CHAPTER II

TWENTY-FIRST GENERAL ASSEMBLY

First Session
held in the San Martin Cultural Centre
1991 July 23 16.30
Professor Y. Kozai, President, in the Chair

1. Formal Opening by the President

"Ladies and Gentlemen,

After the inaugural ceremony we start the first session of the General Assembly. Two sessions of National Representatives of Adhering Countries to the IAU and of IAU Members are planned during the whole General Assembly. And this is the first one of the administrative sessions. According to the Statutes of the Union, the work of the Union is directed by the General Assembly. Therefore, we are supposed to report to the representatives of the adhering bodies and to the members what has happened in the Union since the previous General Assembly at Baltimore in 1988 and what actions have been taken by the Executive Committee to implement the decisions of the General Assembly and to direct the affairs of the Union in the interval between meetings of two consecutive General Assemblies.

Then we would like to nominate and/or identify the representatives of adhering countries and to the nominating and finance committees, and the members of the resolution committee who will work during the General Assembly for their objectives and who will report to you at the final session of the General Assembly. Here I would like to inform you that the number of the adhering bodies has been reduced by one by the unification of the two Germanies. Now a total of 56 countries adhere to the Union including 2 Associate Members. There are also more than 10 individual members in 9 countries which do not adhere to the Union, and it is expected that these numbers will be increased during the General Assembly.

In the past three years, at almost all the meetings of the Executive Committee, we spent much time to allocate funds to several scientific projects, such as symposia, colloquia, International Schools for Young Astronomers, central bureaux and data centers to sponsor projects proposed by the members. And we have tried to reduce the cost of administration. Now in this General Assembly we submit our proposal to improve the financial situation of the Union and I expect that we can find some solutions by the end of the Assembly.

I am afraid that shortage of funds is met not only in the IAU but also in almost all of the observatories and institutes in the world now. At several observatories, operations of some of their facilities had to be stopped for financial reasons, and several new projects cannot be started and/or are delayed due to similar reasons. Moreover, more severe problems exist, according to my view, in developing countries, where able astronomers are working without adequate funds and facilities and where even the one unit

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of contribution to adhere the Union, text-books on astronomy and tickets to go abroad to study and to attend meetings are too expensive to pay. IAU must try to help astronomers there. Such problems will be also discussed during the General Assembly. I believe that it is also one of the objectives of the IAU.

During the General Assembly, there are, of course, meetings of commissions, which are very important organisations in the IAU in any sense. Most of the participants will spend much of their time at commission meetings as well as Joint Discussions, Joint Commission Meetings and Invited Discourses, which were chosen by the Executive Committee out of many proposals by Commission Presidents. As much progress has been made and many new ideas have come out in astronomical researches in the past three years, I expect that participants will benefit very much by attending such meetings. As you may know from the final programme, poster sessions have been introduced in this General Assembly. I am sure that the poster sessions will stimulate more scientific discussions during the General Assembly. Still I believe that the structure of the scientific meetings can be improved by introducing new ideas which will also stimulate the creation of a new structure of the Union.

Besides scientific meetings there will be business meetings for the commissions for their own administrative business and for several items such as international co-operative projects. Among the commissions there are a few which are not purely scientific, like astronomical telegrams, protection of existing and potential observatory sites, exchange of astronomers and teaching of astronomy, all of which being of important concern for the IAU. It is also expected that several resolutions and recommendations will be submitted by the commissions and discussed in the final session of the General Assembly.

Indeed a very busy schedule will be in front of us during the General Assembly. I hope that all the meetings will be very successful and your participation will prove to be valuable to all of us and for you.

I am very happy to extend once again a warm welcome to all of you, Members of the Union, invited participants and guests.

I would like now to propose to send telegrams to the past Presidents and General Secretaries of the Union who are not able to be with us at the General Assembly, namely:

V.A. Ambartsumian
A.A. Blaauw
C. de Jager
G. Contopoulos
J.H. Oort
R. Hanbury Brown
P. Wayman
E. Müller.

I am happy to extend a warm welcome to members who have in the past served on the Executive Committee of the Union and who are here with us:

J.C. Pecker
R. West

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and to the official representatives of the Adhering Organisations which support the Union:

Furthermore, I extend a hearty welcome to the official representatives of Sister Unions, ICSU Committees and other bodies, namely:

J.	Sahade	ICSU
C.	Segovia	IMU
P.	Pâquet	IUGG
R.D.	Eckers	URSI
W.C.	Martin	CODATA
E.	Tandberg-Hanssen	FAGS
B.	Robinson	IUCAF
S.T.	Wu	SCOSTEP
R.M.	Bonnet	ESA
M.C.	Huber	ESA
M.D.	Papagiannis	IAF
B.J.	Robinson	IUT/CCIR
D.	Huenemoerder	NASA
F.	Repetto	UNESCO

I would like to mention, particularly, the name of Prof. Jorge Sahade, who was the President of the Union in 1985-88 and an advisor to the Executive Committee in the past three years and also the official delegate of ICSU, the International Council of Scientific Unions, which is the umbrella for our Union also. I would like to ask him to give us a few words now."

Address by Prof. J. Sahade, ICSU Representative:

"Mr. President, Members of the Union, Ladies and Gentlemen,

It is my privilege and my pleasure to bring to you, at this first session of your XXIst General Assembly, the greetings of ICSU, the International Council of Scientific Unions, and wish you, on ICSU's behalf, a very fruitful and enjoyable gathering.

You have a very compact and very important programme before you, and, as a consequence, I will endeavour to be brief and to the point.

If you permit me, I would take the opportunity just to make you aware of the fact that ICSU is now quite conscious of and shares your deep concern in regard to the increasing dangers to research that arise from space debris and the different types of space pollution.

Your General Secretary, as your representative in the General Committee of ICSU, has been extremely convincing in the presentation of the case, and has also warned us about some weird proposals that would even be more detrimental - I should perhaps say more deadly- to astronomical research at large than it is generally appreciated.

As a result, the 26th Meeting of ICSU's General Committee, that took place in Lisbon on October 11-14, 1989, requested "ICSU to use all means at its disposal, notably through COSPAR, URSI, IUCAF, and ICSU's contacts in the Space Agencies, to seek effective measures to reduce or avoid present or possible future consequences of such space

activities (those mentioned in the whereas section of the Resolution) on astronomy". This 1989 Resolution of the General Committee of ICSU led to a couple of Resolutions adopted at its 23rd General Assembly, held in Sofia, Bulgaria, on October 1-5, 1990:

Space debris

The General Assembly noting with satisfaction the studies already carried out on the hazard to space missions of impacts with space debris, requests COSPAR to continue this important study in the interests of astronomical and earth observations and in particular:

a. to refine the quantification of the hazards to current and future space missions from impact with space debris;

b. to contine strongly to urge the Spage Agencies to adopt more effective ways and means of reducing the hazard in the short term and to work towards its elimination in the longer term future.

The General Assembly also requests COSPAR to maintain an overview of any activities in space which might lead to pollution of nearby space bodies by matter of terrestrial origin.

Multi-wavelength interference with astronomical observation

noting the harmful increase in the level of electromagnetic pollution, ranging from light pollution to radio interference;

recognizing the impact of such pollution on Earth observation, astronomical observation and radio science;

The General Assembly

strongly urges all concerned administrations, agencies and regulatory bodies to recognize the importance of the continuing detection of faint electromagnetic signals at all frequencies in exploring the universe, in seeking the origins of life, in monitoring the natural resources of the Earth and the fragile balance of the Earth's ecosystem. Effective steps to reduce pollution are urgently required to restore the quality of observing conditions;

further stresses that the frequencies used in Earth exploration, radio astronomy and space research need urgent and specific protection from radio interference especially from telecommunications, navigation satellites and other air borne and space emissions;

specially requests to that end, that the World Administrative Radio Conference in 1992 ensure the rational use, conservation and protection of the scarce radio-frequency spectrum, taking into account the astrophysical signficance of the spectral lines listed in Resolution A7 of the 20th General Assembly of the IAU (1988, Baltimore) and supports the strenuous efforts of IUCAF to obtain such protection.

I would be happy to convey to ICSU any suggestion or relevant input that you might like to make whenever appropriate during the General Assembly.

Thank you very much."

After Professor Sahade's address, Professor Kozai continued the ceremony:

"I now ask those present to stand while the General Secretary reads the names of the members who have died since the 20th General Assembly".

The General Secretary read the list of members deceased since the XXth General Assembly on the invitation of the President (see Chapter III, Report of the Executive Committee, Section 9, pp. 111-112).

The Assembly observed a period of silence in their memory.

2. Appointment of Official Interpreters

The General Secretary announced that J.-C. Pecker (English-French) and J. Rountree-Lesh (French-English) had agreed to serve as Official Interpreters.

3. Report of the Executive Committee 1988-1991

The President invited the General Secretary to present the Report of the Executive Committee 1988-1991. The Report covers the period 1988 September - 1991 June 30. (A summary of the Report of the Executive Committee 1988-1991 was published as Section 2-1 pp. 9-26 of Information Bulletin No.66 and appears in full in Chapter IV pp. 93-120).

The General Secretary summarised the Report highlighting the following points:

"The Executive Committee has devoted considerable attention during the triennium to reviewing the ongoing activities of the Union -format of General Assemblies, the Union's publications, fund raising and the Union's sources of income, the Working Group in the World Wide Development of Astronomy, adverse environmental impacts on astronomy. Many of the issues addressed have not yet reached finality but the decisions to be taken will have a profound effect on the future effectiveness of the Union. The format of General Assemblies is still being debated and will be discussed during this Assembly. The Transactions of the Union will also be discussed during this General Assembly. Members will have noted that changes have taken place in the Information Bulletin -two membership updates are published in the second and third January issue between General Assemblies, the Information Bulletin has been used to give in extenso information on the General Assembly including draft and final programmes. It is hoped these changes are advantageous. A new contract for IAU Publications has been signed with Kluwer Academic Publishers for the period 1992-1997, again providing royalty income for the Union. The Executive Committee has also considered the Union's

financial resources and two resolutions, as a result, will be considered by this General Assembly. Default on subvention to the Union has been growing but it is hoped that the situation will improve as a result of action already taken. The Working Group on the World Wide Development of Astronomy, established at the XXth General Assembly, has used the triennium to consider how it can best implement its terms of reference and will be holding two meetings during this General Assembly to discuss proposals for future action. As a result of the withdrawal of a resolution presented by the Swedish National Committee for Astronomy to the XXth General Assembly, the Executive Committee established a subcommittee to examine the issues raised. That committee found reason for concern and their conclusions are given in the full Report. Steps have been taken to implement the committee's suggested action and an IAU/ICSU/UNESCO meeting will be held in the summer of 1992 in Paris to make governments and public aware of the threats now posed to continued astronomical observation from the ground and from space. A presentation to the UN Committee on the Peaceful Uses of Outer Space is under consideration. The IAU has been given every encouragement and support by ICSU in its endeavours to publicise these threats. The mandate of Commission 50 is to be extended to include all threats to astronomical observation.

The Secretariat is well settled into its new premises -which are well suited to its purposes. A new computer system (replacing an IBM PC and a Rank Xerox word-processing system) of three linked Compaq PCs has been installed. The new system permits tape backup so improving the security of Union records. Mrs. H. Gigan resigned from the service of the Union in January 1990 and was replaced by Mrs. J. Crook from July 1990. Monique Léger-Orine continues to direct the day-to-day operation of the Secretariat with great efficiency.

At the XXth General Assembly, four countries were admitted as Members of the Union and two as Associate Members. Because of continued default on Union Subventions, the Executive Committee has recommended that two countries resign from the Union. However, both countries will be offered Associate Member Status and may reapply for full membership once regular financial arrangements can be resumed. The status of the individual members of the Union from the countries deemed to have resigned from the Union is unaltered. At the close of the XXth General Assembly the Union had 6711 individual members and had 6624 individual members as of 1991 June 30.

The Report indicates that the administrative Commissions of the Union have been active during the Triennium. The scientific programme of this General Assembly and Reports on Astronomy (IAU Trans. XXIA) indicate that the remaining Commissions have been active both singly and conjointly. It is a particular pleasure to record that Commission 38 assisted the travel of 25 astronomers mostly from developing countries. Commission 46 has maintained its Visiting Lecturer Programme in Peru and Paraguay and held three International Schools for Young Astronomers -No. 16 in Cuba, No. 17 in Malaysia and No. 18 in Morocco. This last was the first francophone school but sadly the last to be organised on behalf of the Union by

J. Kleczek. Josip Kleczek pioneered and nurtured the ISYA and personally directed all 18 schools since their inception in 1966. He brought to the task a particular talent for organisation of an effective school in all parts of the world as well as a great warmth of personality. He kept a remarkable balance of practicality of execution. Many times an Executive Committee, even Commission 46, set down ideal objectives for ISYA. Josip translated ideals into the reality of the developing world. Perhaps the greatest test of the success of the schools is the fact that the co-organiser of the 17th School was, herself, a graduate of an earlier School. This Union owes Josip Kleczek a great debt of gratitude for his dedication to the realisation of a fine educational enterprise (Applause).

It is unfortunate that he cannot be here today to receive your ovation. We have two worthy successors in that Donat Wentzel will take over as Secretary to the ISYA and he will be ably assisted by Michèle Gerbaldi.

The Union held 12 Symposia, 22 Colloquia, 4 Regional Meetings and cosponsored 11 meetings with other ICSU Unions and Committees. The Union was represented at 21 other Unions, Committees and other important international bodies.

Finally, it will be seen that the Union has ended the triennium in a financial state which allows the maintenance of a balance which is about equal to the expected annual expenditure in the next triennium. Such a balance is necessary for the prudent operation of the Union but that balance is susceptible to erosion by currency inflation and by default on subvention. The proposed budget for 1992-1994 has been devised on the basis of ending a six year level funding period with moderate annual increases in support of the Union's scientific activities."

The President invited discussion of the Report of the Executive Committee 1988-1991. The Report has been given consideration by the Official Representatives of the Adhering Organisations. The financial part of the Report will be scrutinised by the Finance Committee whose report will be presented at the second session of the General Assembly. There being no points raised by Members of the Union from the Floor, the General Assembly unanimously approved the Report of the Executive Committee 1988-1991 subject to receiving the Report of the Finance Committee.

4. Report of the work of the Special Nominating Committee

The President informed the Assembly that the Special Nominating Committee had selected the following IAU members for proposal as members of the Executive Committee from 1991 August 01.

President:	A.A.	Boyarchuk	USSR
General Secretary:	J.	Bergeron	France
Assistant General Secretary:	I.	Appenzeller	Germany
President-Elect:	L.	Woltjer	Netherlands

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Vice-Presidents:	D.S.	Mathewson	Australia
	F.	Pacini	Italy
	V.	Radhakrishnan	India
	M.S.	Roberts	USA
	J.I.	Smak	Poland
	Shu Hua	Ye	China PR
Advisers:	Y.	Kozai	Japan
	D.	McNally	UK

5. Announcement of the Official Representatives of Adhering Organisations and the Representatives to serve on the Nominating Committee

Country	*National Committee Representatives*		*Nominating Committee Representatives*	
Algeria	----	----------	----	----------
Argentina	A.	Feinstein	G.	Lopez Garcia
Australia	R.D.	Eckers	R.D.	Eckers
Austria	H.	Haupt	H.	Haupt
Belgium	P.	Smeyers	P.	Pâquet
Brazil	----	----------	M.T.	Pastoriza
Bulgaria	N.S.	Nikolov	M.K.	Tsvetkov
Canada	S.	van den Bergh	----	----------
Chile	A.	Gutierrez-Moreno	M.T.	Ruiz
China Nanjing	Li	Qi-bin	Li	Qi-bin
China Taipei	H.H.	Wu	Chow	C.K.
Colombia	E.	Brieva	E.	Brieva
Cuba	----	----------	----	----------
Czechoslovakia	----	----------	----	----------
Denmark	L.K.	Kristensen	L.K.	Kristensen
Egypt AR	A.Z.	Aiad	M.A.	Soliman
Finland	K.	Muiononen	K.	Muinonen
France	J.	Kovalevsky	B.	Morando
Germany	R.	Wielen	R.	Wielebinski
Greece	P.	Laskaridis	P.	Laskaradis
Hungary	B.	Szeidl	B.	Szeidl
Iceland	----	----------	----	----------
India	G.	Swarup	----	----------
Indonesia	----	----------	S.D.	Wiramihardja
Iran	----	----------	----	----------
Iraq	----	----------	----	----------
Ireland	M.	de Groot	M.	de Groot
Israel	----	----------	G.	Shaviv
Italy	V.	Castellani	L.	Padrielli
Japan	D.	Sugimoto	D.	Sugimoto
Korea DPR	----	----------	----	----------
Korea RP	H.S.	Yun	Chun	M.S.
Malaysia	----	----------	----	----------
Mexico	P.	Pismis	S.	Torres-Peimbert
Morocco	----	----------	----	----------
Netherlands	C.	Zwaan	C.	Zwaan
New Zealand	E.	Budding	E.	Budding
Nigeria	----	----------	----	----------
Norway	E.	Jensen	K.	Aksnes
Peru	----	----------	----	----------

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Poland	J.	Smak	J.	Smak
Portugal	J.P.	Osorio	J.P.	Osorio
Rumania	----	----------	----	----------
Saudi Arabia	A.	Niazry	----	----------
South Africa	M.W.	Feast	E.E.	Baart
Spain	J.	Gomez-Gonzalez	J.	Gomez-Gonzales
Sweden	R.	Booth	A.	Hjalmarson
Switwerland	B.	Hauck	J.	Stenflo
Turkey	H.	Kirbiyik	H.	Kirbiyik
UK	F.	Graham-Smith	C.	Jordan
Uruguay	J.	Fernandez	J.	Fernandez
USA	K.I.	Kellermann	A.	Cox
USSR	N.V.	Steshenko	B.M.	Shuster
Vatican City State	C.	Corbally	C.	Corbally
Venezuela	G.	Bruzual	G.	Bruzual
Yugoslavia	A.	Cadez	A.	Cadez

6. Acting Presidents of Commissions

Commission	*Acting President*
4	P.K. Seidelmann
5	G.A. Wilkins
6	E. Roemer
7	J. Henrard
8	M. Miyamoto
9	J. Davis
10	E.R. Priest
12	J.W. Harvey
14	S. Sahal-Brechot
15	J. Rahe
16	A. Brahic
19	M. Feissel
20	R.M. West
21	A.-C. Levasseur-Regourd
22	C.S. Keay
24	W.F. van Altena
25	I.S. McLean
26	H.A. McAlister
27	M. Breger
28	G.A. Tammann
29	P.S. Conti
30	D.W. Latham
31	P.Eg. Påquet
33	M. Mayor/L. Blitz
34	J.S. Mathis
35	A. Maeder
36	D.F. Gray
37	C. Pilachowski
38	F.G. Smith
40	P.G. Metzger
41	J.D. North
42	R.H. Koch
44	E.B. Jenkins
45	M. Golay
46	A. Sandqvist
47	K. Sato

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48	J.	Ostriker
49	B.	Buti
50	D.L.	Crawford
51	G.	Marx
WGPSN	K.	Aksnes
WGWDA	A.	Batten

7. Appointment of the Finance Committee

In accord with Statute 22(a), the General Assembly appointed the following Finance Committee consisting of one representative from each Adhering Organisation:

Country	*Category*	*Units*	*Representative*	
Algeria	I	1	----	----------
Argentina	III	4	Z.	Lopez Garcia
Australia	III	4	L.	Keay
Austria	I	1	H.	Haupt
Belgium	IV	6	P.	Smeyers
Brazil	II	2	----	----------
Bulgaria	I	1	M.K.	Tsvetkov
Canada	VI	14	D.C.	Morton
Chile	I	1	B.	Moreno
China Nanjing	V	10	Hong-Jun	Su
China Taipei	I	1	H.H.	Wu
Colombia	I	1	E.	Brieva
Cuba	I	1	----	----------
Czechoslovakia	III	4	----	----------
Denmark	II	2	L.	Helmer
Egypt AR	III	4	M.	Soliman
Finland	I	1	K.	Muiononen
France	VII	20	J.C.	Pecker
Germany	VII	20	M.	Grewing
Greece	II	2	P.	Laskaridis
Hungary	II	2	I.	Almar
Iceland	I	1	----	----------
India	III	4	G.	Swarup
Indonesia	I	1	----	----------
Iran	I	1	----	----------
Iraq	I	1	----	----------
Ireland	I	1	M.	de Groot
Israel	II	2	----	----------
Italy	V	10	L.	Padrielli
Japan	VII	20	D.	Sugimoto
Korea DPR	I	1	----	----------
Korea RP	I	1	M.S.	Chun
Malaysia	I	1	----	----------
Mexico	II	2	A.	Serrano
Morocco	I	1	----	----------
Netherlands	IV	6	C.	Zwaan
New Zealand	I	1	E.	Budding
Nigeria	I	1	L.I.	Onuora
Norway	I	1	E.	Leer
Peru	I	1	----	----------
Poland	III	4	J.	Smak
Portugal	II	2	J.J.	Osorio
Rumania	II	2	----	----------

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Saudi Arabia	I	1	----	----------
South Africa	III	4	G.D.	Nicolson
Spain	II	2	J.	Gomez-Gonzales
Sweden	III	4	A.	Ardeberg
Switwerland	III	4	G.	Burki
Turkey	I	1	H.	Kirbiyik
UK	VII	20	R.D.	Davies
Uruguay	I	1	J.	Fernandez
USA	VIII	30	P.	Boyce
USSR	V	10	B.M.	Shuster
Vatican City State	I	1	R.	Boyle
Venezuela	I	1	G.	Bruzual
Yugoslavia	II	2	A.	Cadez

8. Appointment of the Resolutions Committee

The President informed the Assembly that the Executive Committee proposed the establishment of a Resolutions Committee under the Chairmanship of Professor R.D. Davies, with Drs A.H. Batten (Executive Committee Representative), E. Budding, S. Isobe and J.-C. Pecker as members. The General Assembly unanimously agreed to this composition of the Resolutions Committee.

9. Revision of Bye-Law 24

The President asked the General Secretary to amplify the Executive Committee's proposal to extend the number of categories of adherence. The General Secretary explained the background and need for the proposed change formally set out as:

The Executive Committee of the International Astronomical Union

Recognising

a) the continued growth in the number of individual members of the Union and thereby, the increasing number of members of the Union from Adhering Country;

b) the need for additional financial support for the Union to meet the costs incurred by the Union arising from that growth in membership;

c) that the Union will continue to derive all but an insubstantial fraction of its income from its Adhering Organisations;

Recommends

that Bye-Law 24 of the Union be amended by the creation of 4 new categories of adherence IX, X, XI, XII paying 40, 55, 75, 100 units of contribution respectivily to allow Adhering Countries to assume a higher category of adherence than is currently possible.

Bye-Law 24 as revised would read

"Each Adhering Country pays annually to the Union a number of units of contribution corresponding to its category as follows:

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Category as defined in Statute 8:

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Number of units of contribution:											
1	2	4	6	10	14	20	30	40	55	75	100"

10. Resolutions submitted by Adhering Organisations

No Resolutions were proposed to the XXIst General Assembly by Adhering Organisations.

11. Resolutions submitted by Commissions or Associated Inter-Union Commissions

No Resolutions were proposed to the XXIst General Assembly by Commissions or by Associated Inter-Union Commissions.

12. A proposal by the Executive Committee that the Union should establish an IAU Trust Fund

The President asked the General Secretary to amplify the Executive Committee proposal to move towards the institution of an IAU Trust Fund. The General Secretary explained the background which led to the proposal finally set out as follows:

"The Executive Committee of the IAU

recognising

i) the severe financial restraints under which Adhering Organisations must operate

ii) the need for further financial support to develop new Union services and activities in support of astronomical research asks the General Assembly to signify their support/lack of support for the Executive Committee to proceed to a proposal for an International Astronomical Union Trust Fund, to be governed by a Board of independent Trustees answerable to the General Assembly, for consideration by the XXIInd General Assembly".

The Scientific Unions of the ICSU family derive their income directly or indirectly from the governments of the Adhering Member Countries usually through a body such as a National Academy. In recent years the worldwide finance available for science has come under considerable pressure and the IAU has had several periods of level funding for its science in recent years. This has meant a reduction in the support the Union has been able to give to the science of astronomy. Inflation inexorably erodes Union income. This means that the Union can only maintain existing commitments at a devaluing rate and cannot undertake new initiatives which are necessary in a rapidly changing world.

The concept of a Union Trust Fund was introduced in Information Bulletins 63 (p. 12) and 64 (p. 4). It has proved impossible to gauge Union opinion on this important matter and accordingly the Executive Committee has put forward a resolution to the XXIst General Assembly to test the reaction of the members attending to such a proposal.

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The General Secretary stressed that members should only vote for the proposal at the second session of the General Assembly were they willing to contribute such a Fund.

The President then formally adjourned the meeting until 1991 August 01 at 10.00 and closed the meeting with a word of thanks to the participants.

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TWENTY-FIRST GENERAL ASSEMBLY

Second Session
held in the San Martin Cultural Centre
1991 August 01 10.00
Professor Y. Kozai, in the Chair

The President asked the General Secretary to report on the fire(*) which had occurred in the Cultural Centre the previous day (1991 July 31). The General Secretary reported that prior to 08.00 on July 31, the final day of scientific sessions at the General Assembly, a fire had ignited in some rubbish in one of the basement car park levels of the San Martin Cultural Centre. Although the fire was confined to the basement level, dense smoke had permeated the remainder of the building and it was clear that some days would elapse before the building was again usable. The General Secretary summoned an emergency meeting of the Executive Committee to consider the situation. The General Secretary was empowered to take such action he deemed necessary to retrieve as much of the scientific programme as was possible under the circumstances and to arrange a venue for this second session of the General Assembly.

It was fortunate that the General Assembly was divided between two conference centres -eight parallel sessions were held in the San Martin Cultural Centre and four were held in the La Plaza development. La Plaza also had an open air amphitheatre where it was possible to hold an information session for the participants and all scientific activity was transferred to this site plus a nearby cinema which was made available for the afternoon. The LOC, their Conference Consultants Annajuan and the Management of La Plaza made Herculean efforts to provide as much accommodation as could be found and we are very much in the debt of all those in and around La Plaza who went out of their way to assist us. The efforts of Juan O'Farrell of Annajuan must be mentioned especially (Professor A. Wolfendale gave the General Secretary a large bottle for award to the most notable person of the General Assembly -the General Secretary informed the Assembly he had presented it to Juan O'Farrell): Juan seemed to conjure meeting rooms out of nowhere and to generate notices as soon as a need was identified. Without Juan, our best efforts would have been pale indeed. The General Secretary expressed his appreciation of the help he had received from those organising scientific meetings -particularly from those who agreed to cancel their meetings; from those, whose meetings were possible, for agreeing to hold them in the lunch-hour and on into the evening; and from Bernard Hauck and George Wilkins for volunteering the cancellation of Joint Commission Meeting VIII Archiving Current Astronomical Data. This Joint Commission Meeting was of great timeliness and papers contributed to it will be published in Highlights Vol. 9. Unfortunately, the discussion and visibility that the meeting would have generated for this important topic has been lost. The General Secretary hoped that he had managed to accommodate all the Commissions who needed a final meeting and asked Presidents of Commissions who kindly cancelled their meetings to report

the science to be presented in their Transactions XIIB reports. Regrettably the final day's poster session has been lost.

The General Secretary reported that the LOC and the IAU staff mounted a rescue operation in co-operation with the Fire Service and recovered the IAU records, papers, equipment and speakers' slides, not to mention airline tickets being reconfirmed. The IAU computer worked upon rescue and it seems the IAU data records are intact. The General Secretary asked for the Assembly's forebearance during this second session if some information needed correction -the Secretariat had planned to spend the previous day in peace and quietness preparing for the second session of the General Assembly. Nevertheless, the fact that a session was in progress, with only a faint smell of smoke to remind the Assembly of yesterday's traumatic events, is a tribute to the efforts of the LOC, the Secretariat and all those who gave unstintingly of their help to ensure the conclusion of business in some semblance of good order.

The General Secretary also reported that the two firemen, who were overcome by the smoke in their efforts to deal with the fire, were now recovering. Fortunately no-one was seriously injured in this fire and it was merciful that it occurred before the start of the working day when the building would have been full.

(*) The following information was received from Hugo Levato:

"The reason for the fire seems to be the following: At the fourth underground level, garbage was stored in the wrong place. This place has ventilation pipes which go to the street level. It seems that some pedestrian passed walking through and threw a cigarette or a match and it falled on the garbadge (mainly papers for discarding). It was a fire that during working hours would have been easily extinguised, but very early in the morning (5 a.m. approximately), no personnel was working there and the fire became more important."

Before passing to the Agenda, the General Secretary was asked by the President to review the voting procedure. The Rules for Voting may be summarised as follows:

a) only National Representatives may vote on financial and administrative matters (Statute 15 (a) (b));

b) all members of the Union present have one vote each on scientific matters (Statute 16);

c) the vote of the National Representatives is valid only if at least 2/3 of the Adhering Countries having the right to vote participate -in this instance 24 (Statute 15 (b);

d) the vote is determined by simple majority subject to (c) above. Countries in arrears with their subvention as of 1990 December 31 may not vote -such countries were advised prior to the session by the General Secretary (Statute 15 (a) (b));

e) on financial matters each Adhering Country has a number of votes equal to their category of adherence plus one (Statute 15 (b)). On administrative matters each Adhering Country has one vote (Statute 15 (a)).

A quorum having been established the General Assembly appointed H. Levato, E. Sadler and V. Trimble as Tellers.

13. Report on the Finance Committee

The General Secretary announced that copies of the Report of the Finance Committee had been made available to the National Representatives and he invited P. Boyce, Chairman of the Finance Committee, to present the report.

Report of the IAU Finance Committee

"The Finance Committee appointed a subcommittee to examine the accounts and proposed budget of the Union and to make recommendations to the General Assembly.

The Committee believed that the summary of the accounts as printed closely reflects the result of the official audit of the Union's accounts.

The Finance Committee recommends that the accounting system be changed to reflect the revenues and expenses incurred in a given calender year, regardless of when the payments or receipts are made (known in US terms as "accrual accounting"). The Committee further requests that all triennium reports and budgets start with the year of the General Assembly. The budget will then have to include one additional year for the future General Assembly.

The Finance Committee recommends two cutting measures:

1. One particularly costly item for this General Assembly is the payment of all expenses for nearly all the incoming and outgoing Executive Committee for the duration of the General Assembly. There does not seem to be a uniform policy on this matter. The Finance Committee thus recommends that the Executive Committee consider whether the full payment of travel and per diem for such a long stay provides benefits commensurate with the high cost involved, and

2. that the Executive Committee should ask each National Committee to check the membership list annually and to eliminate individuals no longer interested in the Union's activities. The Committee further notes with approval that the Executive Committee has taken the steps of terminating the membership in the Union for two countries and strongly encourages the Executive Committee to strengthen the efforts to ensure prompt payment of dues.

The Finance Committee strongly urges that the reserve funds of the Union be maintained at a level equal to an average year's operations and points out that this requires a net gain equal to the inflation rate.

The Committee recommends that the General Assembly adopt the following rates as proposed by the General Secretary which are based upon assuming an average inflation rate of five percent per year in those countries where the Union conducts business:

1992: 2345 SwF,
1993: 2460 SwF and
1994: 2580 SwF

The Finance Committee recommends amending the proposed change to the levels of adherence as listed in IB 66 to the following pattern which reduces the absolute sizes of the steps for the higher categories:

Category										
I	II	III	IV	V	VI	VII	VIII	VIII½	IX	X
Votes										
2	3	4	5	6	7	8	9	9	10	11
Units										
Present										
1	2	4	6	10	14	20	30	-	-	-
Proposed										
1	2	4	6	10	14	20	27	30	35	45

Since the United States currently adheres at a level of 30 units we suggest retaining that level temporarily as category VIII½. If the United States decides to change its level of adherence that categorry would be automatically dropped and it is intended that if additional categories are added, they should be in constant steps of 10 units.

The Committee recommends approval of the proposed budget with the proviso that the Executive Committee make every effort to obtain additional income through increased levels of adherence to the Union and better honoring of the dues and by maintaining tight control over costs.

Having done so at the past two General Assemblies, the Committee again recommends that, with a budget of the present size, prudent management practice would be to make a fiscally knowledgeable person always available to the Executive Committee and suggests that the Executive Committee consider establishing the office of Treasurer, but without expanding the size of the Executive Committee.

The Finance Committee encourages the Executive Committee to study the concept of an IAU Trust Fund structured along the lines as outlined in IB 63. The study should be done in consultation with the National Adhering Bodies and should include possible negative consequences upon the overall support of the Union.'

The President thanked Dr. Boyce for his Chairmanship of the Finance Committee.

Vote on the Report of the Finance Committee:

The President conducted the vote on the Report of the Finance Committee as follows:

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The audited Accounts for 1988, 1989 and 1990 were unanimously accepted together with the residual budget for 1991.

The increased Units of Contribution for 1992, 1993, 1994 were approved by 145 votes, there were two abstentions.

The proposed budget for 1992-1994 was unanimously accepted.

14. Vote on the Change of Bye-Law 24

An Amendment to the Executive Committee's proposed change of Bye-Law 24 was proposed by the National Representatives. They proposed that a redefined category VIII carrying 27 units of contribution should be inserted, that a special category VIII½ carrying 30 units of contribution should be created temporarily to accommodate the United States (currently paying 30 units of contribution) and that the step between units of contribution reduced from that proposed by the Executive Committee such that category IX carried 35 units of contribution, category X, carried 45 units of contribution and thereafter additional categories would carry units of contribution increasing in fixed steps of 10 units. Category VIII½ would be eliminated as and when the United States choose to alter its category of adherence. The proposed amendment led to the following form for Bye-Law 24. The associated number of votes for each category is appended.

The revised form of Bye-Law 24 proposed by the National Representatives as an amendment to the change proposed by the Executive Committee (pp. 21-22). "Each Adhering Country pays annually to the Union a number of units of contribution corresponding to its category as follows:

Category as defined in Statute 8:

I	II	III	IV	V	VI	VII	VIII	VIII½	IX	X

Number of units of contribution:

1	2	4	6	10	14	20	27	30	35	45.

If further Categories of Adherence are required in the future, the step in the number of units shall be 10 units/category."

This Amendment was carried by 142 votes: there were 5 abstentions.

The proposal to change Bye-Law 24 by the Executive Committee, therefore, was lost.

15. A proposal to institute an IAU Trust Fund

After some clarification from the General Secretary, the President explained that while strictly, the proposal to consider the formation of an IAU Trust Fund was financial, its sources of income lay outside the Adhering Countries -in particular from contributions by individual members of the Union -it was appropriate that opinion of all members of the Union present should be tested on this important issue. On the motion of the President, a substantial majority of the membership indicated support for the motion as set out in Section 12. Only one member wished to record an abstention. The question of an IAU Trust must now be considered by the Executive Committee.

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16. Resolutions submitted by the Executive Committee

The following resolutions were submitted by the Executive Committee:

Resolution A1: Sharing Hydroxyl Band with Land Mobile Satellite Services

The XXIst General Assembly of the International Astronomical Union,

considering

a) that the 1660-1660.5 MHz band is allocated to the Radio Astronomy Service on a shared, primary basis, and is used to observe hydroxyl lines, which are of the highest astrophysical importance, in many galaxies in the nearby Universe;

b) that the World Administrative Radio Conference for the Mobile Services (WARC MOB-87) has also allocated the 1660-1660.5 MHz band to the land mobile satellite service;

c) that WARC MOB-87 has added Footnote 730A to the Regulations, allowing administrations to authorize aircraft stations and ship stations to communicate with space stations in the land mobile satellite service in the 1660-1660.5 MHz band.

urges

that administrations adhering to the International Astronomical Union and to the International Telecommunication Union bear in mind at WARC 92 the importance of the primary allocation to the Radio Astronomy Service in the band 1660.0-1660.5 MHz;

and instructs the President

to support IUCAF strongly in its efforts to bring this resolution to the attention of delegations participating in WARC 92.

IUCAF *Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science*

WARC MOB *World Administrative Radio Conference for Mobile Services*

Résolution A1: Partage de la bande de l'hydroxyle avec les services mobiles au sol

La XXIe Assemblée générale de l'Union Astronomique Internationale,

considérant

a) que la bande 1660-1660.5 MHz est attribuée au Service de la Radioastronomie sur une base de priorité et de partage et qu'elle est utilisée pour l'observation des raies de l'hydroxyle qui sont de la plus grande importance astrophysique dans de nombreuses galaxies appartenant à l'Univers proche ;

b) que la Conférence Administrative Mondiale des Radiocommunications pour les services mobiles (WARC MOB-87)

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, a aussi attribué la bande 1660-1660.5 MHz aux services mobiles au sol associés aux satellites ;

c) que la WARC MOB-87 a ajouté la note 730A aux Réglementations Radio, permettant ainsi aux administrations d'autoriser les stations embarquées sur avion ou sur bateau de communiquer avec les stations spatiales par des services mobiles dans la bande 1660-1660.5 MHz ;

recommande de façon pressante

que les administrations adhérant à l'Union Astronomique Internationale et à l'Union Internationale des Télécommunications aient présente à l'esprit, lors de la Conférence Administrative Mondiale des Radiocommunications (WARC 92), l'importance d'attribuer en premier au Service de la Radioastronomie la bande 1660.0-1660.5 MHz ;

et demande au Président

d'appuyer fortement la Commission Inter-union pour les Allocations des Bandes de Fréquences à la Radioastronomie et à la Recherche Spatiale (IUCAF) dans ses efforts en vue de porter cette résolution à l'attention des délégations participant à la WARC 92.

IUCAF *Commission Inter-Union pour les Allocations des Bandes de Fréquences pour la Radioastronomie & la Recherche Spatiale*

WARC MOB *Conference Administrative Mondiale des Radiocommunications pour les services mobiles*

Resolution A2: Revision of Frequency Bands for Astrophysically Significant Lines

The XXIst General Assembly of the International Astronomical Union,

recalling

a) resolutions passed by the International Astronomical Union in 1979 and 1982 recommending the provision by national administrations of frequency bands for the astrophysically most important spectral lines;

b) the need expressed in those resolutions to protect these frequency bands from in-band, band-edge and harmonic emissions, especially from space-borne transmitters;

c) the documentation of Study Group 7 of the CCIR in Recommendation 314 and Reports 224 and 697 concerning harmful interference to the Radio Astronomy Service;

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and considering

the careful reviews by the International Astronomical Union in the period 1983-1991 of the astrophysically most important spectral lines;

recommends

that the International Astronomical Union take note of the revision of the frequencies of the astrophysically most important spectral lines listed in Tables 1 and 2 below;

and instructs the President

to bring the resolution to the attention of the General Secretary of the International Telecommunication Union, and to support IUCAF strongly in its efforts to bring this resolution to the attention of delegations participating in WARC 92.

CCIR — *Consultative Committee on International Radiommunications*

IUCAF — *Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science*

WARC — *World Administrative Radio Conference*

Résolution A2: Révision des bandes de fréquences pour les raies d'intérêt astrophysique

La XXIe Assemblée générale de l'Union Astronomique Internationale,

rappelant

a) les résolutions de l'Union Astronomique Internationale de 1979, 1982 and 1988 recommandant la mise à disposition, par les administrations nationales, de bandes de fréquences pour les raies spectrales de plus grande importance en Astrophysique ;

b) la nécessité exprimée dans ces résolutions de protéger ces bandes de fréquences des émissions dans la bande, en bordure de bande et des harmoniques, en particulier celles provenant de transmetteurs spatiaux ;

c) la documentation du Groupe d'étude 7 du Comité Consultatif Radio International (CCIR) dans sa Recommandation 314 et les rapports 224 et 697 traitant des interférences nuisibles au Service de la Radioastronomie ;

et considérant

les revues faites avec grand soin par l'Union Astronomique Internationale, au cours de la période 1983-1991, des raies spectrales de plus grande importance en Astrophysique ;

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recommande

que l'Union Astronomique Internationale prenne note de la révision de la liste des raies spectrales les plus importantes en astrophysique, telles que répertoriées dans les Tableaux 1 et 2 annexés ;

et demande au Président

de porter cette résolution à l'attention du Secrétaire Général de l'Union Internationale des Télécommunications et d'appuyer fortement la Commission Inter-Union pour les Allocations des Bandes de Fréquences pour la Radioastronomie et la Recherche Spatiale (IUCAF) dans ses efforts pour porter cette résolution à l'attention des délégations participant à la WARC 92.

CCIR *Comité Consultatif Radio International*

IUCAF *Commission Inter-Union pour les Allocations des Bandes de Fréquences pour la Radioastronomie & la Recherche Spatiale*

WARC *Conférence Administrative Mondiale des Radiocommunications*

TABLE I

Radio-frequency lines of the greatest importance to radio astronomy at frequencies below 275 GHz

(Raies de fréquence radio d'importance majeure pour la Radioastronomie aux fréquences inférieures à 275 GHz)

Substance *Corps Composé*	Rest frequency *Fréquences au repos*	Suggested minimum band *Bande minimum suggérée*	Notes (1)
Deuterium (DI) *Deuterium*	327.384 MHz	327.0 - 327.7 MHz	
Hydrogen (HI) *Hydrogène*	1420.406 MHz	1370.0 - 1427.0 MHz	(2),(3)
Hydroxyl radical (OH) *Radical oxhydrile*	1612.231 MHz	1606.8 - 1613.8 MHz	(3),(4)
Hydroxyl radical (OH) *Radical oxhydrile*	1665.402 MHz	1659.8 - 1667.1 MHz	(4)
Hydroxyl radical (OH) *Radical oxhydrile*	1667.359 MHz	1661.8 - 1669.0 MHz	(4)
Hydroxyl radical (OH) *Radical oxhydrile*	1720.530 MHz	1714.8 - 1722.2 MHz	(3),(4)
Methyladyne (CH) *Méthyladyne*	3263.794 MHz	3252.9 - 3267.1 MHz	(3),(4)

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Methyladyne (CH) *Méthyladyne*	3335.481 MHz	3324.4 - 3338.8 MHz	(3),(4)
Methyladyne (CH) *Méthyladyne*	3349.193 MHz	3338.0 - 3352.5 MHz	(3),(4)
Formaldehyde (H_2CO) *Formaldehyde*	4829.660 MHz	4813.6 - 4834.5 MHz	(3),(4)
Methanol (CH_2OH) *Méthanol*	6668.518 MHz	6661.8 - 6675.2 MHz	(3),(6)
Ionized helium isotope (^{3}HeII) *Isotope ionisé de l'Hélium*^{3}	8665.650 MHz	8660.0 - 8670.0 MHz	
Methanol (CH_3OH) *Méthanol*	12.178 GHz	12.17 - 12.19 GHz	(3),(6)
Formaldehyde (H_2CO) *Formaldéhyde*	14.488 GHz	14.44 - 14.50 GHz	(3),(4)
Cyclopropenylidene(C_3H_2) *Cyclopropénylidène*	18.343 GHz	18.28 - 18.36 GHz	(3),(4),(6)
Water vapour (H_2O) *Vapeur d'eau*	22.235 GHz	22.16 - 22.26 GHz	(3),(4)
Ammonia (NH_3) *Ammoniac*	23.694 GHz	23.61 - 23.71 GHz	(4)
Ammonia (NH_3) *Ammoniac*	23.723 GHz	23.64 - 23.74 GHz	(4)
Ammonia (NH_3) *Ammoniac*	23.870 GHz	23.79 - 23.89 GHz	(4)
Silicon monoxide (SiO) *Monoxyde de silicium*	42.821 GHz	42.77 - 42.86 GHz	
Silicon monoxide (SiO) *Monoxyde de silicium*	43.122 GHz	43.07 - 43.17 GHz	
Carbon monosulphide (CS) *Monosulfure de carbone*	48.991 GHz	48.94 - 49.04 GHz	
Deuterated formylium (DCO^+) *Formylium deutéré*	72.039 GHz	71.96 - 72.11 GHz	(3)
Silicon monoxide (SiO) *Monoxyde de silicium*	86.243 GHz	86.16 - 86.33 GHz	
Formylium ($H^{13}CO^+$) *Formylium*	86.754 GHz	86.66 - 86.84 GHz	
Silicon monoxide (SiO) *Monoxyde de silicium*	86.847 GHz	86.76 - 86.93 GHz	
Ethynyl radical (C_2H) *Radical Ethynil*	87.300 GHz	87.21 - 87.39 GHz	(5)
Hydrogen cyanide (HCN) *Cyanure d'hydrogène*	88.632 GHz	88.34 - 88.72 GHz	(4)

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Formylium (HCO^+) *Formylium*	89.189 GHz	88.89 - 89.28 GHz	(4)
Hydrogen isocyanide (HNC) *Isocyanure d'hydrogène*	90.664 GHz	90.57 - 90.76 GHz	
Diazenylium (N_2H^+) *Diazénylium*	93.174 GHz	93.07 - 93.27 GHz	
Carbon monosulphide (CS) *Monosulfure de Carbone*	97.981 GHz	97.65 - 98.08 GHz	(4)
Carbon monoxide ($C^{18}O$) *Monoxyde de carbone*	109.782 GHz	109.67 - 109.89 GHz	
Carbon monoxide (^{13}CO) *Monoxyde de carbone*	110.201 GHz	109.83 - 110.31 GHz	(4)
Carbon monoxide ($C^{17}O$) *Monoxyde de carbone*	112.359 GHz	112.25 - 112.47 GHz	(6)
Carbon monoxide (CO) *Monoxyde de carbone*	115.271 GHz	114.88 - 115.39 GHz	(4)
Formaldehyde ($H_2{}^{13}CO$) *Formaldéhyde*	137.450 GHz	137.31 - 137.59 GHz	(3),(6)
Formaldehyde (H_2CO) *Formaldéhyde*	140.840 GHz	140.69 - 140.98 GHz	
Carbon monosulphide (CS) *Monosulfure de carbone*	146.969 GHz	146.82 - 147.12 GHz	
Water vapour (H_2O) *Vapeur d'eau*	183.310 GHz	183.12 - 183.50 GHz	
Carbon monoxide ($C^{18}O$) *Monoxyde de carbone*	219.560 GHz	219.34 - 219.78 GHz	
Carbon monoxide (^{13}CO) *Monoxyde de carbone*	220.399 GHz	219.67 - 220.62 GHz	(4)
Carbon monoxide (CO) *Monoxyde de carbone*	230.538 GHz	229.77 - 230.77 GHz	(4)
Carbon monosulphide (CS) *Monoxyde de carbone*	244.953 GHz	244.72 - 245.20 GHz	(6)
Hydrogen cyanide (HCN) *Cyanure d'hydrogène*	265.886 GHz	265.62 - 266.15 GHz	
Formylium (HCO^+) *Formylium*	267.557 GHz	267.29 - 267.83 GHz	
Hydrogen isocyanide (HNC) *Isocyanure d'hydrogène*	271.981 GHz	271.71 - 272.25 GHz	

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(1) If Note (4) or Note (2) are not listed, the band limits are the Doppler-shifted frequencies corresponding to radial velocities of ± 300 km/s (consistent with line radiation occurring in our galaxy).

(Les limites des bandes, pour toutes les raies spectrales figurant dans ce Tableau à l'exception de celles qui portent la note (4) ou la note (2), sont les fréquences décalées par l'effet Doppler correspondant à des vitesses radiales de ± 300 km/s (compatible avec l'émission spectrale se produisant dans notre Galaxie).

(2) An extension to lower frequency of the allocation of 1400-1427 MHz is required to allow for the higher Doppler shifts for HI observed in distant galaxies.

(Une extension vers les basses fréquences de l'attribution de la bande 1400-1427 MHz est nécessaire afin de tenir compte des effets Doppler importants pour la raie de HI observée dans les galaxies éloignées).

(3) The current international allocation is not primary and/or does not meet bandwidth requirements. See the Radio Regulations for more detailed information.

(L'attribution internationale actuelle n'est pas une attribution principale et/ou ne répond pas aux besoins pour la largeur de bande. On trouvera à ce sujet des précisions dans le Règlement des radiocommunications).

(4) Because these line frequencies are also being used for observing other galaxies, the listed bandwidths include Doppler shifts corresponding to radial velocities of up to 1000 km s^{-1}. It should be noted that HI has been observed at frequencies redshifted to 500 MHz, while some lines of the most abundant molecules have been detected in galaxies with velocities up to 50000 km s^{-1}, corresponding to a frequency reduction of up to 17%.

(Ces raies spectrales étant utilisées également pour l'observation d'autres galaxies, les largeurs des bandes mentionnées ci-dessus tiennent compte des effets Doppler correspondant à des vitesses radiales allant jusqu'à 1000 km s^{-1}. Il est à noter que HI a été observé à des fréquences décalées vers le rouge jusqu'à 500 MHz, et que quelques raies spectrales des molécules les plus abondantes ont été détectées dans des galaxies ayant des vitesses allant jusqu'à 50000 km s^{-1}, ce qui correspond à une diminution de fréquence pouvant atteindre 17%.

(5) There are six closely spaced lines associated with this molecule at this frequency. The listed band is wide enough to permit observations of all six lines.

(Six raies spectrales très proches les unes des autres à cette fréquence sont associées à cette molécule. La bande indiquée est suffisamment large pour permettre d'observer toutes ces raies).

(6) This line frequency is not mentioned in Article 8 of the Radio Regulations.

(Cette raie spectrale n'est pas mentionnée par le Règlement des radiocommunications. Article 8).

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TABLE II

Radio-frequency lines of the greatest importance to radio astronomy
at frequencies between 275 and 811 GHz

(not allocated in the Radio Regulations)

(Raies de fréquence radio d'importance majeure
pour la Radioastronomie
aux fréquences comprises entre 275 et 811 GHz)

(Dans le Règlement des radiocommunications, il n'existe aucune attribution sur ces fréquences)

Substance *Corps composé*	Rest frequency *Fréquences au repos*	Suggested minimum band *Bande minimum suggérée*
Diazenylium (N_2H^+) *Diazénylium*	279.511 GHz	279.23 - 279.79 GHz
Carbon monoxide ($C^{18}O$) *Monoxyde de carbone*	329.330 GHz	329.00 - 329.66 GHz
Carbon monoxide (^{13}CO) *Monoxyde de carbone*	330.587 GHz	330.25 - 330.92 GHz
Carbon monosulphide (CS) *Monosulphure de carbone*	342.883 GHz	342.54 - 343.23 GHz
Carbon monoxide (CO) *Monoxyde de carbone*	345.796 GHz	345.45 - 346.14 GHz
Hydrogen cyanide (HCN) *Cyanure d'hydrogène*	354.484 GHz	354.13 - 354.84 GHz
Formylium (HCO^+) *Formylium*	356.734 GHz	356.37 - 357.09 GHz
Diazenylium (N_2H^+) *Diazénylium*	372.672 GHz	372.30 - 373.05 GHz
Water vapour (H_2O) *Vapeur d'eau*	380.197 GHz	379.81 - 380.58 GHz
Carbon monoxide ($C^{18}O$) *Monoxyde de carbone*	439.088 GHz	438.64 - 439.53 GHz
Carbon monoxide (^{13}CO) *Monoxyde de carbone*	440.765 GHz	440.32 - 441.21 GHz
Carbon monoxide (CO) *Monoxyde de carbone*	461.041 GHz	460.57 - 461.51 GHz
Heavy water (HDO) *Eau lourde*	464.925 GHz	464.46 - 465.39 GHz

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Carbon (CI) *Carbone*	492.162 GHz	491.66 - 492.66 GHz
Water vapour ($H_2{}^{18}O$) *Vapeur d'eau*	547.676 GHz	547.13 - 548.22 GHz
Water vapour (H_2O) *Vapeur d'eau*	556.936 GHz	556.37 - 557.50 GHz
Ammonia ($^{15}NH_3$) *Ammoniac*	572.113 GHz	571.54 - 572.69 GHz
Ammonia (NH_3) *Ammoniac*	572.498 GHz	571.92 - 573.07 GHz
Carbon monoxide (CO) *Monoxyde de carbone*	691.473 GHz	690.78 - 692.17 GHz
Hydrogen cyanide (HCN) *Cyanure d'hydrogène*	797.433 GHz	796.64 - 798.23 GHz
Formylium (HCO^+) *Formylium*	802.653 GHz	801.85 - 803.85 GHz
Carbon monoxide (CO) *Monoxyde de carbone*	806.652 GHz	805.85 - 807.46 GHz
Carbon (CI) *Carbone*	809.350 GHz	808.54 - 810.16 GHz

Resolution A3: Preservation of Radio Frequencies for Radio Astronomy

The XXIst General Assembly of the International Astronomical Union,

noting

a. the long-standing concern of the International Astronomical Union for protecting radio astronomy from interference, particularly through resolutions passed at the General Assemblies in 1979, 1982, 1985 and 1988;

b. the increasing levels of harmful interference to radio astronomy, particularly from space and airborne transmitters, which diminish the advantages of locating observatories at remote sites;

c. the particularly high levels of harmful interference experienced consistently in the sub-band 1610.6-1613.8 MHz from navigation satellites which make observations of an astrophysically important hydroxyl line increasingly difficult;

d. that the 1612 MHz hydroxyl line has assumed greatly increased importance since the 1979 World Administrative Radio Conference due particularly to the discovery of numerous OH/IR stars which have been used for absolute distance determination in the Galaxy and for understanding stellar evolution;

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e. that the World Administrative Radio Conference for the Mobile Services (WARC MOB-87) has also allocated the band 1610-1626.5 MHz to the Radio-Determination Satellite Service (RDSS), subject to footnote 733E of the Radio Regulations, which states that in Regions 1 and 3 harmful interference shall not be caused to the Radio Astronomy Service (RAS), and that in Region 2 several administrations have agreed to limited protection for the RAS;

f. that the WARC MOB-87 in Resolution PLEN/1 has invited the CCIR to continue its studies in order to obtain more precise results concerning the conditions of sharing in the band 1610-1625.5 MHz between the RDSS on the one hand and the RAS, among other services, on the other;

urges

1. that administrations adhering to the International Astronomical Union and the International Telecommunication Union strive for improved protection of the RAS in the 1610.6-1613.8 MHz band by upgrading the allocation status of the RAS to that of primary service in this sub-band at WARC 92;

2. that national administrations cooperate with IUCAF to examine means to prevent harmful interference to observations in the band 1610.6-1613.8 MHz from global navigation satellite systems, particularly in designing changes to existing systems and planning new systems;

3. that IUCAF, representing the IAU, respond rapidly to the invitation to continue studying in Study Group 7 of the CCIR the conditions for successfully sharing the band 1610-1626.5 MHz;

4. that administrations operating satellites or satellite systems in the aeronautical navigation satellite service at 1.5/1.6 GHz frequencies protect the RAS from harmful interference by appropriately filtering unwanted emissions;

and instructs the President

to bring this Resolution to the attention of the Secretary General of the International Telecommunication Union, and to support IUCAF strongly in its efforts to bring this resolution to the attention of delegations participating in WARC 92.

CCIR	*Consultative Committee on International Radiocommunications*
IUCAF	*Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science*
RAS	*Radio Astronomy Service*
RDSS	*Radio Determination Satellite Service*
WARC	*World Administrative Radio Conference*

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Résolution A3: Préservation des fréquences radio pour la Radioastronomie

La XXIe Assemblée générale de l'Union Astronomique Internationale,

notant

a. l'intérêt manifesté de longue date par l'Union Astronomique Internationale pour la protection de la Radioastronomie des interférences, en particulier par les résolutions adoptées lors des Assemblées Générales de 1979, 1982, 1985 et 1988 ;

b. le niveau croissant des interférences nuisibles affectant la Radioastronomie, et en particulier celles provenant de transmetteurs spatiaux ou aéroportés, réduisant de ce fait l'intérêt de situer les observatoires dans des sites éloignés ;

c. le niveau particulièrement élevé des interférences nuisibles régulièrement observées dans la sous-bande 1610.6-1613.8 MHz provenant de satellites de navigation qui rendent de plus en plus difficiles les observations d'une raie importante en astrophysique de l'hydroxyle ;

d. que la raie de l'hydroxyle à 1612 MHz a pris un intérêt croissant depuis la Conférence Administrative Mondiale des Radiocommunications (WARC) de 1979 en raison, en particulier, de la découverte de nombreuses étoiles OH/IR qui ont été utilisées pour la détermination des distances absolues dans la Galaxie et pour la compréhension de l'évolution stellaire ;

e. que la WARC pour les services mobiles (WARC MOB-87) a également attribué la fréquence 1610-1626.5 MHz au Service de Détermination Radio par Satellite (RDSS), en application de la note 733E du Règlement des radiocommunications, laquelle précise que dans les Régions 1 et 3 aucune interférence nuisible ne doit être causée aux services de Radioastronomie (RAS), et que, dans la Région 2, plusieurs administrations ont accepté une protection minimale du RAS ;

f. que la WARC MOB-87 dans sa Résolution PLEN/1 a invité le Comité Consultatif Radio International (CCIR) à poursuivre ses études en vue d'obtenir des résultats plus précis sur les conditions de partage de la bande 1610-1625.5 MHz entre le RDSS d'une part, et le RAS, entre autres services, d'autre part ;

demande expressément

1. que les organisations adhérant à l'Union Astronomique Internationale et à l'Union Internationale des Télécommunications s'efforcent d'obtenir une protection accrue du Service de Radioastronomie dans la bande de fréquence 1610.6-1613.8 MHz en élevant la classe de l'allocation au Service de Radioastronomie à celle d'un service principal pour cette sous-bande lors de la WARC 92 ;

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2. que les administrations nationales coopèrent avec l'Inter-Union Commission pour les Allocations des Bandes de Fréquence pour la Radioastronomie et la Recherche Spatiale (IUCAF) afin d'étudier les moyens d'éviter les interférences nuisibles aux observations dans la bande 1610.6-1613.8 MHz dues aux systèmes de satellites de navigation globale, particulièrement par la planification de la modification des systèmes existants et de la conception de nouveaux systèmes ;

3. que l'IUCAF, représentant l'Union Astronomique Internationale, réponde rapidement à l'invitation à poursuivre, dans le cadre du Groupe d'étude n° 7 du CCIR, l'étude des conditions d'un partage réussi de la bande 1610-1626.5 MHz ;

4. que les administrations exploitant des satellites ou des systèmes de satellites dans le service de satellites de navigation aéronautiques à des fréquences comprises entre 1.5 et 1.6 GHz protègent des interférences nuisibles le Service de Radioastronomie par un filtrage adéquat des émissions indésirables ;

et demande au Président

de porter cette Résolution à l'attention du Secrétaire Général de l'Union Internationale des télécommunications, et d'appuyer fortement l'IUCAF dans ses démarches pour porter cette résolution à l'attention des délégations participant à la WARC 92.

CCIR	*Comité Consultatif Radio International*
IUCAF	*Commission pour les Allocations des Bandes de Fréquence pour la Radioastronomie et la Recherche Spatiale*
RAS	*Service de Radioastronomie*
RDSS	*Service de Détermination Radio par Satellite*
WARC	*Conférence Administrative Mondiale des Radiocommunications*

Resolution A4: Recommendations from the Working Group on Reference Systems

Recommendations I to IX

The XXIst General Assembly of the International Astronomical Union,

RECOMMENDATION I

considering,

that it is appropriate to define several systems of space-time coordinates within the framework of the General Theory of Relativity,

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recommends,

that the four space-time coordinates ($x^0 = ct$, x^1, x^2, x^3) be selected in such a way that in each coordinate system centred at the barycentre of any ensemble of masses, the squared interval ds^2 be expressed with the minimum degree of approximation in the form:

$$ds^2 = -c^2 d\tau^2$$

$$= -\left(1 - \frac{2U}{c^2}\right)(dx^0)^2 + \left(1 + \frac{2U}{c^2}\right)[(dx^1)^2 + (dx^2)^2 + (dx^3)^2],$$

where c is the velocity of light, τ is proper time, and U is the sum of the gravitational potentials of the above mentioned ensemble of masses, and of a tidal potential generated by bodies external to the ensemble, the latter potential vanishing at the barycentre.

Notes for Recommendation I

1. *This recommendation explicitly introduces The General Theory of Relativity as the theoretical background for the definition of the celestial space-time reference frame.*

2. *This recommendation recognizes that space-time cannot be described by a single coordinate system because a good choice of coordinate system may significantly facilitate the treatment of the problem at hand, and elucidate the meaning of the relevant physical events. Far from the space origin, the potential of the ensemble of masses to which the coordinate system pertains becomes negligible, while the potential of external bodies manifests itself only by tidal terms which vanish at the space origin.*

3. *The ds^2 as proposed gives only those terms required at the present level of observational accuracy. Higher order terms may be added as deemed necessary by users. If the IAU should find it generally necessary, more terms will be added. Such terms may be added without changing the rest of the recommendation.*

4. *The algebraic sign of the potential in the formula giving ds^2 is to be taken as positive.*

5. *At the level of approximation given in this recommendation, the tidal potential consists of all terms at least quadratic in the local space coordinates in the expansion of the Newtonian potential generated by external bodies.*

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RECOMMENDATION II

considering,

a) the need to define a barycentric coordinate system with spatial origin at the centre of mass of the solar system and a geocentric coordinate system with spatial origin at the centre of mass of the Earth, and the desirability of defining analogous coordinate systems for other planets and for the Moon,

b) that the coordinate systems should be related to the best realization of reference systems in space and time, and,

c) that the same physical units should be used in all coordinate systems,

recommends that,

1. the space coordinate grids with origins at the solar system barycentre and at the centre of mass of the Earth show no global rotation with respect to a set of distant extragalactic objects,

2. the time coordinates be derived from a time scale realized by atomic clocks operating on the Earth,

3. the basic physical units of space-time in all coordinate systems be the second of the International System of Units (SI) for proper time, and the SI meter for proper length, connected to the SI second by the value of the velocity of light c = 299792458 ms^{-1}.

Notes for Recommendation II

1. *This recommendation gives the actual physical structures and quantities that will be used to establish the reference frames and time scales based upon the ideal definition of the system given by Recommendation I.*

2. *The kinematic constraint for the rate of rotation of both the geocentric and barycentric reference systems cannot be perfectly realized. It is assumed that the average rotation of a large number of extragalactic objects can be considered to represent the rotation of the universe which is assumed to be zero.*

3. *If the barycentric reference system as defined by this recommendation is used for studies of dynamics within the solar system, the kinematic effects of the galactic geodesic precession may have to be taken into account.*

4. *In addition, the kinematic constraint for the state of rotation of the geocentric reference system as defined by this recommendation implies that when the system is used for dynamics (e.g., motions of the Moon and Earth satellites), the time dependent geodesic precession of the geocentric frame*

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relative to the barycentric frame must be taken into account by introducing corresponding inertial terms into the equations of motion.

5. *Astronomical constants and quantities are expressed in SI units without conversion factors depending upon the coordinate systems in which they are measured.*

RECOMMENDATION III

considering,

the desirability of the standardisation of the units and origins of coordinate times used in astronomy,

recommends that,

1. the units of measurement of the coordinate times of all coordinate systems centred at the barycentres of ensembles of masses be chosen so that they are consistent with the proper unit of time, the SI second,
2. the reading of these coordinate times be 1977 January 1, $0^h\ 0^m\ 32.184^s$ exactly, on 1977 January 1, $0^h\ 0^m\ 0^s$ TAI exactly (JD = 2443144.5, TAI), at the geocentre,
3. coordinate times in coordinate systems having their spatial origins respectively at the centre of mass of the Earth and at the solar system barycentre, and established in conformity with the above sections (1) and (2), be designated as Geocentric Coordinate Time (TCG) and Barycentric Coordinate Time (TCB).

Notes for Recommendation III

1. *In the domain common to any two coordinate systems, the tensor transformation law applied to the metric tensor is valid without re-scaling the unit of time. Therefore, the various coordinate times under consideration exhibit secular differences. Recommendation 5 (1976) of IAU Commissions 4, 8 and 31, completed by Recommendation 5 (1979) of IAU Commissions 4, 19 and 31, stated that Terrestrial Dynamical Time (TDT) and Barycentric Dynamical Time (TDB) should differ only by periodic variations. Therefore, TDB and TCB differ in rate. The relationship between these time scales in seconds is given by:*

$$TCB - TDB = L_B \times (JD - 2443144.5) \times 86400.$$

The present estimate of the value of L_B *is* 1.550505×10^{-8} $(\pm\ 1 \times 10^{-14})$ *(Fukushima et al., Celestial Mechanics, 38, 215, 1986).*

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2. *The relation TCB -TCG involves a full 4-dimensional transformation*

$$TCB - TCG = c^{-2} \left[\int_{t_o}^{t} (v_e^2/2 + U_{ext}(x_e))dt + v_e.(x - x_e) \right],$$

x_e and v_e denoting the barycentric position and velocity of the Earth's centre of mass and x the barycentric position of the observer. The external potential U_{ext} is the Newtonian potential of all solar system bodies apart from the Earth. The external potential must be evaluated at the geocentre. In the integral, t = TCB and to is chosen to agree with the epoch of Note 3. As an approximation to TCB -TCG in seconds one might use:

$$TCB - TCG = L_C \times (JD - 2443144.5) \times 86400 + c^{-2} v_e.(x - x_e) + P.$$

The present estimate of the value of L_C is 1.480813×10^{-8} ($\pm 1 \times 10^{-14}$) (Fukushima et al., Celestial Mechanics, 38, 215, 1986). It may be written as $[3GM/2c^2a] + \epsilon$ where G is the gravitational constant, M is the mass of the Sun, a is the mean heliocentric distance of the Earth, and ϵ is a very small term (of order 2×10^{-12}) arising from the average potential of the planets at the Earth. The quantity P represents the periodic terms which can be evaluated using the analytical formula by Hirayama et al., ("Analytical Expression of TDB-TDT$_o$", in Proceedings of the IAG Symposia, IUGG XIX General Assembly, Vancouver, August 10-22, 1987). For observers on the surface of the Earth, the terms depending upon their terrestrial coordinates are diurnal, with a maximum amplitude of 2.1 μs.

3. *The origins of coordinate times have been arbitrarily set so that these times all coincide with the Terrestrial Time (TT) of Recommendation IV at the geocentre on 1977 January 1, $0^h\ 0^m\ 0^s$ TAI. (See Note 3 of Recommendation IV.)*

4. *When realizations of TCB and TCG are needed, it is suggested that these realizations be designated by expressions such as TCB(xxx), where xxx indicates the source of the realized time scale (e.g., TAI) and the theory used for the transformation into TCB or TCG.*

RECOMMENDATION IV

considering,

a) that the time scales used for dating events observed from the surface of the Earth and for terrestrial metrology should have as the unit of measurement the SI second, as realized by terrestrial time standards,

b) the definition of the International Atomic Time, TAI, approved by the 14th Conférence Générale des Poids et Mesures (1971) and completed by a declaration of the 9th session of the Comité Consultatif pour la Définition de la Seconde (1980),

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recommends that,

1) the time reference for apparent geocentric ephemerides be Terrestrial Time, TT,

2) TT be a time scale differing from TCG of Recommendation III by a constant rate, the unit of measurement of TT being chosen so that it agrees with the SI second on the geoid,

3) at instant 1977 January 1, $0^h\ 0^m\ 0^s$ TAI exactly, TT have the reading 1977 January 1, $0^h\ 0^m\ 32.184^s$ exactly.

Notes for Recommendation IV

1. *The basis of the measurement of time on the Earth is International Atomic Time (TAI) which is made available by the dissemination of corrections to be added to the readings of national time scales and clocks. The time scale TAI was defined by the 59th session of the Comité International des Poids et Mesures (1970) and approved by the 14th Conférence Générale des Poids et Mesures (1971) as a realized time scale. As the errors in the realization of TAI are not always negligible, it has been found necessary to define an ideal form of TAI, apart from the 32.184^s offset, now designated Terrestrial Time, TT.*

2. *The time scale TAI is established and disseminated according to the principle of coordinate synchronization, in the geocentric coordinate sytem, as explained in CCDS, 9th Session (1980) and in Reports of the CCIR, 1990, annex to Volume VII (1990).*

3. *In order to define TT it is necessary to define the coordinate system precisely, by the metric form, to which it belongs. To be consistent with the uncertainties of the frequency of the best standards, it is at present (1991) sufficient to use the relativistic metric given in Recommendation I.*

4. *For ensuring an approximate continuity with the previous time arguments of ephemerides, Ephemeris Time, ET, a time offset is introduced so that TT-TAI = 32.184^s exactly at 1977 January 1, 0^h TAI. This date corresponds to the implementation of a steering process of the TAI frequency, introduced so that the TAI unit of measurement remains in close agreement with the best realizations of the SI second on the geoid. TT can be considered as equivalent to TDT as defined by IAU Recommendation 5 (1976) of Commissions 4, 8 and 31, and Recommendation 5 (1979) of Commissions 4, 19 and 31.*

5. *The divergence between TAI and TT is a consequence of the physical defects of atomic time standards. In the interval 1977-1990, in addition to the constant offset of 32.184^s, the deviation probably remained within the approximate limits of ± 10μs. It is expected to increase more slowly in the future as a consequence of improvements in time standards. In many cases, especially for the publication of ephemerides, this deviation is negligible. In such cases, it can be stated that the argument of the ephemerides is TAI + 32.184^s.*

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6. *Terrestrial Time differs from TCG of Recommendation III by a scaling factor, in seconds:*

$$TCG - TT = L_G \times (JD - 2443144.5) \times 86400.$$

The present estimate of the value of L_G *is* 6.969291×10^{-10} ($\pm 3 \times 10^{-16}$). *The numerical value is derived from the latest estimate of gravitational potential on the geoid,* $W = 62636860$ (± 30) m^2/s^2 *(Chovitz, Bulletin Géodesique, 62, 359, 1988). The two time scales are distinguished by different names to avoid scaling errors. The relationship between* L_B *and* L_C *of Recommendation III, notes 1 and 2, and* L_G *is,* $L_B = L_C + L_G$.

7. *The unit of measurement of TT is the SI second on the geoid. The usual multiples, such as the TT day of 86400 SI seconds on the geoid and the TT Julian century of 36525 TT days, can be used provided that the reference to TT be clearly indicated whenever ambiguity may arise. Corresponding time intervals of TAI are in agreement with the TT intervals within the uncertainties of the primary atomic standards (e.g., within* $\pm 2 \times 10^{-14}$ *in relative value during 1990).*

8. *Markers of the TT scale can follow any date system based upon the second, e.g., the usual calendar date or the Julian Date, provided that the reference to TT be clearly indicated whenever ambiguity may arise.*

9. *It is suggested that realizations of TT be designated by TT(xxx) where xxx is an identifier. In most cases a convenient approximation is:*

$$TT(TAI) = TAI + 32.184^s.$$

However, in some applications it may be advantageous to use other realizations. The BIPM, for example, has issued time scales such as TT(BIPM90).

RECOMMENDATION V

considering,

that important work has already been performed using Barycentric Dynamical Time (TDB), defined by IAU Recommendation 5 (1976) of IAU Commissions 4, 8 and 31, and Recommendation 5 (1979) of IAU Commissions 4, 19 and 31,

recognizes,

that where discontinuity with previous work is deemed to be undesirable, TDB may be used.

Note to Recommendation V

Some astronomical constants and quantities have different numerical values depending upon the use of TDB or TCB. When giving these values, the time scale used must be specified.

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RECOMMENDATION VI

considering,

the desirability of implementing a conventional celestial barycentric reference system based upon the observed positions of extragalactic objects, and,

noting,

the existence of tentative reference frames constructed by various institutions and combined by the International Earth Rotation Service (IERS) into a frame used for Earth rotation series,

recommends,

1. that intercomparisons of these frames be extensively made in order to assess their systematic differences and accuracy,
2. that an IAU Working Group consisting of members of Commissions 4, 8, 19, 24, 31 and 40, the IERS, and other pertinent experts, in consultation with all the institutions producing catalogues of extragalactic radio sources, establish a list of candidates for primary sources defining the new conventional reference frame, together with a list of secondary sources that may later be added to or replace some of the primary sources, and,

requests,

1. that such a list be presented to the XXIInd General Assembly (1994) as a part of the definition of a new conventional reference system,
2. that the objects in this list be systematically observed by all VLBI and other appropriate astrometric programmes.

Note for Recommendation VI

This recommendation essentially describes the first part of the work that must be done to prepare the realization of the reference system defined by Recommendations I and II. The choice of objects must be made in the first place by considering their observability by VLBI, but special care should be taken to include a large proportion of extragalactic radio sources with well identified optical counterparts.

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RECOMMENDATION VII

considering,

a) that the new conventional celestial barycentric reference frame should be as close as possible to the existing FK5 equator and equinox and the dynamical equinox which are referred to J2000.0,

b) that it should be accessible to astrometry in visual as well as in radio wavelengths,

recommends,

1. that the principal plane of the new conventional celestial reference system be as near as possible to the mean equator at J2000.0 and that the origin in this principal plane be as near as possible to the dynamical equinox of J2000.0,

2. that the positions of the extragalactic objects selected in accordance with Recommendation VI and representing the reference frame be computed initially for the equator and equinox J2000.0 using the best available values of the celestial pole offset with respect to the IAU expressions for precession and nutation,

3. that a great effort be made to compare reference frames of all types, in particular the FK5, solar system and extragalactic reference frames,

4. that observing programmes be undertaken or continued in order to relate planetary positions to radio and optical objects, and to determine the relationship between catalogues of extragalactic source positions and the best catalogues of star positions, in particular the FK5 and Hipparcos catalogues.

Notes for Recommendation VII

1. *This recommendation specifies the choice of the coordinate axes that will be adopted in the final reference frame and describes the work to be done before such a frame can be constructed. Although the considerations call for visual and radio wavelengths for the primary catalogue, other observable wavelengths are not excluded. Positions of objects observed in other wavelengths should also be referred to the same system.*

2. *The objective set by this recommendation is that there should be no discontinuity in the positions of stars when the present FK5 frame is replaced by the extragalactic reference frame. This means that the position of the extragalactic objects should be in the FK5 system for J2000.0. It is acknowledged that the best values of precession and nutation must be used in order to avoid introducing spurious proper motions into the positions of*

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extragalactic objects. The final transfer to the preferred equinox and principal plane will be done by applying a rotation at J2000.0.

3. *The dynamical equinox in this recommendation is defined as the intersection of the mean equator and the ecliptic. The latter is defined as the uniformly rotating plane of the orbit of the Earth-Moon barycentre averaged over the entire period for which the ephemerides are valid. Since it is ephemeris dependent, the choice of the equinoctial point will be made using the most accurate and generally available ephemerides of the solar system at the time.*

4. *The definition given to the reference system by Recommendations I and II implies the stability in time of the system of coordinates realized by the celestial reference frame. The directions of the coordinate axes should not be changed even if at some later date the realizations of the dynamical equinox or the celestrial ephemeris pole are improved. Similarly, modifications to the set of extragalactic objects realizing the reference system should be made in such a way that the directions of the axes are not changed. This means that once the coordinate axes have been specified, in the way described in the first part of the recommendation, the connection between the definition of the conventional reference system and the peculiarities of the Earth's kinematics will have been severed.*

5. *As long as the relationship between the optical and the extragalactic radio frames is not sufficiently accurately determined, the FK5 talogue shall be considered as a provisional realization of the celestial reference system in optical wavelengths.*

RECOMMENDATION VIII

recognizing,

a) the importance to astronomy of adopting conventional values of astronomical and physical constants,

b) that values of these constants should be unchanged unless they differ significantly from their latest estimates,

c) that estimates of these constants should be improved frequently to represent the current status of knowledge,

d) the necessity of providing standard procedures using these numerical values, and,

noting,

a) that the MERIT Standards and IERS Standards have contributed significantly to the progress of astronomy and geodesy,

b) that numerical values in these standards have served as a system of constants in analyzing observations of high quality, and

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considering,

that procedures in these standards do not cover the whole of fundamental astronomy,

recommends,

that a permanent working group be organized by Commissions 4, 5, 8, 19, 24 and 31, in consultation with the IAG and the IERS, in order to update and improve the system of astronomical units and constants, the list of estimates of fundamental astronomical quantities and standard procedures; this group shall:

1. prepare a draft report on the system of astronomical units and constants at least six months before the XXIInd General Assembly (1994),
2. prepare a draft list of best estimates of astronomical quantities at least six months before each following General Assembly,
3. prepare, at least six months before each following General Assembly, a draft report on standard procedures needed in fundamental astronomy, which,
   a) should have a maximum degree of compatibility with the IERS Standards,
   b) should include the implementations of procedures in the form of tested software and/or test cases,
   c) should be available not only in written form, but also in machine-readable form,
4. prepare a draft report on possible electronic access to these units, constants, quantities and procedures at least six months before the XXIInd General Assembly (1994).

RECOMMENDATION IX

recognizing,

that a generally accepted non-rigid Earth theory of nutation, including all known effects at the one tenth milliarcsecond level, is not yet available,

recommends,

1. that those satisfied with accuracy of the nutation angles (ϵ or $\psi \sin\epsilon_0$) numerically greater than $\pm$ 0.002" (one sigma rms) may continue to use the 1980 IAU Nutation Theory (P.K. Seidelmann, Celestial Mechanics, 27, 79, 1982),

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2. that those requiring values of the nutation angles more accurate than ± 0.002" (one sigma rms) should make use of the Bulletins of the IERS which publish observations and predictions of the celestial pole offsets accurate to about ± 0.0006" (one sigma rms) for a period of up to six months in advance,
3. that the IUGG be encouraged to develop and adopt an appropriate Earth model to be used as the basis for a new IAU Theory of Nutation.

CCIR *Consultative Committee on International Radiocommunications*

IAG *International Association of Geodesy*

IUGG *International Union of Geodesy & Geophysics*

IERS *International Earth Rotation Service*

Résolution A4: Recommandations du Groupe de travail sur les Systèmes de référence

Recommandations I à IX

La XXIe Assemblée générale de l'Union Astronomique Internationale,

RECOMMANDATION I

considérant

qu'il convient de définir, dans le cadre de la théorie de la Relativité générale, plusieurs systèmes de coordonnées spatio-temporelles,

recommande

que les coordonnées spatio-temporelles ($x^0 = ct$, x^1, x^2, x^3) soient choisies de telle façon que dans chaque système de coordonnées, centré au barycentre de tout ensemble de masses, le carré ds^2 de l'intervalle soit exprimé au plus faible niveau d'approximation sous la forme :

$$ds^2 = -c^2 d\tau^2$$

$$= -\left(1 - \frac{2U}{c^2}\right)(dx^0)^2 + \left(1 + \frac{2U}{c^2}\right)[(dx^1)^2 + (dx^2)^2 + (dx^3)^2],$$

où c est la vitesse de la lumière, τ le temps propre et U la somme des potentiels de gravitation de l'ensemble de masses considéré et d'un potentiel de marée engendré par les corps extérieurs à cet

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ensemble, ce potentiel étant écrit de façon à s'annuler au barycentre.

Notes pour la recommandation I

1. *Cette recommandation introduit explicitement la théorie de la Relativité générale comme base pour la définition du repère de référence spatio-temporel céleste.*

2. *Cette recommandation reconnaît que l'espace-temps ne peut pas être décrit par un système de coordonnées unique parce qu'un choix judicieux d'un système de coordonnées peut faciliter de façon significative la résolution des problèmes et clarifier la signification physique des phénomènes qui s'y rapportent. Lorsqu'on se trouve loin de l'origine spatiale, le potentiel de l'ensemble de masses auquel appartient le système de coordonnées devient négligeable alors que le potentiel des corps extérieurs se manifeste seulement par des termes de marées qui disparaissent à l'origine.*

3. *Le ds^2 proposé ne comprend que les termes nécessaires au niveau actuel de la précision des observations. Des termes d'ordre plus élevé peuvent être ajoutés si les utilisateurs le jugent utile. Si l'UAI l'estime nécessaire de façon générale, on ajoutera d'autres termes. Cette addition pourra être faite sans changer le reste de la recommandation.*

4. *Le potentiel dans la formule donnant le ds^2 doit être défini avec le signe plus.*

5. *Au niveau de l'approximation qu'implique cette recommandation, le potentiel de marée comprend tous les termes du deuxième degré au moins par rapport aux coordonnées spatiales locales dans le développement du potentiel newtonien créé par les corps extérieurs.*

RECOMMANDATION II

considérant

a) la nécessité de définir un système de coordonnées barycentriques ayant pour origine spatiale le centre de masse du système solaire et un système de coordonnées géocentriques ayant pour origine spatiale le centre de masse de la Terre, ainsi que l'avantage qu'il y aurait à définir les systèmes de coordonnées analogues pour d'autres planètes et pour la Lune,

b) que les systèmes de coordonnées devraient correspondre aux meilleures réalisations des systèmes de référence spatiaux et temporels,

c) que les mêmes unités physiques devraient être utilisées dans tous les systèmes de coordonnées,

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recommande que

1. les réseaux de coordonnées spatiales ayant pour origine le barycentre du système solaire et le centre de masse de la Terre ne présentent pas de rotation globale par rapport à un ensemble d'objets extragalactiques éloignés,

2. les coordonnées temporelles dérivent d'une échelle de temps construite en utilisant des horloges atomiques en fonctionnement sur la Terre,

3. les unités physiques de base pour l'espace-temps dans tous les systèmes de coordonnées soient la seconde du Système international d'unités (SI) pour le temps propre et le mètre SI pour les longueurs propres, lié à la seconde SI par la valeur de la vitesse de la lumière c = 299792458 ms^{-1}.

Notes pour la recommandation II

1. *Cette recommandation indique les structures et les quantités physiques qui seront utilisées pour construire les repères de référence et les échelles de temps basés sur la définition idéale du système donnée par la recommandation I.*

2. *La contrainte cinématique relative à la rotation des systèmes de référence géocentrique et barycentrique ne peut être réalisée de façon parfaite. On fait l'hypothèse que la rotation moyenne d'un grand nombre d'objets extragalactiques peut être considérée comme représentant la rotation de l'Univers que l'on admet être nulle.*

3. *Si le système de référence barycentrique, tel qu'il est défini par cette recommandation, est utilisé dans des études de dynamique dans le système solaire, les effets cinématiques de la précession géodésique d'origine galactique peuvent devoir être pris en compte.*

4. *De plus, la contrainte cinématique relative à l'état de rotation du système de référence géocentrique, tel qu'il est défini par cette recommandation, implique que si on effectue des études de dynamique dans ce système (par exemple les mouvements de la Lune ou des satellites de la Terre), les effets variables avec le temps de la précession géodésique du repère géocentrique par rapport au repère barycentrique doivent être pris en compte en introduisant les termes d'inertie correspondants dans les équations du mouvement.*

5. *Les constantes et grandeurs astronomiques seront exprimées en unités du Système international (SI) sans facteurs de conversion qui dépendraient des systèmes de coordonnées dans lesquels elles sont mesurées.*

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RECOMMANDATION III

considérant

qu'il est souhaitable de normaliser les unités et les origines des temps-coordonnées utilisés en astronomie,

recommande que

1. les unités d'échelle des temps-coordonnées de tous les systèmes de coordonnées centrés au barycentre d'ensembles de masses soient choisies de sorte qu'elles soient toutes compatibles avec l'unité de temps propre, la seconde du SI,
2. les lectures de ces temps-coordonnées soient 1977 janvier 1, $0^h\ 0^m\ 32{,}184^s$ exactement pour 1977 janvier 1, $0^h\ 0^m\ 0^s$ TAI exactement (JD = 2443144,5, TAI), au géocentre,
3. les temps-coordonnées dans les systèmes de coordonnées qui ont leur origine spatiale respectivement au centre de masse de la Terre et au barycentre du système solaire et qui sont établis conformément aux sections 1. et 2. ci-dessus soient désignés par Temps-coordonnée géocentrique (TCG) et Temps-coordonnée barycentrique (TCB).

Notes sur la recommandation III

1. *Dans le domaine commun à deux systèmes de coordonnées quelconques, la loi de transformation tensorielle appliquée au tenseur métrique est valable sans modification supplémentaire de l'unité de temps. En conséquence, la différence des temps-coordonnées de ces systèmes présente une variation séculaire. La Recommandation 5 (1976) des commissions de l'UAI 4, 8 et 31, complétée par la Recommandation 5 (1979) des commissions de l'UAI 4, 19 et 31, spécifie que le Temps dynamique terrestre (TDT) et le Temps dynamique barycentrique (TDB) ne doivent différer que par des variations périodiques. Il en résulte que TDB et TCB ont une différence de marche. La relation entre ces échelles de temps, en secondes, est donnée par :*

$$TCB - TDB = L_B \times (JD - 2443144{,}5) \times 86400.$$

La valeur actuellement estimée de L_B est $1{,}550505 \times 10^{-8}$ ($\pm\ 1 \times 10^{-14}$) (Fukushima et al., Celestial Mechanics, 38, 215, 1986).

2. *La relation TCB -TCG exige une transformation quadri-dimensionnelle complète :*

$$TCB - TCG = c^{-2} \left[\int_{t_o}^{t} (v_e^2/2 + U_{ext}(x_e))dt + v_e.(x - x_e) \right],$$

x_e et v_e désignant la position et la vitesse barycentriques du centre de masse de la Terre et x la position barycentrique de l'observateur. Le potentiel extérieur U_{ext} est le potentiel newtonien de tous les corps du système solaire, sauf la Terre. Dans l'intégrale, t = TCB et t_o est choisi pour être en accord avec les origines spécifiées par la note 3. Comme approximation de TCB -TCG, exprimé en secondes, on peut utiliser :

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$$TCB - TCG = L_C \times (JD - 2443144.5) \times 86400 + c^{-2} v_e . (x - x_e) + P.$$

La valeur actuellement estimée de L_C est $1{,}480813 \times 10^{-8}$ ($\pm 1 \times 10^{-14}$) (Fukushima et al., Celestial Mechanics, 38, 215, 1986). L_C peut être exprimé par $[3GM/2c^2a] + \epsilon$ où G est la constante de la gravitation, M est la masse du Soleil, a est la distance héliocentrique moyenne de la Terre, et où ϵ est un très petit terme (de l'ordre de 2×10^{-12}) provenant du potentiel des planètes au niveau de la Terre. La quantité P représente les termes périodiques qui peuvent être évalués en utilisant la formule analytique de Hirayama et al. ("Analytical Expression of TDB-TDT$_0$", in Proceedings of the IAG Symposia, UGGI XIXe Assemblée générale, Vancouver, 10-22 août, 1987). Pour des observateurs sur la surface de la Terre, les termes dépendant de leurs coordonnées terrestres sont diurnes, avec une amplitude maximale de 2,1 μs.

3. *Les origines des temps-coordonnées ont été arbitrairement fixées de sorte que ces temps coincident tous avec le Temps terrestre (TT) de la Recommandation IV, au géocentre, pour 1977 janvier 1, $0^h\ 0^m\ 0^s$ (Voir note 4 de la Recommandation IV).*

4. *Quand des réalisations de TCB et TCG sont nécessaires, il est suggéré que ces réalisations soient désignées par des expressions telles que TCB(xxx), où xxx indique la source de l'échelle de temps réalisée (par exemple TAI) et la théorie utilisée pour la transformation en TCB ou en TCG.*

RECOMMANDATION IV

considérant

a) que les échelles de temps utilisées pour dater les événements observés depuis la surface de la Terre ainsi que pour la métrologie terrestre doivent avoir comme unité d'échelle la seconde du SI, telle qu'elle est réalisée par des étalons terrestres de temps,

b) la définition du Temps atomique international (TAI), approuvée par la 14e Conférence générale des poids et mesures (1971) et complétée par une déclaration de la 9e session du Comité consultatif pour la définition de la seconde (1980),

recommande que

1) la référence temporelle pour les éphémérides apparentes géocentriques soit le Temps terrestre (TT),

2) TT soit une échelle de temps différant du TCG de la Recommandation III par une marche constante, l'unité d'échelle de TT étant choisie de sorte qu'elle s'accorde avec la seconde du SI sur le géoïde,

3) à l'instant 1977 janvier 1, $0^h\ 0^m\ 0^s$ TAI exactement, la lecture de TT soit 1977 janvier 1, $0^h\ 0^m\ 32{,}184^s$ exactement.

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Notes sur la Recommandation IV

1. *La base de la mesure du temps sur la Terre est le Temps atomique international (TAI) qui est mis à la disposition de ses utilisateurs par la publication de corrections à ajouter aux lectures des échelles de temps et horloges nationales. L'échelle de temps TAI a été définie par la 59e session du Comité international des poids et mesures (1970) et approuvée par la 14e Conférence générale des poids et mesures (1971) comme une échelle de temps réalisée. Comme les erreurs dans la réalisation du TAI ne sont pas toujours négligeables, on a jugé nécessaire de définir une forme idéale du TAI, mis à part le décalage de 32,184s, qui est maintenant désignée par Temps terrestre, TT.*

2. *L'échelle de temps TAI est établie et disséminée suivant le principe de la synchronisation coordonnée, dans le système de coordonnées géocentrique, comme cela est expliqué dans les documents CCDS, 9e session (1980) et Rapports du CCIR, 1990, annexe au Volume VII (1990).*

3. *Afin de définir TT, il est nécessaire de définir précisément le système de coordonnées auquel il appartient en donnant sa métrique relativiste. Compte tenu des incertitudes en fréquence des meilleurs étalons, il suffit à présent (1991) d'employer la métrique donnée dans la Recommandation I.*

4. *Pour assurer une continuité approximative avec l'argument temporel précédemment utilisé pour les éphémérides, le Temps des éphémérides TE, un décalage de temps est introduit de sorte que TT - TAI = $32,184^{s}$ exactement pour 1977 janvier 1, 0^{h} TAI. Cette date correspond à la mise en pratique d'un pilotage de la fréquence du TAI, introduit pour que l'unité d'échelle du TAI reste en accord étroit avec les meilleures réalisations de la seconde du SI sur le géoïde. On peut considérer que TT est équivalent au TDT défini par la Recommandation 5 (1976) des commissions de l'UAI 4, 8 et 31 et par la Recommandation 5 (1979) des commissions de l'UAI 4, 19 et 31.*

5. *La divergence entre TAI et TT est une conséquence des défauts physiques des étalons atomiques de temps. Dans l'intervalle 1977-1990, outre le décalage constant de $32,184^{s}$, l'écart entre TAI et TT est probablement resté entre les limites approximatives de ± 10μs. On espère que cet écart s'accroîtra plus lentement à l'avenir, par suite de l'amélioration des étalons de temps. Dans bien des cas, en particulier pour la publication d'éphémérides, cet écart est négligeable. Dans ces cas, on peut déclarer que l'argument des éphémérides est TAI + $32,184^{s}$.*

6. *Le Temps terrestre TT diffère du TCG de la Recommandation III par un facteur d'échelle; on a, en secondes:*

$$TCG - TT = L_G \times (JD - 2443144,5) \times 86400.$$

La valeur actuellement estimée de L_G est $6,969291 \times 10^{-10}$ ($\pm 3 \times 10^{-16}$). Cette valeur numérique est déduite de la dernière estimation du potentiel gravitationnel sur le géoïde, $W = 62636860\ (\pm 30) m^2/s^2$ (Chovitz, Bulletin Géodésique, 62, 359, 1988). Les deux échelles de temps sont distinguées par des noms différents afin d'éviter les erreurs de facteur d'échelle. La relation

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entre les quantités L_B et L_C de la Recommandation III, notes 1 et 2, et L_G est $L_B = L_C + L_G$.

7. *L'unité d'échelle de TT est la seconde du SI sur le géoïde. Les multiples usuels, tels que le jour de TT de 86400 secondes du SI sur le géoïde et le siècle julien de TT de 36525 jours de TT, peuvent être employés, pourvu que la référence au TT soit clairement indiquée chaque fois qu'il peut y avoir ambigüité. Les intervalles d'échelle correspondants de TAI et de TT ont des durées qui s'accordent dans la limite des incertitudes des étalons atomiques primaires (par exemple à moins de $\pm 2 \times 10^{-14}$ en valeur relative, en 1990).*

8. *Les repères de l'échelle TT peuvent suivre n'importe quel système de datation basé sur la seconde, par exemple la date du calendrier habituelle ou la Date julienne, pourvu que la référence au TT soit clairement indiquée chaque fois qu'il peut y avoir ambigüité.*

9. *Il est suggéré que les réalisations de TT soient désignées par TT(xxx) où xxx est un identificateur. Dans la plupart des cas une approximation convenable est:*

$$TT(TAI) = TAI + 32{,}184^{s}.$$

Cependant, dans certaines applications, il peut être avantageux d'utiliser d'autres réalisations. Le BIPM, par exemple, a produit des échelles de temps telles que TT(BIPM90).

RECOMMANDATION V

considérant

que des travaux importants ont déjà été réalisés en employant le Temps dynamique barycentrique (TDB), défini par la Recommandation 5 (1976) des commissions de l'UAI 4, 8 et 31 et la Recommandation 5 (1979) des commissions de l'UAI 4, 19 et 31,

reconnaît

que lorsqu'une discontinuité avec les travaux antérieurs est jugée indésirable, TDB peut être utilisé.

Note sur la Recommandation V

Certaines grandeurs et constantes astronomiques ont des valeurs numériques qui dépendent de l'usage de TDB ou de TCB. Quand on donne ces valeurs, l'échelle de temps employée doit être spécifiée.

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RECOMMANDATION VI

considérant

qu'il est souhaitable de réaliser un système de référence céleste barycentrique conventionnel basé sur les positions observées d'objets extragalactiques et

notant

l'existence de repères de référence expérimentaux, construits par divers établissements et dont la combinaison établie par le Service international de la rotation terrestre (IERS) constitue un repère utilisé pour décrire la rotation de la Terre,

recommande

1. qu'on effectue de façon extensive des comparaisons entre ces repères afin d'établir leurs différences systématiques et leur exactitude,
2. qu'un groupe de travail de l'UAI, comprenant des membres des Commissions 4, 8, 19, 24, 31, 40 et de l'IERS ainsi que d'autres experts, en consultation avec tous les instituts produisant des catalogues de radio-sources extragalactiques, établisse une liste de sources primaires définissant le nouveau repère conventionnel de référence ainsi qu'une liste de sources secondaires qui pourraient ultérieurement être ajoutées, ou remplacer certaines sources primaires,

et demande

1. que cette liste soit présentée à la XXIIe Assemblée générale de l'UAI en 1994 à titre de contribution à la définition du nouveau système conventionnel de référence,
2. que les objets de cette liste soient systématiquement observés en radio-interférométrie à longue base et par d'autres programmes astrométriques appropriés.

Note pour la Recommandation VI

Cette recommandation décrit essentiellement la première partie du travail qui doit être effectué pour préparer la réalisation du système de référence défini par les recommandations I et II. Le choix des objets de référence doit être fait en tenant compte en premier lieu de leur observabilité par la radio-interférométrie à longue base, mais on prendra soin d'inclure une proportion importante de radio-sources extragalactiques ayant des contreparties optiques bien identifiées.

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RECOMMANDATION VII

considérant

a) que le nouveau repère barycentrique céleste conventionnel de référence devrait se rapprocher autant que possible des équateur et équinoxe FK5 existants ainsi que de l'équinoxe dynamique, rapportés à l'époque J2000.0,

b) qu'il devrait être accessible aux instruments astrométriques aussi bien en lumière visible qu'en ondes radio,

recommande

1. que le plan principal du nouveau système céleste conventionnel de référence soit aussi proche que possible de l'équateur moyen de J2000.0 et que l'origine sur ce plan principal soit aussi proche que possible de l'équinoxe dynamique de J2000.0,

2. que les positions des objets extragalactiques sélectionnés en conformité avec la recommandation VI et représentant le repère de référence, soient initialement calculées pour l'équateur et l'équinoxe de J2000.0 en utilisant les meilleures corrections disponibles à la position du pôle céleste de J2000.0 donnée par les expressions adoptées par l'UAI pour la précession et la nutation,

3. qu'un grand effort soit fait pour comparer les repères de référence de tous types, en particulier le FK5, les repères dynamiques dans le système solaire et les repères extragalactiques,

4. que l'on entreprenne ou continue tous programmes d'observation destinés à rapporter les positions des planètes à des objets émettant en ondes radio ou en lumière visible et à déterminer les relations qui existent entre les catalogues de positions de sources extragalactiques et les meilleurs catalogues de positions d'étoiles, notamment les catalogues FK5 et HIPPARCOS.

Notes pour la Recommandation VII

1. *Cette recommandation spécifie les axes de coordonnées qui seront adoptés pour le repère de référence définitif et décrit le travail qu'il faut effectuer avant que l'on puisse construire un tel repère. Bien que les considérants se réfèrent, pour le catalogue primaire, aux longueurs d'onde visuelles et radio, d'autres longueurs d'onde observables ne sont pas exclues. Les positions des objets observés dans d'autres longueurs d'onde devront également être rapportées au même système.*

2. *L'objectif établi par cette recommandation est qu'il ne doit pas y avoir de discontinuité dans les positions des étoiles lorsque le repère FK5 actuel sera remplacé par le repère de référence extragalactique. Ceci signifie que les*

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positions des objets extragalactiques devront être données dans le système FK5 pour J2000.0. On reconnaît que, pour ce faire, les meilleures valeurs de la précession et de la nutation doivent être utilisées afin d'éviter que des mouvements propres fictifs soient introduits dans la position des objets extragalactiques. La transformation finale pour se référer à l'équinoxe et au plan principal adoptés sera faite en appliquant une rotation à l'instant J2000.0.

3. *L'équinoxe dynamique, dans cette recommandation, est défini comme l'intersection de l'équateur moyen et de l'écliptique. Ce dernier est considéré comme le plan de l'orbite du barycentre Terre/Lune, en rotation uniforme moyennée sur l'intervalle de validité des éphémérides. Comme le choix de l'équinoxe dépend ainsi des éphémérides, on prendra les éphémérides du système solaire, généralement disponibles, qui seront les plus exactes en temps voulu.*

4. *La définition du système de référence donnée par les Recommandations I et II implique la stabilité dans le temps du système de coordonnées réalisé par le repère de référence céleste. Les directions des axes de coordonnées ne doivent pas être changées, même si à quelque date ultérieure les réalisations de l'équinoxe dynamique ou du Pôle céleste des éphémérides sont améliorées. De la même manière, des modifications de l'ensemble des objets extragalactiques qui réalisent le système de référence doivent être faites de telle sorte que les directions des axes ne soient pas changées. Cela signifie qu'une fois que les axes de coordonnées ont été spécifiés, comme cela est indiqué par la première partie de la recommandation, la connexion entre la définition du système conventionnel de référence et les particularités des mouvements de la Terre doit être abandonnée.*

5. *Tant que la relation entre le repère optique et le repère extragalactique radio n'est pas établie avec une exactitude suffisante, le catalogue FK5 sera considéré comme une réalisation provisoire du système de référence céleste, pour les longueurs d'onde optique.*

RECOMMANDATION VIII

reconnaissant

a) l'importance pour l'astronomie de l'adoption de valeurs conventionnelles de constantes astronomiques et physiques,

b) que les valeurs de ces constantes doivent demeurer inchangées à moins qu'elles ne diffèrent significativement de leur plus récente estimation,

c) que l'estimation de ces constantes doit être fréquemment améliorée afin de représenter l'état actuel des connaissances,

d) la nécessité de fournir des procédés de calcul normalisés pour utiliser ces valeurs numériques et

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notant

a) que les "MERIT Standards" et les "IERS Standards" ont apporté une contribution significative au progrès de l'astronomie et de la géodésie,

b) que les valeurs numériques de ces normes (standards) ont servi de système de constantes pour analyser des observations de grande qualité et

considérant

que les procédés de calcul fournis par ces normes ne couvrent pas la totalité de l'astronomie fondamentale,

recommande

qu'un groupe de travail permanent soit organisé par les commissions 4, 5, 8, 19, 24 et 31, en consultation avec l'AGI et l'IERS, afin de mettre à jour et d'améliorer le système des unités et constantes astronomiques, la liste des estimations de grandeurs astronomiques fondamentales et des procédés de calcul normalisés; ce groupe devra

1. préparer un rapport provisoire sur le système des unités et constantes astronomiques au plus tard six mois avant la XXIIe Assemblée générale (1994),
2. préparer une liste provisoire des meilleures estimations de grandeurs astronomiques au plus tard six mois avant chaque Assemblée générale suivante,
3. préparer, au plus tard six mois avant chaque Assemblée générale suivante, un rapport provisoire sur les procédés de calcul normalisés dont on a besoin en astronomie fondamentale, lequel
   a) devrait avoir un maximum de compatibilité avec les "IERS Standards",
   b) devrait inclure des mises en pratique des procédés de calcul sous forme de programmes informatiques ou d'exemples éprouvés,
   c) devrait être disponible, non seulement sous forme écrite, mais aussi sous forme informatisée,
4. préparer un rapport provisoire sur un possible accès électronique à ces unités, constantes, grandeurs et procédés de calcul, au plus tard six mois avant la XXIIe Assemblée générale (1994).

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RECOMMANDATION IX

reconnaissant

qu'il n'existe pas, pour le moment, de théorie de la nutation d'une Terre non rigide incluant tous les effets au niveau de 10^{-4} seconde de degré qui fasse l'objet d'un consensus général,

recommande

1. que, pour des besoins ne nécessitant pas une exactitude sur les angles de nutation (ϵ or $\psi \sin\epsilon_0$) meilleure que ± 0,002" (à 1 σ), on peut continuer à utiliser la théorie de la nutation UAI 1980 (P.K. Seidelmann, Celestial Mechanics, 27, 79, 1982),
2. que, lorsqu'on a besoin d'une exactitude meilleure que ± 0,002" (à 1 σ), il faut utiliser les bulletins de l'IERS qui donnent les observations et les prédictions des écarts de position du pôle céleste avec une exactitude de l'ordre de ± 0,0006" (à 1 σ) pour une période allant jusqu'à 6 mois à l'avance,
3. que l'on encourage l'UGGI à établir et à adopter un modèle de Terre adéquat pour servir de base à une nouvelle théorie de la nutation de l'UAI.

CCIR *Comité Consultatif International des Radiocommunications*

IAG/AIG *Association Internationale de Géodésie*

IUGG *Union Internationale de Géodésie & Géophysique*

IERS *Service International de la Rotation de l'Heure*

Resolution A5: Encouraging International Development of Antarctic Astronomy

The XXIst General Assembly of the International Astronomical Union,

recognising

1. the potential for making some important classes of astronomical observations from Antarctica that are not possible from elsewhere on the Earth's surface,
2 the fact that the extremely dry, cold and tenuous atmosphere, above the Antarctic Plateau provides the best observing conditions on Earth in the infrared, sub-mm and mm wavelength range, and
3. the unique opportunities Antarctica offers for establishing truly international bases for scientific cooperation,

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and noting that

1. technological advances are greatly widening the scope for exploiting the astronomical merits of Antarctica,
2. a Working Group of the ICSU Scientific Committee on Antarctic Research has formally recommended (*) serious international consideration be given to participation in designing, building and operating a new station in the highest part of the inland plateau,
3. there is widespread concern to ensure any development in Antarctica is compatible with preservation of the natural environment,
4. some astronomical instruments in Antarctica will be well suited to studies of global environmental problems,
5 astronomical activities and planning for new instrumentation in Antarctica have greatly increased over the last few years, and
6. international links should be increased to enhance scientific returns,

urges

National Committees for Astronomy and National Antarctic agencies to establish an international astronomical base on the high plateau

and resolves

to create a Working Group to encourage international cooperation in site testing and in designing and constructing new Antarctica astronomical facilities.

(*) *Recommendation 6 of the Atmospheric Sciences Working Group (now divided into two groups: Solar, Terrestrial and Astrophysical Research & and Physics and Chemistry of the Atmosphere) at the biennial meeting in 1990 of the Scientific Committee for Antarctic Research.*

Résolution A5: Encouragement pour le développement international de l'Astronomie en Antarctique

La XXIe Assemblée générale de l'Union Astronomique Internationale,

reconnaissant

1. la possibilité de faire depuis l'Antarctique plusieurs types d'observations astronomiques importantes qui ne peuvent être effectuées d'aucun autre endroit sur la surface terrestre ;
2. le fait que l'atmosphère extrêment sèche, froide et peu dense au-dessus du plateau antarctique fournit les meilleures conditions d'observation sur terre pour les domaines de longueurs d'onde infrarouge, submillimétrique et millimétrique ;

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3. l'occasion unique qu'offre l'Antarctique d'établir des bases réellement internationales pour la coopération scientifique ;

et notant

1. que les progrès technologiques augmentent considérablement les possibilités d'exploiter les qualités astronomiques de l'Antarctique ;
2. qu'un Groupe de travail du Comité Scientifique pour la Recherche en Antarctique (SCAR, de l'ICSU) a formellement recommandé (*) que soit sérieusement envisagée une participation internationale à la conception, la construction et l'exploitation d'une nouvelle station sur la partie la plus élevée du plateau central ;
3. qu'il y a une volonté très large de s'assurer que tout développement en Antarctique est compatible avec la protection de l'environnement naturel ;
4. que certains instruments astronomiques en Antarctique seront bien adaptés à l'étude de problèmes d'environnement global ;
5. que les activités astronomiques et les projets de nouvelle instrumentation en Antarctique ont considérablement augmenté au cours des dernières années et
6. que les coopérations internationales pour ces projets doivent être développées pour améliorer les résultats scientifiques ;

demande expressément

que les instances nationales d'astronomie, ainsi que les Agences nationales pour l'Antarctique établissent une base internationale pour l'astronomie sur le haut plateau ;

et décide

de mettre en place un Groupe de travail afin d'encourager la coopération internationale pour le test des sites, la définition et la construction de nouvelles installations et équipements pour l'astronomie en Antarctique.

(*) *6e Recommandation du Groupe de travail en sciences atmosphériques (maintenant divisé en deux sous-groupes: Recherche astrophysique, Terre, Soleil et Physique et chimie de l'atmosphère) lors de la réunion biennale de 1990 du Comité Scientifique pour la Recherche en Antarctique (SCAR).*

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Resolution A6: Working Group on the Prevention of Interplanetary Pollution

The XXIst General Assembly of the International Astronomical Union,

recognising

that the pollution of the space environment in the close vicinity of the Earth is now of serious concern, and that pollution of the remainder of the solar system is only a matter of time,

recommends

that steps be taken immediately to ensure that interplanetary space throughout the solar system is protected as far as possible from all forms of pollution,

urges

the International Astronomical Union to establish an inter-Commission Working Group on the Prevention of Interplanetary Pollution and that the Working Group should consult widely with COSPAR, other relevant Unions, Space Agencies and the United Nations Committee for the Peaceful Uses of Outer Space.

COSPAR Committee on Space Research

Résolution A6: Groupe de travail sur la prévention de la pollution interplanétaire

La XXIe Assemblée générale de l'Union Astronomique Internationale,

reconnaissant

que la pollution de l'espace dans un environnement proche de la Terre pose maintenant un sérieux problème et que la pollution du reste du système solaire n'est qu'une question de temps,

recommande

que des mesures soient prises immédiatement pour protéger de toutes formes de pollution l'ensemble de l'espace interplanétaire du système solaire aussi loin que possible.

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et demande instamment

à l'Union Astronomique Internationale d'établir un groupe de travail inter-commission sur la prévention de la pollution interplanétaire et que ce dernier consulte largement le Comité de la Recherche Spatiale (COSPAR), les autres unions concernées, les agences spatiales et le Comité des Nations Unies pour assurer une utilisation pacifique de l'espace.

Resolution A7: Joint IUGG/IAU Working Group

The XXIst General Assembly of the International Astronomical Union,

recognizing

the importance of rapid determinations of Earth rotation recommended by the International Workshop "Interdisciplinary role of space geodesy" held in Erice (Italy) in 1988, and

considering

the proposal made to the International Association of Geodesy by its Special Study Group 5.98 on "Atmospheric excitation of the Earth's rotation" to set up a Working Group on "High time resolution measurements of Earth rotation",

requests

the Executive Committee of the International Astronomical Union to approach the International Association of Geodesy in order to consider the possibility of organizing a joint IUGG/IAU Working Group for such activity.

IUGG International Union of Geodesy & Geophysics

Résolution A7: Groupe de travail conjoint IUGG/IAU

La XXIe Assemblée générale de l'Union Astronomique Internationale,

reconnaissant

l'importance des déterminations à haute résolution temporelle de la rotation de la Terre recommandées par le groupe de travail international "Rôle interdisciplinaire de la géodésie spatiale" tenu à Erice (Italie) en 1988, et

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considérant

la proposition faite à l'Association Internationale de Géodésie par son groupe d'étude spécialisé 5.98 sur "l'excitation par l'atmosphère d'irrégularités de la rotation de la Terre" de constituer un groupe de travail sur les "Mesures à haute résolution temporelle de la rotation de la Terre".

demande

au Comité Exécutif de l'Union Astronomique Internationale de prendre contact avec l'Association Internationale de Géodésie et de Géophysique pour envisager la possibilité d'organiser un groupe de travail conjoint IUGG/UAI pour une telle étude.

IUGG Union internationale de géodésie & de géophysique

Resolution A8: Catalogue Compilation

The XXIst General Assembly of the International Astronomical Union,

recognizing

the great value to astronomical research of comprehensive catalogues of critically evaluated data on celestial objects of particular types,

urges

that appropriate support be provided by institutions and funding agencies to those experts who are willing to devote time to the long-term task of compiling such catalogues.

Résolution A8: Compilation de Catalogues

La XXIe Assemblée générale de l'Union Astronomique Internationale,

reconnaissant

l'importance majeure des grands catalogues complets de données critiquement sélectionnées concernant des objets célestes de différents types,

demande instamment

qu'une aide appropriée soit apportée par les institutions et agences de financement aux experts qui sont prêts à consacrer du temps à ce travail à long terme de compilation de tels catalogues.

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Resolution A9: Hazardous Near-Earth Objects

The XXIst General Assembly of the International Astronomical Union,

considering

that various studies have shown that the Earth is subject to occasional impacts by minor bodies in the solar system, possibly with serious results, and

noting

that there is a well-founded evidence that only a very small fraction of NEO's (Natural Near-Earth Objects: minor planets, comets and fragments thereof) has actually been discovered and has well-determined orbits,

affirms

the importance of expanding and sustaining scientific programmes for the discovery, continued surveillance and in-depth physical and theoretical study of potentially hazardous objects, and

resolves

to establish an ad-hoc Joint Working Group on NEO's, with participation of Commissions 4, 7, 9, 15, 16, 20, 21 and 22, to:

1. assess and quantify the potential threat, in close interaction with other specialists in these fields;
2. stimulate the pooling of all appropriate resources in support of relevant national and international programmes;
3. act as an international focal point and contribute to the scientific evaluation, and
4. report back to the XXIInd General Assembly of the IAU in 1994 for possible further action.

Résolution A9: Objets hasardeux proches de la Terre

La XXIe Assemblée générale de l'Union Astronomique Internationale,

reconnaissant

que diverses études ont montré que la Terre est soumise à des impacts occasionnels avec de petits corps du système solaire, impacts qui ont parfois des conséquences graves, et

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notant

qu'il est clairement établi que seulement une très faible proportion des objets naturels proches de la Terre (planètes mineures, comètes et leurs fragments) ont de fait été découverts et ont des orbites déterminées avec précision,

confirme

l'importance qu'il y a d'accroître et de soutenir les programmes scientifiques de découverte, de surveillance continue, et d'étude de fond, physique et théorique, des objets potentiellement dangereux, et

décide

d'établir un groupe de travail ad hoc inter-commissions sur les objets naturels proches de la Terre avec la participation des Commissions 4, 7, 9, 15, 16, 20, 21 et 22, pour :

1. évaluer et quantifier le danger potentiel, en concertation avec les autres spécialistes de ce domaine ;
2. encourager la mise en commun de toutes les ressources nationales et internationales consacrées à ces programmes ;
3. servir de point centralisateur international et contribuer à l'évaluation scientifique des travaux, et
4. rendre compte à la XXIIe Assemblée générale de l'Union Astronomique Internationale en vue d' actions ultérieures possibles.

17. Resolution proposed by the Resolutions Committee

Resolution B1: Endorsement of Commission Resolutions

The XXIth General Assembly of the International Astronomical Union;

having

full confidence in its Commissions,

endorses

the Resolutions submitted by them to the Resolutions Committee (pp. 71-77).

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Resolution B1: Soutien des Résolutions des Commissions

La XXIe Assemblée générale de l'Union Astronomique Internationale,

accordant

son entière confiance à ses Commissions,

souscrit

aux résolutions qu'elles ont soumises au Comité des Résolutions (pp. 71-77).

18. Resolutions proposed by the Commissions

Resolution C1: Directory of Astronomical Software

Commission 5

considers

that the establishment of an electronically accessible directory of astronomical software that is available and suitable for general use would be of great value to the astronomical community,

further considering

the need for an appropriate institution to providing facilities for the compilation and maintenance of such a directory, and

requests

that astronomers provide appropriate details for inclusion in the directory.

Resolution C2: Editorial Instructions

Commission 5

welcomes

the efforts being made by the editors of the major astronomical journals to standardise their instructions to authors and

urges

all editors to include the recommendations adopted by the XXth IAU General Assembly concerning the use of SI units, the designation of celestial objects, and the abbreviations for the titles of journals.

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Resolution C3: Astronomical Telegrams

Commission 6

noting

the indispensable character of the service rendered to the international astronomical community by the Central Bureau for Astronomical Telegrams by rapid communication of critical information,

calls attention

to the importance of the token subvention as a demonstration of the support of the IAU for this crucial activity,

strongly urges

the continuation of this subvention, and

further urges

the General Secretary to maintain an appropriate subvention in the IAU budget and negotiate a payment schedule with the Director of the Central Bureau for Astronomical Telegrams.

Resolution C4: Publication of Solar Eclipse Information

Commissions 10 & 12

considering

that the United States Naval Observatory (USNO) has for more than forty years generously provided crucial information to assist scientists who observe solar eclipses for scientific purposes (in the form of the Central Solar Eclipse Circulars and other specialized calculations) and,

recognising

that the USNO plans to cease publication of the Eclipse Circulars due to programmatic changes and plans to continue to support scientific observations by publishing eclipse circumstances in the Astronomical Almanac, and by providing specialized eclipse calculations to scientific researchers,

commend

on behalf of past and present eclipse researchers, the management and staff of the USNO responsible for the preparation and publication of the calculations and,

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request

that the USNO continue to provide advance calculations for a variety of sites in order to aid site selection and to publish this information in Circulars or by other means and,

further commend

all official national organizations that prepare eclipse calculations, and urge that they continue their efforts.

Resolution C5: Long-term Solar Observations

Commissions 10 & 12

considering

long-term observations are essential to understand the behaviour of such quasi-periodic phenomena that characterize solar and stellar activity and that link the Sun to our terrestrial environment;

recommend

1. strong support for continuing data-gathering programmes and observational facilities that are essential to long-term research;
2. the optimization of data-gathering enterprises in order to improve services to the research community.

Resolution C6: Comet Rendezvous Asteroid Flyby (CRAF) Mission

Commission 15

considering

current plans for the Comet Rendezvous Asteroid Flyby (CRAF) mission, and

recognising

the need to study many alternative scenarios because of the lack of basic data for possible target comets (P/Kopff, P/Tempel 2, P/Tempel 1, P/Wild 2, P/d'Arrest, and P/Wirtanen), and

noting

that the CRAF Project Science Group is strongly encouraging observations of these comets with ground-based, airborne, rocket-borne, and Earth-orbit instruments; particularly to determine the size, and spin-period of the nucleus, the orientation of the spin-axis, and the development of outgassing and dust ejection as the comets approach the Sun; and

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that such observations are particularly desirable at the next aphelion and perihelion passages through 1996; and

that such observations, must be made with good temporal coverage and, especially near aphelion, require instruments with the highest sensitivity,

strongly urges

all observing-time allocation committees to take account of these considerations in their decisions about relevant programmes submitted to them.

Resolution C7: Expansion of the Minor Planets Names Committee

Commission 20,

noting

the recent disagreement between it and the Working Group on Planetary System Nomenclature (WGPSN) concerning the proposed names for the recently discovered satellites of Neptune,

drawing attention to

its 1985 resolution to minimize the duplication between the names of minor planets and natural satellites, and

considering

the vast potential for drawing on a number of different cultures for the selection of names,

recommends

that its Minor Planet Names Committee, currently consisting of the President, the Vice-President and the Director of the Minor Planet Centre, be expanded to include more effective liaison with the WGPSN, and

charges

the expanded Committee to take a more active rôle in both choosing names and writing completed, concise citations.

WGPSN *Working Group for Planetary System Nomenclature*

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Resolution C8: Long-term Observation of Fifteen Minor Planets

Commission 20,

welcoming

the proposal of the Institute of Theoretical Astronomy (USSR) to prolong the observational programme for 15 selected minor planets (Nos. 1, 2, 3, 4, 6, 7, 11, 18, 35, 39, 40, 148, 382, 532 and 704) for the period 1991-2000, and

encouraging

all observatories which have astrographs of focal length 2 m to take part in this programme,

recommends

that the most precise reference catalogues, PPM (Positions and Proper Motions), Fokat (Fotograficheskij Katalog, Pulkovo) and ACRS (Astrographic Catalogue Reference System), are used for the determination of the spherical coordinates of the planets.

Resolution C9: Ephemerides of Minor Planets

Commission 20

supports

the activities of the Institute of Theoretical Astronomy (USSR) on the elaboration of PC software packages for the provision of ephemerides of minor planets, and

suggests

that systems like "STAMP" may be used together with the printed annual volumes "Ephemerides of Minor Planets".

Resolution C10: Data Centre at the Bureau des Longitudes

Commission 20

having heard

the report of the Chairman of the Working Group on Satellites, in which is proposed the creation of a Data Centre at the Bureau des Longitudes (France),

supports

this proposal, and

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recommends

that this centre develops into an International Data Centre, as defined in Internal Resolution of Commission 20, adopted on August 8, 1988, during the XXth IAU General Assembly.

Resolution C11: Variable Star Observations

Commissions 27 & 42

considering

that the systematic coverage of the long-term behaviour of the population of variable stellar objects, such as the sixty years of measurements made at Sonneberg Observatory, makes a major contribution to Astronomy and Astrophysics,

recommend

that all efforts be undertaken to continue these important measurements and to ensure the appropriate maintenance and availability of the data archives.

Resolution C12: Space Schmidt Telescope

Commission 28

recognizing

the important scientific opportunities inherent in the ASCHOT (80 cm Space Schmidt) project to be placed on board of the Soviet space station in 1996, and

noting

that several of the available focal positions have not yet been equipped with optimum detectors,

urges

astronomical institutions with detector capabilities to consider participation in this project and further to enhance its scientific return.

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Resolution C13: Archiving Spectroscopic Results

Commission 29

considering

that a large amount of spectroscopic data has been collected on photographic plates,

that the widest use of electronic detectors has generated a rapid growth in the build-up of raw spectroscopic data files, and

that the information contained in such data could represent an important source for future studies,

recognizing

the importance of safeguarding such data, and the need to create an accessible archive of the observations,

recommends

that an IAU Working Group for spectroscopic Data Archives be set up in order to establish agreed means of archiving and distributing the spectroscopic data.

Resolution C14: Astronomical Archives

Commissions 41 and 5

recommend

that the Union supports the initiatives taken by them

1. to establish a register of the whereabouts of all extant astronomical archives of historical interest;
2. to impress on observatories and other institutions their responsibility for the preservation, conservation, and where possible, cataloguing of such archives;
3. to search for an institution that will allocate space and funds for maintaining such a register and publishing it.

Resolution C15: The use of Vacuum Wavelengths in Astronomy

Commission 44

recognizing

that with the increasing availability of spectroscopic observations in the middle and far ultraviolet provided by spectrometers in orbit, it has become desirable to provide a uniform wavelength scale by removing the traditional discontinuity in the expression of wavelengths from vacuum to air across 2000 Å, and

whereas

(1) there is a trend in both space and ground-based astronomy to replace air wavelengths with vacuum values,

(2) the IAU has already agreed upon and published a simple conversion formula between the two systems,

(3) neglect by authors to indicate which standard they are using in this time of flux is a source of confusion,

recommends

that the IAU favors a uniform expression of vacuum wavelengths across the entire spectrum in astronomy,

urges

since we are in a transition period, that all publications clearly indicate which convention is being used, and

further urges

that the IAU conversion algorithm (current reference: Oosterhoff, P.T. 1957 Trans IAU Vol. IX pp. 69, 202) be used and referenced in articles expressing wavelengths in air.

Resolution C16: Concerning Extraterrestrial Intelligence

Commission 51

considering

that searches for evidence of technologically developed life elsewhere in the universe have been conducted for more than 30 years by means of astronomical instruments, and

that much more extensive searches, using large radio telescopes around the world, are about to commence,

recommends

that the astronomical community follows the guidelines for verifying the nature of a candidate extraterrestrial intelligent signal and announcing its detection, as presented in the document from the International Academy of Astronautics and the International Institute of Space Law entitled "Declaration of Principles Concerning Activities Following the Detection of Extraterrestrial Intelligence".

19. Appointment of the Special Nominating Committee 1991-1994 (SNC)

The President asked the General Secretary to announce the names of the members proposed for appointment by the General Assembly to the Special Nominating Committee 1991-1994. These persons will be convened by the President of the IAU for the purpose of proposing

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names to the XXIInd General Assembly (1994) for IAU Executive Committee membership (1994-1997). The four persons appointed are:

H. Abt (USA)
K.C. Freeman (Australia)
B. Hauck (Switzerland)
D.C. Morton (Canada)

The member of the SNC appointed by the Executive Committee is

A. Feinstein (Argentina)

These appointments were unanimously confirmed by the General Assembly.

Note: The President and Past President are members of the SNC ex officio. The General Secretary and Assistant General Secretary are consultants to the SNC.

20. Nomination of New Members of the Union

The General Secretary announced that the Executive Committee had, on the proposal of the Adhering Bodies and with the advice of the Nominating Committee, admitted 760 new members to the Union. The names of the new members had been displayed at the entrance to Room P in the La Plaza Centre during the course of the General Assembly. The names will be incorporated in the alphabetical list of IAU Members to appear in IAU Transactions XXIB.

21. Applications for IAU Membership

No country had applied for IAU membership during the triennium.

22. Changes in Commissions

The General Secretary read the proposals of the Executive Committee as regards the Presidents & Vice-Presidents of Commissions for the triennium 1991-1994:

Commissions/ Working Groups	*President*	*Vice-president*
04	B.D. Yallop	H. Kinoshita
05	B. Hauck	O.B. Dluzhnevskaya
06	J.E. Grindlay	R.M. West
07	A. Deprit	S. Ferraz-Mello
08	L.V. Morrison	C.A. Smith
09	J.C. Bhattacharyya	G. Lelièvre
10	V. Gaizauskas	O. Engvold
12	J.O. Stenflo	F. Deubner
14	W.L. Wiese	W.H. Parkinson
15	A. Harris	V.M.F. A'Hearn
16	D. Morrison	M. Marov
		C. de Bergh
19	B. Kolaczek	J. Vondrak
20	A. Carusi	D. Yeomans
21	M. Hanner	M. Hauser
22	J. Stohl	I. Williams
24	C. de Vegt	C. Turon

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25	A.T.	Young	J.D.	Landstreet
26	H.	Abt	C.E.	Worley
27	J.R.	Percy	M.	Jerzykiewics
28	E.	Ye Khachikian	V.L.	Trimble
29	D.	Lambert	M.	Bessel
30	G.	Burki	C.D.	Scarfe
31	E.	Proverbio	H.	Fliegel
33	L.	Blitz	J.	Binney
34	H.	Habing	D.R.	Flower
35	P.	Demarque	C.	Chiosi
36	W.	Kalkofen	L.	Cram
37	J.C.	Mermilliod	A.	Feinstein
38	J.	Sahade	H.E.	Jorgensen
40	M.	Morimoto	J.B.	Whiteoak
41	S.	Debarbat	S.M.R.	Ansari
42	Y.	Kondo	M.	Rodono
44	J.	Trümper	G.	Fazio
45	D.	MacConnel	H.	Levato
46	L.	Gougenheim	J.	Percy
47	R.B.	Partridge	J.	Narlikar
48	J.	Ostriker	G.	Srinivasan
49	B.	Buti	H.	Ripken
50	P.	Murdin	S.	Isobe
51	R.D.	Brown	J.	Tarter
WGPSN	K.	Aksnes		
WGWDA	A.H.	Batten		
WGDAA	P.	Gillingham		

This proposal was received with acclamation by the General Assembly.

Organising Committees of Commissions

The General Secretary announced that, in the interest of economy of time, it had been decided not to present the lists of Members in the Organising Committees of Commissions, but that the lists were available at the IAU Secretariat for inspection. They will be printed in IAU Transactions XXIB in Chapter VI.

23. Change of Name of Commission 12

The Executive Committee on the advice of Commissions 12 and 35 proposed that the name of Commission 12 currently "Radiation and Structure of the Solar Atmosphere" be changed with immediate effect to "Solar Radiation and Structure".

This change of name was unanimously agreed by the General Assembly.

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24. IAU representatives to other ICSU & International Institutions

Acronyms	*Organisation*	*Representative*
ICSU	International Council of Scientific Unions General Committee	*J. Bergeron*
BIPM/ CCDS	Bureau international des poids et mesures Working Group on the Temps Atomique International of the Consultative Committee for the Definition of the Second	*G. Winkler*
CCIR	Consultative Committee on International Radiocommunications	
	Study Group 2	*J. Whiteoak/* *A.R. Thompson*
	Study Group 7	*S. Leschiutta*
CIE	Compagnie internationale de l'éclairage	*D. Crawford*
CODATA	Committee on Data for Science & Technology	*A. Heck*
COSPAR	Committe on Space Research	*J. Bergeron*
	COSPAR ISC B	*J. Rahe*
	COSPAR ISC D	*S. Grzedzielski*
	COSPAR ISC E	*Y. Kondo/J.-P. Swings*
	COSPAR Sub. Committee E1	*R. Sunyaev*
	COSPAR Sub. Committee E2	*O. Engvold*
COSTED	Committee on Science & Technology in Developing Countries	*J. Bergeron*
CTS	Committee on the Teaching of Science	*J.M. Pasachoff*
EPS	European Physical Society Conference Committee	*J. Bergeron*
FAGS	Federation of Astronomical & Geophysical Services	*E.Tandberg-Hanssen*
IAF	International Astronautical Federation	*Y. Kondo*
IERS	International Earth Rotation Service	*Ya. Yatskiv*
IGBP	International Geosphere-Ionospehre Programme	*J. Eddy*
ISY	International Space Year	*L. Gouguenheim*
IUCAF	Inter-Union Commission on Frequency Allocation for Radio Astronomy & Space Science	*B.A. Doubinsky* *M. Ishiguro* *V.L. Pankonin* *G. Swarup*
IUPAP	International Union of Pure & Applied Physics	*V. Trimble*
IUWDS	International Ursigram & World Day Service	*H. Coffey*
QBSA	Quarterly Bulletin on Solar Activity	*S.T. Wu*
SCOPE	Scientific Committee on Problems of Environment	*R. Cayrel*
SCOSTEP	Scientific Committee on Solar-Terrestrial Physics	*S.T. Wu*
URSI	Union Radio-Scientifique Internationale	*J. Baldwin*
WMO	World Meteorological Organization	*G. Wallerstein*

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25. Place and Date of the XXIInd General Assembly

The President called upon Professor H. Habing to present the invitation of the Netherlands to hold the XXIInd General Assembly in the Hague. Professor Habing read the invitation to the Union from Prof. Dr. C. de Jager on behalf of the Board of the Royal Netherlands Academy of Arts and Sciences warmly inviting the Union to the Netherlands. Professor Habing outlined some of the many attractions of the Netherlands and the Hague and promised a worthy scientific meeting.

The General Assembly accepted this invitation with acclamation and the President asked Professor Habing to convey the acceptance and gratitude of the Union to Prof. Dr. C. de Jager and the Royal Netherlands Academy of Arts and Sciences.

The proposed dates for the XXIInd General Assembly are 1994 August 14-27.

26. Election to the Union of a President, a President-elect, six Vice-Presidents, a General Secretary and an Assistant General Secretary.

The General Assembly approved by acclamation the proposal of the President that Academician A.A. Boyarchuk be elected the new President of the Union, for the term 1991-1994.

The General Assembly approved by acclamation the proposal of the President that Professor L. Woltjer be elected the new President-elect of the Union, for the term 1991-1994.

The President announced that Professor V. Radhakrishnan, Dr. M.S. Roberts, Dr. Ye Shu Hua would continue as Vice-Presidents of the Union for the term 1991-1994 and the General Assembly approved by acclamation the proposal of the President that Professors D. Mathewson, F. Pacini and J. Smak be elected Vice-Presidents of the Union for the term 1991-1994.

The President finally proposed that Dr. J. Bergeron be elected General Secretary of the Union and Professor I. Appenzeller be elected Assistant General Secretary of the Union for the term 1991-1994. This proposal was received with acclamation by the General Assembly.

The President then invited Professors L. Woltjer, D. Mathewson, F. Pacini, J. Smak and I. Appenzeller to join the Executive Committee on the platform.

Following these elections, the IAU Executive Committee for the period 1991-1994 will be:

President:	A.A.	Boyarchuk	USSR
General Secretary:	J.	Bergeron	France
Assistant General Secretary:	I.	Appenzeller	Germany
President-Elect:	L.	Woltjer	Netherlands

Vice-Presidents:	D.S.	Mathewson	Australia
	F.	Pacini	Italy
	V.	Radhakrishnan	India
	M.S.	Roberts	USA
	J.I.	Smak	Poland
	Shu Hua	Ye	China PR
Advisers:	Y.	Kozai	Japan
	D.	McNally	UK

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