+5	0.0T	0	0.0T
62	6.8	+2	0	+2	0	+1	-5	0.0T	+3	0.0T
63	15.4	0	+1	0	-2	0	-4	0.0T	0	0.0T
64	26.9	+1	0	-2	0	0	+4	0.0T	0	0.0T
65	29.5	0	0	0	+1	0	-4	0.0T	0	0.0T
66	25.6	+1	+1	0	0	0	-3	0.0T	0	0.0T
67	9.1	+1	0	+2	0	0	+3	0.0T	0	0.0T
68	9.4	+1	-1	+2	0	+2	-3	0.0T	+1	0.0T
69	9.8	-1	-1	+2	+2	+2	-3	0.0T	+1	0.0T
70	13.8	-2	0	0	0	+1	-2	0.0T	+1	0.0T
71	5.5	+3	0	+2	0	+2	-3	0.0T	+1	0.0T
72	7.2	0	-1	+2	+2	+2	-3	0.0T	+1	0.0T
73	8.9	+1	+1	+2	0	+2	+2	0.0T	-1	0.0T
74	32.6	-1	0	+2	-2	+1	-2	0.0T	+1	0.0T
75	13.8	+2	0	0	0	+1	+2	0.0T	-1	0.0T
76	27.8	+1	0	0	0	+2	-2	0.0T	+1	0.0T
77	9.2	+3	0	0	0	0	+2	0.0T	0	0.0T
78	9.3	0	0	+2	+1	+2	+2	0.0T	-1	0.0T
79	27.3	-1	0	0	0	+2	+1	0.0T	-1	0.0T
80	10.1	+1	0	0	-4	0	-1	0.0T	0	0.0T
81	14.6	-2	0	+2	+2	+2	+1	0.0T	-1	0.0T
82	5.8	-1	0	+2	+4	+2	-2	0.0T	+1	0.0T
83	15.9	+2	0	0	-4	0	-1	0.0T	0	0.0T
84	22.5	+1	+1	+2	-2	+2	+1	0.0T	-1	0.0T
85	5.6	+1	0	+2	+2	+1	-1	0.0T	+1	0.0T
86	7.3	-2	0	+2	+4	+2	-1	0.0T	+1	0.0T
87	9.1	-1	0	+4	0	+2	+1	0.0T	0	0.0T
88	29.3	+1	-1	0	-2	0	+1	0.0T	0	0.0T
89	12.8	+2	0	+2	-2	+1	+1	0.0T	-1	0.0T
90	4.7	+2	0	+2	+2	+2	-1	0.0T	0	0.0T
91	9.6	+1	0	0	+2	+1	-1	0.0T	0	0.0T
92	12.7	0	0	+4	-2	+2	+1	0.0T	0	0.0T
93	8.8	+3	0	+2	-2	+2	+1	0.0T	0	0.0T
94	23.8	+1	0	+2	-2	0	-1	0.0T	0	0.0T
95	13.1	0	+1	+2	0	+1	+1	0.0T	0	0.0T
96	35.0	-1	-1	0	+2	+1	+1	0.0T	0	0.0T
97	13.6	0	0	-2	0	+1	-1	0.0T	0	0.0T
98	25.4	0	0	+2	-1	+2	-1	0.0T	0	0.0T
99	14.2	0	+1	0	+2	0	-1	0.0T	0	0.0T
100	9.5	+1	0	-2	-2	0	-1	0.0T	0	0.0T
101	14.2	0	-1	+2	0	+1	-1	0.0T	0	0.0T
102	34.7	+1	+1	0	-2	+1	-1	0.0T	0	0.0T
103	32.8	+1	0	-2	+2	0	-1	0.0T	0	0.0T
104	7.1	+2	0	0	+2	0	+1	0.0T	0	0.0T
105	4.8	0	0	+2	+4	+2	-1	0.0T	0	0.0T
106	27.3	0	+1	0	+1	0	+1	0.0T	0	0.0T

$$\sin \epsilon_{2000} = 0.397\ 777\ 16$$

Commission 5 (Documentation/Documentation)

2. Resolution no. 1.

Considering the present unsatisfactory situation of the identification of astronomical objects in astronomical publications, the joint meeting of Commission 5 and representatives appointed by Commissions

8, 24, 25, 26, 27, 28, 29, 30, 34, 37, 40, 42, 45 held in Montreal, on August the 14th, requests strongly that:

- (a) editors of scientific journals and other publications impose stricter standards of object identifications upon the authors through appropriate instructions to the referees;
- (b) catalog abbreviations be explicated either in footnotes or in the bibliography tables;
- (c) two identifications be quoted for each object, in order to provide a check against errors and misprints, especially for faint objects.

3. Resolution no. 2.

Considering the confusion existing at the present time in the literature concerning the abbreviations of catalogs, the joint meeting of Commission 5 and representatives appointed by Commissions 8, 24, 25, 26, 27, 28, 29, 30, 34, 37, 40, 42, 45 desires that:

under IAU auspices, a list of catalog abbreviations be published. This list should be a new version of the work of Fernandez, Lortet and Spite, revised by the IAU Commission representatives and edited by C. Jaschek.

To this resolution, the following note was added, at the intention of the Executive Committee, and in view of the financial implications of the resolution no. 2: "The planned book will be of 60 to 100 pages. A subvention (5000 \$?) will be necessary even if the published document can be sold. The Commission 5 is asking this subvention for Dr. Jaschek."

in first writing and compiling UDC 52 and then in implementing its use. UDC 52 has been published as "British Standard 1000: UDC 52", to be ordered from British Standard Institution, 2 Park Street, London W1, U.K.. As to the "Handbook on the use of UDC 52", it is still in its draft form. G.A. Wilkins explains that it is now been used at Greenwich Observatory. It is hoped that through this experience adequate remarks will be made to improve the draft. The use of UDC 52 will probably be mainly restricted to Europe. USA libraries use for national reasons the library of Congress classification. It would be desirable however to establish cross reference between the two classifications.

The group of Physics of the ICSU AB has put up a sub-classification for astronomy. IAU representatives (J.-C. Pecker and P. Lantos) have made efforts to establish connections between it and UDC 52. Users of ICSU AB are mainly secondary papers: they need less details than provided by UDC 52.

Commission 5 carried unanimously the following resolution:

Resolution no. 3.

Considering the steadily increasing number of publications in the field of astronomy and astrophysics, Commission 5 (Documentation and Astronomical Data) of the IAU,

- recommends the introduction and extensive use of proper key words by authors and publishers of primary journals and other publications in order to facilitate indexing and retrieval work,
- welcomes the initiative of Astronomy and Astrophysics Abstracts (AAA) in preparing a draft vocabulary and invites AAA and other astronomical abstracting services to cooperate in the preparation of an agreed vocabulary.

During the next three years period the prime goal of the Working Group will be first to issue an agreed vocabulary and second to attract attention of people preparing thesaurus to what is going on in the Working Group and to keep close contacts. There seems to be within the commission a consensus that a good vocabulary should be bilingual, not too long but well constructed for information retrieval.

L.A. Higgs from NCR has announced the preparation of an astronomical thesaurus for data bank of NCR. P. Lantos will be kept informed about the evolution of this work.

Since work on UDC 52 is about finished, it seems that the name of the working group is no more adequate and that it should be named Working Group on "Classification Systems and Information Retrieval" (Systèmes de Classification et Recherche de l'Information). Its new President will be P. Lantos.

Commission 10 (Solar Activity/Activité Solaire)

I. Commission 10, recognizing that the long series of relative sunspot numbers is a unique link with the course of solar activity in the past,

Recommends that all institutions that have demonstrated interest and competence in the work of obtaining sunspot numbers should continue the series.

II. Commission 10, recognizing that the 2800 MHz solar flux provides a standard quantitative index of solar activity for use in solar and solar-terrestrial studies,

Recommends that those institutions making such measurements should continue to do so.

III. Commission 10, recognizing that the International Ursigram and World Days Service (IUWDS) has rendered valuable service to the scientific community during the coordination of such international programs as the IGY, the IQSY, and the IMS; that the services provided by the IUWDS are not provided by any other agency and are relevant to the work of several commissions of the IAU; that these services will be particularly important for such programs as the Solar Maximum Year; and that the IUWDS included the prompt reporting of geophysical and solar events which will be occurring with increased frequency in the next few years;

Recommends that the IAU continue to support the activities of the IUWDS to assure continuance of this valuable service.

IV. Commission 10, recognizing that the Quarterly Bulletin of Solar Activity has for many years provided a valuable reporting service to the international scientific community; that this service continues to be relevant to the activities of

Commissions 10, 12, 40, 44, and 49 of the IAU; that the continuation of this service will be of particular value during the coming Solar Maximum Year;

Recommends that the IAU support the Quarterly Bulletin of Solar Activity to assure that this service continues into the future.

V. Commissions 10, 12, and 44 draw attention to the coming of Solar Maximum and recommend a sustained and coordinated effort in its study during the next three years.

VI. Commission 10, recognizing the important contribution made to solar physics by very high frequency (greater than 9 GHz) radio flux observations of the sun,

Recommends that such observations should continue to be strongly supported during the coming solar maximum.

Commission 15 (Physical Study of Comets, Minor Planets and Meteorites/L'Etude Physique des Comètes, des Petites Planètes et des Meteorites)

A. Whereas attendance at the Commission Meetings is essential to the work of the Commission, be it resolved that only those members shall be nominated as officers or as members of the Organizing Committee whose presence at the General Assembly seems reasonably assured.

B. Whereas it is now nearly impossible to correlate, and therefore to interpret, the diverse photometric data on comets, Commission 15 hereby requests the chairman of the comet filters working group to seek funds for purchasing filters for worldwide distribution and/or resale.

Commission 16 (Physical Study of the Planets/L'Etude Physiques des Planètes et des Satellites)

Whereas the Moon is no longer the only celestial body whose surface can be studied at high resolution, the only body explored by spacecraft, or even the only well-studied satellite, a separate Commission devoted to the Moon is no longer needed.

Be it therefore resolved, that Commission 17: The Moon, be merged with Commission 16: Physical Study of Planets and Satellites, to form a new Commission that shall retain the title and number of the existing Commission 16. The membership of the new Commission shall consist of those members of the existing Commissions 16 and 17 who have expressed their intent to join as well as other members of the IAU who have been invited to join on the basis of their research interests. This Merger will permit studies of the Moon to be continued for mutual benefit, in closer association with studies of other planetary bodies.

Note: This Resolution was passed by the General Assembly; Commissions 16 and 17 are now combined as Commission 16.

Commission 19 (Rotation of the Earth/Rotation de la Terre)

Commission 19,

Noting with regret that Dr. Shigeru Yumi is resigning as Director of the Central Bureau of the International Polar Motion Service, at Mizusawa,

Thanks Dr. Yumi for his services in directing the work and the staff of the

Central Bureau for 18 years, during which time the IPMS polar motion was established with high accuracy and the ILS polar motion since 1899.9 was revised on a homogeneous basis, and for the prompt publication of results needed for astronomy, geodesy, and geophysics.

The above resolution was unanimously approved by the Commission. Other resolutions discussed and approved by the Commission are included in the reports of other Commissions and are published in this volume.

Commission 20 (Minor Planets, Comets and Satellites/Petites Planètes, Comètes et Satellites)

Introducing the consideration of proposed resolutions, the President noted that the requested slight increase of the subvention for the Minor Planet Center had been approved by the Finance Committee.

A slightly modified version of the resolution on comet missions discussed in Commission 20 earlier had been approved in the interim by Commissions 15 and 22; Commission 21 also was considering the same resolution. The modified version was voted upon and carried, with none opposed and one abstention.

The resolution concerning Space Astrometry, sponsored by Commission 24 and supported by a number of other commissions, was next voted upon favorably, with none opposed and one abstention.

Consideration next turned to internal resolutions of Commission 20.

The updated policy statement concerning the naming of minor planets had been refined, in part on the basis of discussion at the first administrative meeting of the Commission. The refined version was put to a vote and adopted, with none opposed and two abstentions:

"Commission 20 affirms the tradition that the discoverer of a numbered minor planet be permitted to propose a name for the object. A proposal would normally be accepted, provided that it is consistent with the broad policy of the Working Group on Planetary System Nomenclature. The name would become official following the publication in the MPCs of a brief citation explaining its significance. The Commission defines the discovery as the earliest apparition at which an orbit useful in the establishment of identifications was calculated; in the case of double designations during the same apparition, priority will be given in order of announcement of discovery, unless the double designation follows from an orbit computation using the observations made according to the second announcement. Further, the Commission proposes that, if the discoverer is deceased, or if a minor planet remains unnamed ten years after it has been numbered, a name could appropriately be suggested by identifiers of the various apparitions of

the object, by discoverers at apparitions other than the official one, by those whose observations contributed extensively to the orbit determination, or by representatives of the observatory at which the official discovery was made. In such a case, the selection of a name shall be judged by a committee of three, consisting normally of the President and Vice President of Commission 20 and the Director of the Minor Planet Center, and the final decision shall be made not less than six months following the announcement of the numbering of the minor planet."

The next matter was the proposal to include correction for the light time in ephemerides for minor planets and comets, so that ephemerides should be astrometric rather than geometric. Some careful explanations were given of the meaning of the different kinds of ephemerides, and a question was raised as to what should be done about ephemerides of satellites, the relative ephemerides usually being apparent. Should the resolution apply to ephemerides of faint satellites, such as the outer satellites of Jupiter? After some discussion, it was clear that a consensus had not been reached on exactly what should be done, but there was a consensus that the matter could not be put off until the next General Assembly. It was therefore proposed that a vote be taken on the principle that ephemerides of minor planets and comets should be astrometric rather than geometric, such matters as the date of introduction of the change and the question of what should be done about ephemerides of satellites being left to an ad hoc committee to work out. This proposal passed, with none opposed, and one abstention. The President then appointed a committee consisting of himself, K. Aksnes, Yu. V. Batrakov, B. Morando, J. D. Mulholland, P. K. Seidelmann (chm), and G. E. Taylor to compose the specific recommendation. This is now available as follows:

"Commission 20 proposes that, as soon as practicable, the published ephemerides of minor planets, comets and satellites be astrometric or apparent, rather than geometric. An astrometric position means that the light-time correction has been applied and that the ephemeris is directly comparable with star positions given in a catalogue referred to a mean equinox such as that of 1950.0, except for the application of observer-dependent effects, such as parallax, refraction and diurnal aberration; an astrometric position differs from an apparent position by the effects of precession, nutation and annual aberration. The Commission further proposes that explanations of the meaning of the ephemerides be published from time to time in the standard sources."

The resolution regarding the absolute magnitude to be used in ephemerides of minor planets until 1982 was next formally voted upon; a recommendation based on that developed at the asteroid conference in Tucson was adopted, with none opposed, and three abstentions:

"Commission 20 recommends that the T. Gehrels and N. Gehrels (Astron. J. 83, 1660-1674, 1978) list of asteroid B(1,0), with a phase coefficient of 0.023 mag/deg, be used until 1982. Probably, at that time, a change will be made that should be durable."

The President appointed an ad hoc committee, with membership consisting of Yu. V. Batrakov, E. Bowell (chm), T. Gehrels, L. Kresák, B. G. Marsden, E. Roemer, and L. D. Schmadel, to look into the matter of magnitude ephemerides for minor planets and to make a recommendation for consideration at the next General Assembly.

With respect to the questions raised by Kovalevsky regarding priorities for observational programs on minor planets, it was noted that there is need for a substantially larger number than now available of minor planets with well determined orbits for use in such studies as that of J. G. Williams on asteroid families. It was proposed that an ad hoc committee be appointed to sharpen the goals and observational requirements of astrometric programs on minor planets. The President asked the following to be members of the committee: E. Bowell, J. Kovalevsky (chm), L. K. Kristensen, B. G. Marsden, J. Schubart, V. A. Shor, G. E. Taylor, C. J. van Houten, and J. G. Williams.

Announcements were made regarding future meetings of interest to members of Commission 20: (1) Satellites of Jupiter, 13-16 May 1980, Kailua-Kona, Hawaii; (2) Comets: Gas, Grains, and Plasma, 11-14 March 1981, Tucson, Arizona. The latter meeting is being organized by L. Wilkening in the pattern of earlier Tucson conferences directed by T. Gehrels and will be followed by publication of a book by the University of Arizona Press.

J. D. Mulholland inquired about the value of such programs as the ongoing long-focus observational program on faint satellites at the McDonald Observatory, noting the tight situations with respect to both telescope time and funding. Y. Kozai spoke in support of the program. With time running out, F. K. Edmondson proposed a vote of thanks to President Marsden for his distinguished service as the ninth president of the Commission. This was adopted by acclamation, and the meeting adjourned.

Commission 22 (Meteors and Interplanetary Dust/Météores et la Poussière Interplanétaire)

After considerable discussion the Commission approved a resolution on comet missions. (Submitted jointly by Commission 15, 20, 21, and 22. The text may be found elsewhere in this volume.)

The Commission was polled for its opinion on the desirability of an administrative resolution regarding conflicts of meetings among IAU, COSPAR, and IUGG. Noting that COSPAR already has a non-conflict policy and also that it may change its meeting interval to 2 years, and that geographic location of meetings frequently created problems as severe as time conflicts, concensus was that such a resolution was unnecessary.

The Commission agreed to co-sponsor a Joint Discussion on the formation and early history of the Solar System.

Incoming President expressed the members' thanks to the retiring president for his work on behalf of the Commission during the past three years.