THE IAU STYLE MANUAL (1989)
THE PREPARATION OF ASTRONOMICAL PAPERS AND REPORTS

Prepared by
George A. Wilkins
(President of IAU Commission 5)
on behalf of the
EXECUTIVE COMMITTEE
of the
INTERNATIONAL ASTRONOMICAL UNION

Dedicated to the memory of
Donald H. Sadler
(General Secretary of the IAU, 1958–1964)
THE IAU STYLE MANUAL (1989)

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PREFACE

It is a pleasure to contribute a preface to the IAU Style Manual dedicated to the memory of Donald R. Sadler, Dr Sadler, General Secretary of the International Astronomical Union (IAU) 1959-1964, prepared the first "IAU Style Book" in 1961 for use in editing and proofreading the contributions to the Transactions of the IAU. It was republished with amendments by his successor, J. C. Perley, in 1964 and in a shortened version by C. de Jager and A. Jappeli in 1971. On the invitation of IAU Commission 5, an extensive revision was begun by B. Mitton (Cambridge University Press) but was not completed: the task of revision was passed to G. A. Wilkins prior to the Delhi General Assembly in 1995. The first draft of the present text was distributed for comment in April 1985; it was primarily intended for use in the preparation of papers for publication in the proceedings of IAU meetings. It was then suggested that an attempt should be made to obtain an agreement with the editors of the principal astronomical journals to use a common set of recommendations in order to simplify the preparation of all astronomical papers. A meeting of editors held in May 1998 reached a wide measure of agreement and a revised draft was prepared for comment during the Bologna General Assembly.

Since manuscripts for IAU Transactions, Symposia and Highlights are now submitted in camera-ready form, where correction after submission is almost impossible, it was decided that the new Style Manual should include general and detailed guidance on both the drafting of the text and the preparation of the typescript. The increasing use of text-processing software and of high-quality printers, which together give results that are comparable with those from commercial typesetting, has been taken into account. The present Style Manual therefore contains recommendations on style and other information for authors of papers and reports for publication by or on behalf of the IAU. 'Style' is here taken to mean the format and layout of the document together with the conventions regarding designations, references, units etc. IAU publications should maintain consistency and be of pleasing and acceptable appearance. The recommendations take into account the views of the editors of the principal astronomical journals and the recommendations of other major international organizations. It is hoped, therefore, that these recommendations will be widely adopted in all appropriate astronomical publications to the benefit of authors, editors, referees, publishers, printers and, most importantly, the readers.

I would like to express the appreciation of the Union to Dr Wilkins for undertaking and bringing this onerous task to a successful completion and to Dr Mitton who made the first start. The preparation of a document of this nature requires that considerable thought be given to establishing conventions which remain unambiguous for long periods of time. Dr Wilkins is to be congratulated on the thorough manner he has brought to the production of the text. It is also a pleasure to record the Union's appreciation of the support Dr Wilkins received from Annette Hedges, Cynthia White and Sue Frizan at the Royal Greenwich Observatory (UK) in the preparation of drafts and the final camera-ready copy of this Manual. The final text of the Manual benefited from the comments of many colleagues of whom the following deserve special mention:


On behalf of the International Astronomical Union, I would like to thank all who have contributed to the preparation of the Manual and urge all members of the Union to adhere to its precepts in the preparation of their astronomical typescripts.

1999 December

T. McCarthy
General Secretary
IAU-UNESCO
Institut d'Astrophysique
98bis Boulevard Arago
P-75014 Paris
SUMMARY OF RECOMMENDATIONS BY THE INTERNATIONAL ASTRONOMICAL UNION TO AUTHORS ON THE PREPARATION OF ASTRONOMICAL PAPERS AND REPORTS

1. PURPOSE

The following recommendations apply in particular to the preparation of camera-ready copy for papers and reports for publication by, or on behalf of, the International Astronomical Union; most of them apply also to other forms of copy and to other publishers. The recommendations are intended to assist astronomers to prepare reports on their investigations and activities in a form that will result in their publication with the minimum of effort and delay and that will be effective in conveying to the readers the essential information about their methods and results. Further details and advice are given in the IAU Style Manual (1999).

2. PREPARATION OF THE DRAFT PAPER

2.1 Planning

Ensure that you are aware of the recommendations concerning content, style and layout before you start to write the manuscript or type the 'compscript'.

Prepare an outline structure of the paper bearing in mind any particular restriction on length that may apply when the paper is to be published in the proceedings of a meeting.

In general, each paper should include an introduction giving the background and the objectives, a description of the techniques used, a statement of the results obtained, a summary of the conclusions, and a list of references.

2.2 Preliminaries

Choose a clear, informative and concise title that does not include any special symbols nor any acronyms that will be familiar only to specialists.

Write an author statement that includes all those, but only those, who have made significant contributions to the development of the paper; give affiliations and postal addresses.

Draft an abstract that states clearly and concisely the objectives, methods, and principal conclusions; keep within a length of about 200 words, or less for short papers.

Prepare a list of keywords, if required.

2.3 The text

Keep sentences short and simple in construction; avoid unusual words and long compound terms whenever possible.

Be consistent in typographical style (e.g. initial capital letters).

Use SI and other recognised units throughout. Give clear and unambiguous designations for all astronomical objects (e.g. include coordinates in standard format).

Use unambiguous notations and terminology for physical quantities, coordinates and timescales.

Give citations to other useful and relevant papers by identifying the author and year of publication as in Brown (1988); cite more than two authors as Brown et al.

Insert appropriate headings and subheadings with a decimal system of numbering.

Cross-references within the text should be by section number.

Do not use footnotes for additional information or references.
2.4 Tables and illustrations

Careful consideration should be given to the choice, content and design of tables and illustrations to ensure that they are appropriate and well presented.

2.5 Checking

Prepare the manuscript and any typewritten or typeset text to be used as printer’s copy at double spacing in order to facilitate the marking of corrections and revisions and the insertion of other instructions or comments. Check the first typewritten copy carefully for content (correctness, completeness and clarity) and typical accuracy, and mark clearly the changes to be made and other action to be taken during the preparation of the final copy.

Pay particular attention to all numerical information, including designations and references.

Whenever possible, a person other than the first author should also carry out such checking, especially if the paper is to be printed from camera-ready copy provided by the author.

3. PREPARATION OF CAMERA-READY COPY

3.1 Physical quality and format

For the typewritten or typeset text, use either the preprinted sheets supplied by the publisher or other good quality paper of the same size.

Use an electric typewriter with a carbon ribbon or use another type of printer that will produce sharp black characters. A dot-matrix printer should only be used if it produces letter-quality copy.

Type (print) only within the specified type area (150 x 215 mm for IAU Symposia and Highlights; 175 x 230 mm for Transactions), except that an unjustified text is not permitted in line to extend occasionally over the right-hand margin by two or three characters so as not to break a word unnaturally. The last line may also cover a one-line limit, but letters or lines should not be squeezed together to fit them into the printed line.

Type at a line spacing of about 4 mm (6 lines per inch) with a character width of about 3 mm (12 characters per inch). Choose a typeface that matches the one currently used in the publications and that distinguishes between the Figure 1 and the letter 0 and between the figure 1 and the lower-case letter l. The line on the preprinted sheet for running-head and page number should be left blank. The typed sheets should be numbered in (blue) pencil in the top right-hand corner.

The typewritten text must be absolutely clean and any minor corrections of a few characters must be made very carefully; correcting fluid may be used, but it must be thin and dry so that the overtyped characters are of equal density. For large corrections the whole line should be retyped on a separate sheet of paper, if additional material is to be inserted the following lines must also be retyped to the point where the corrected lines can be inserted without disturbing the remainder of the paragraph. A major correction that would seriously disturb the pagination may be inserted at the end of the page with an appropriate heading and cross-reference.

3.2 Layout

The first page of each paper in IAU Symposia or Highlights is to include:

- The title of the paper in capital letters starting at the left-hand margin and followed by 3 line spaces (blank lines).
- The author’s name in capital and small letters, indented 10 spaces and followed on the next line by the author’s affiliation and full postal address (unless this is given elsewhere in the volume) and then by 4 line spaces.

The abstract, starting with the word ABSTRACT in capital letters at the left-hand margin and followed by 2 line spaces and then the heading of the first section of the text.

All section and subsection headings are to start at the left, and have arabic (decimal) numbers, as follows:-

- First-level headings in capital letters on a separate line, with two line spaces above and one below.
- Second-level headings (one decimal place) in small letters on a separate line, with one line space above and below; bold type may be used.
- Lower-level subheadings (two or more decimal places) in underlined small letters, followed by the text on the same line.

New paragraphs are to be preceded by a blank line; the first word is to be indented by 5 spaces (10 mm) unless it follows a heading or starts with a subheading. All pages should normally be full, except that a new section or subsection should not be started unless there is space for at least two lines of text, except that there should always be at least two lines at the top of a new page at the end of a paragraph.

Displayed matter, such as mathematical equations, should have one line space above and below and should be indented 5 spaces (10 mm). The numbers of an equation should normally be given in parentheses at the end of the line. Formulas should be spaced so as to avoid ambiguity and to show their structure.

3.3 Tables and illustrations

Tables should normally be typed in the same manner as the text. Columns should be separated by adequate spacing, and not by rules. The caption should precede the table, but auxiliary information may be given below the tabular matter. A narrow table should be centered; the caption should be the same width as the table. Two line spaces should be given between the table and any following or preceding text. If necessary, place a wide table sideways on the page with the top at the left of the right page; do not include any text (other than the caption and notes) on such a page.

Illustrations should be supplied as original drawings in black ink on good quality paper or as glossy sharp photographic prints or as high-quality computer output from a laser printer. If possible, they should be prepared to a size that is appropriate for reduction with the text, but an unreduced illustration may be supplied separately. Memes, numbers on axes or contours, and units should be shown clearly and unambiguously on the drawings. The size of characters and the thickness of lines should be appropriate for reproduction. The caption should be typed under the illustration, usually at the same time as the main text, and to the same width as the illustration. Clear instructions must be given about the placing of separate illustrations.

Tables and figures should be numbered in separate sequences in arabic numerals.

3.4 References

The standard format for reference to a paper in a serial publication is as follows:

Author, A. B., Year. Title of paper. Abbreviated title of serial Volume number (arabic numerals), first-last page numbers.

If there are several authors, their names should be given in the same form (up to a maximum of eight, then et. al.). All journals do not allow the inclusion of the title of the paper; in any case, a very long title should be shortened.
The abbreviations of the title words of serials should follow international standards as exemplified by the list in Astronomy and Astrophysics Abstracts. The title of the serial should be given in italic type and the volume number in bold type if this facility is available; otherwise they should not be underscored. If it is useful to give a part number, it should be given in parentheses immediately after the volume number.

The standard form for a reference to a book such as a monograph or the proceedings of a conference is as follows:

Author, A.N., Year. Title of book. Place of publication: Name of publisher.

The role of an editor is indicated by giving (Ed.), after the name.

The number of the edition may be given in parentheses after the title in the form (n th ed.), after the name.

The details of the conference, including place and date, should be given after the title if they do not form part of it.

The standard form for a reference to a paper in the proceedings of a conference is as follows:


If there are several references to the same proceedings, a separate reference may be given for the proceedings, and then the references reduce to:

Author, year. Title of paper. In: Editor year, first-last page numbers.

References are to be arranged in alphabetical order of the name of the author, and in chronological order for each author. If there is more than one reference to an author in one year, then they should be distinguished by giving a letter a, b, c, ... , as a suffix to the year. Papers by a single author should be given before those in which that author is the first of more than two co-authors. The usual rules for arranging names in alphabetical sequence should be applied in so far as they are appropriate for multiple authors.

3.5 Checking

The camera-ready copy should be checked carefully to ensure that all corrections marked on the draft have been carried through correctly without introducing any further errors.

The copy should be examined separately to verify that it conforms with the recommendations on style given above. The abstract and the text should be read again to verify that they are clear, correct and complete.

Final corrections should be made in the manner described above, and should themselves be checked.

4. PACKING AND DESPATCH

The copy should be checked carefully to ensure that it is complete and that all pages of text and any separate illustrations, corrections or other material are clearly and correctly identified.

Camera-ready copy should be protected on both sides by cardboard and placed in a strong envelope of appropriate size or wrapped in carefully sealed paper.

The copy should be sent by airmail (unless local) letter post to the Editor or other person specified by the Editor.
It is important that the separate responsibilities of the author, editor, publisher and subscriber are properly understood. Most of the following notes are of general application, but some apply specifically to JAM publications and do not always apply to other journals that are printed in the United States. A general statement of the obligations of authors, editors and referees (or reviewers) has been issued by the American Geophysical Union (1960); it is reproduced in Appendix A since it is applicable to astronomers as well as to geophysicists. Some, but not all, of the points in it are discussed in more detail in later sections of this manual. The resolution on the improvement of publications that was adopted at the IAU General Assembly in Baltimore in August 1969 is reproduced in Appendix A.

1.21 Author. The author is responsible for submitting the copy for the paper by the scheduled date and in a form that is acceptable to both the editor and the publisher. If the report is the joint work of several persons, they should agree amongst themselves on the contact author who will be responsible for submitting the copy and for any subsequent negotiations with the editor and publisher. The copy will usually consist of a typescript, together with any necessary drawings, photographs and tables, in a format that is specified by the publisher. This material may take the form of camera-ready copy that will be composited, that is set in type (which is now usually on film rather than through metal). It may also, in certain circumstances, be submitted in electronic form, on a magnetic disc or via a computer network.

The author should read carefully any specific instructions provided by the editor or publisher about the length and content of the paper, the format of the copy, and any timetable for submission and subsequent stages of the publication procedure. These instructions may supplement or differ in detail from the recommendations given in this manual.

The author should obtain the agreement of the editor, in advance of submission of the copy, if for any reason he wishes to depart from these instructions in any significant way. The author should inform the typist of any special requirements that are not covered by markings on the draft of the report. All authors are advised to seek critical comments from their colleagues about the content and clarity of the text before preparing the copy that will be submitted to the editor. The author is also responsible for obtaining permission to reproduce copyright material, such as Sky-Survey plates.

The author must ensure that any camera-ready copy is of an appropriate technical quality with respect to the sharpness and uniformity of the characters and the format of mathematical expressions and tables. Unless the author has the use of suitable equipment he should not attempt to prepare a paper that contains a high proportion of complex mathematical expressions (or otherwise requires the use of different typewriters and sizes, especially symbols, and flexible spacing). Instead, for example, he should submit only a summary of such a paper in the proceedings of a conference and submit the full paper to a journal that is printed by conventional methods.

The responsibility for the accuracy of the copy rests with the author but, if it is possible, the copy should also be checked by another person who has not been involved in its preparation. If this is very difficult, and the information density is high (as in formulae, tables and reference lists) or if time is short, the author (or his literary agent) should try to make sure that the copy is correct and clearly marked to indicate the author's intentions.

1.22 Editor. The tasks of the editor of any symposium are clearly defined to plan the structure of the volume and to inform the authors of the conditions under which their contributions should satisfy. Secondly, he must provide advice to referees, whatever the contributions received meet the required standards for quality of content and presentation. If he is not satisfied he should reject the paper or return it for revision or retyping. An editor should not amend a paper in any significant respect without obtaining the agreement of the author; he should not, for example, make extensive alterations to improve the style and construction of the English without permission. On the other hand he should not accept a paper unless he is satisfied that it is appropriate, soundly based, clearly expressed and carefully prepared in accordance with the instructions given to the author. A paper that reaches numerous conclusions should not be rejected solely for that reason: it should be rejected if the author is unable to present the arguments clearly or is unwilling to take into account other relevant evidence.

The editor of a volume that is to be printed from camera-ready copy should not normally accept a paper that is not of an appropriate technical quality. (See the corresponding guidance for authors, above.) If necessary, he should arrange for the preparation of good-quality copy for the summary only, and encourage the author to submit the full paper to a journal printed by conventional methods.

Guidance for the editors of the proceedings of JAU symposia, colloquia and regional meetings is given in the 'Bulletin for Scientific Meetings' in IAU Circular Notice 26 (June 1987); 25-31; extracts are given in Appendix C. The editor is expected to prepare an introduction, table of contents and an index to the volume (B/S 1976a).

1.23 Referee. The refereeing, or reviewing, of typescripts prior to publication is an important step in the task of ensuring that published scientific literature is of a high quality. The criteria that are to be used vary according to the type of the paper, which may, for example, be concerned mainly with the presentation of the results of original research, with a critical review of past research, or with a proposal for a new observational programme. The editor of the journal or other publisher usually provides a list of referees for the referee to consider, but the main criteria are significance, originality and clarity.

All papers should be original in the sense that they do not largely consist of material that has already been (or is to be) published by the author or by another person. The referees should try to verify that the author has cited relevant work he knows but that he has not claimed (directly or indirectly) credit for work for which he was not responsible. (Further guidance on the selection of references is given in section 3.6.)

The referee should verify that the arguments are logical, complete and presented in a manner that will be understandable by the paper's intended readership. He should also check that the terminology, notation, units and designations used are in accordance with the recommendations given later in this manual. He should also judge the completeness and acceptability of papers that report numerical results by reference to the principles listed in section 3.2.3; those principles reflect the views of many scientists who have experience in the use and evaluation of published data. The referee is not, however, expected to check every detail of the paper, although he should draw attention to any errors that he notices and should try to verify that no serious blunders have been made in algebraic or numerical derivations.

Criteria for judgement on significance are not easy to formulate, especially as the importance of an observation or other result may not be apparent until much later when it can be related to other observations or new hypotheses.

1.24 Publisher. The task of the publisher is to ensure, firstly, that the papers are properly arranged in a clear and pleasant format and, secondly, that the complete set is published and distributed as quickly as possible. The publisher's cooperator is expected to check on the copy any further instructions for the printer. These may include minor changes to bring the typescript into conformity with the standard
style for the volume, but he should not alter the text in any significant respect without the mutual agreement of both parties. The proofreading and indexing should be agreed upon between the editor and the publisher.

2. DRAFTING AN ASTRONOMICAL PAPER

2.1 Planning

Important factors that must be taken into account during the drafting of an astronomical paper are the context in which the paper will be published and the length that will be acceptable to the editor; these factors determine the level of knowledge and understanding by the readers that may be assumed and the style and depth of treatment that will be appropriate. In general, papers in the proceedings of conferences should give fairly broad descriptions of the background, methods and results of the investigations; such papers can be fairly brief and can be evaluated by the editor alone. The detailed report on the investigation that provides the basis for the validation of the data and the justification of the conclusions is best suited to a primary journal where it will be more rigorously refereed and where delays in the compilation and acceptance of one paper do not cause delays in the publication of other papers. On the other hand, a conference may be deliberately planned so that all participants are encouraged to develop their subject in depth and so that the proceedings will provide an authoritative review of a particular field. The standard required for the contributions to such volumes will be quite different from those that contain short reports on current research.

In all cases, however, the author should develop the theme and structure of the paper before beginning detailed drafting. The initial outline should include the following items:

(a) the title of the paper;
(b) a list of contributors;
(c) an abstract that summarizes the substance of the paper;
(d) a list of sections and, if appropriate, subsection headings;
(e) a list of key references;
(f) a list of figures (drawings and photographs); and
(g) a list of tables.

This outline should be updated as the drafting progresses and should be used at the end to verify that there are no accidental omissions from the final manuscript. A list of keywords, or other indexing information, should be prepared if required by the journal.

In general, appendices (or annexes) should be included only if they are clear advantages either in not incorporating such material in the main structure or in not publishing it in separate papers. Any appendix that might be cited and reproduced separately from the main paper should include an informative title, an author statement, a brief abstract (not exceeding one paragraph), the substance of the appendix, and a list of any necessary references.

2.2 The preliminaries

The title, author statement, abstract, and keywords are particularly important since they will often be reprinted in abstracts journals and stored in bibliographic databases for use in computer-based information retrieval systems; they are also used for the classification and indexing of the paper.

2.2.1 Title. The title should be clear, informative and concise; it should indicate the character of the paper and the principal topic discussed in it. Short, eye-catching titles that give an inadequate or misleading impression of the subject of the paper should not be used. Titles that are too general should be avoided. (Editors of conference proceedings should examine the titles of contributions with this requirement in mind.) Special characters that are not available on ordinary typewriters, and symbols for names of elements, compounds and physical quantities should normally be avoided in titles. Acronyms and abbreviations should only be given where their significance and meaning will be widely understood.

A short title for use as a headline for the right-hand page should be suggested (or checked for suitability) by the author; it may be assumed that the context, or the names of the authors, will be indicated by the headline on the left-hand page. These headlines are also known as "running heads".

An English translation of the title should be given if the original is written in another language. A French translation may be required for some IAU reports.

2.2.2 Author. The list of the names of the authors of a joint paper should include only those persons who have made significant contributions to its development. (See also section 2.52.) The list should be arranged in alphabetical order unless the authors consider that a different order is appropriate because of the different contributions to the work; for example, the name of a person who has played a dominant role in the work reported or in the writing of the paper may be listed first. In such cases, the editor should not change the sequence. Each name should be given in the form that the author normally uses for scientific purposes so that all contributions in citation indexes will appear together. The affiliation of each author should be given in the form specified by the editor or publisher; the full postal address should be given in the proceedings of IAU symposia and colloquia, and in papers published in most journals.

If a paper has been prepared by an institution or formally constituted workshop group, it is desirable that the principal author or authors should be identified personally in the author statement so as to simplify the citation and referencing of the paper. The role of the person concerned should be indicated briefly; full information about the status of the paper and of those who contributed to it should be given in the introduction to the paper or in the acknowledgement section, if this is more appropriate.

If a paper is not printed in a Latin alphabet, the names of the authors should be transliterated into English in accordance with the appropriate standard; for example, the names of Russian authors should be transliterated from the Russian alphabet according to the scheme given in section 6.31.

2.2.3 Abstract. Every paper should be accompanied by an abstract in the language of the main text and by an abstract in English if the paper is in another language. For some IAU reports a translation of the abstract into French is also useful; the General Secretary should be consulted in individual cases.

An abstract should state briefly the objectives, methods and principal conclusions of the investigation or paper; it should be concise, clear and as comprehensive as is possible, preferably within a length of about 200 words, or less. Original journals allow longer abstracts, but any abstract that is longer than this may be arbitrarily truncated in an abstracts journal or bibliographic database. It should form a continuous text and should not take the form of a list of subject headings; rather, it should summarize in general terms the substance of the paper. Specialist journals should not be used. Any important numerical result should be given, and the nature and extent of the numerical data given in the paper should be indicated; in general, however, the listing of numerical data in the abstract is to be avoided.

The abstract should be understandable without reference to the main text or external source of information. Bibliographic citations and explicit references to figures and tables should not be given; any necessary citation should be given in full. Mathematical formulae, special characters and abbreviations should be avoided; any abbreviation that is not in wide use, but which it is necessary to use for brevity, should be explained on its first occurrence.
2.4 Keywords. A list of keywords is useful for indexing purposes in abstracts journals (and in the volume in which the paper is printed) and for information retrieval from databases that do not include the abstract. A list of terms that are available for this purpose is being prepared by the International Astronomical Union for the Structure and Temperature Abstracts. This is an earlier step of preparation. The indexes to Astronomy and Astrophysics Abstracts provide a useful source of keywords. The indexes to previous volumes of the journal in which a paper is to be published should also be consulted.

The combination of a general term with a specific term (for example, stars: chemical composition) often provides an effective way of specifying a keyword that can also serve as a subject heading for the index of the journal.

2.3 The Text

2.3.1 General guidance. It is not the purpose of this manual to provide instruction in the art of writing English prose. It is, however, appropriate to draw attention to a few points that are particularly important for scientific papers that will be written and read by scientists who are not fluent in English.

(a) Different aspects of the paper (such as objectives, methods and results) should be treated systematically in sections with appropriate headings.

(b) Sentences should be short and simple in construction. Any long and complicated sentence should be examined and then split into shorter sentences, even if this involves inserting a few extra words to link the sentences together.

(c) Short and familiar words should be used in preference to long and unusual words whenever possible. Long compound terms, specialist jargon and slang should be avoided.

In addition to being correct and clear, it is desirable that the text should be consistent in typographical matters such as the use of initial capital letters and the form of abbreviations. Inconsistent or unconventional typographical style, like errors in spelling and syntax, can be distracting to readers even when they are not misleading. The later sections of this manual contain much detailed guidance on such points; for example, the use of capitals for the initial letters of words is discussed in section 6.13. It must be recognised, however, that there are no absolute rules on such matters, and so the guidance given here differs in detail from that given in other publications, such as: AID 1978; ApJ 1963; Butcher 1963; Herbig 1965; Society 1970; Proc Roy Soc 1974; Proc Roy Soc 1975.

Further guidance on the writing of scientific papers and reports and on English usage is given in many books, including: Barone & Schiff 1977; Booth 1950; CE 1953; Ochun et al. 1973; Day 1969; Fowler 1965; Gowers 1982; O'Connor & Woodford 1976; Frontiere-Tall 1974; Strunk & White 1979.

It is particularly important that mathematical formulae and other symbols are presented clearly and correctly, and that the terminology, notation and designations used for astronomical concepts and objects are appropriate. These matters are also discussed in some detail in sections 5 and 7 of this manual.

2.12 Data. It is important that a paper presents numerical data obtained from astronomical observations should contain all the information that is necessary for their use and evaluation. The following principles, which have been developed by experts from many different fields of science, should be followed in the presentation of astronomical papers.

(a) The paper must describe the observational procedures used to obtain the numerical data.

(b) The paper must describe the procedure used to derive the reported results from the actual measurements.

(c) The paper must give the numerical results in a form that is as free from interpretation as possible and in such a manner that the uncertainties of the data can be re-analysed in terms of a hypothesis that is different from that considered by the author.

(d) The data must be presented in such a way that the object, system or phenomena observed and the quantities tabulated can be unambiguously identified and so that the results can be readily related to other data for the same or similar systems.

The basic and implications of these principles are discussed further in the CRAWH 'Guideline for the Presentation of Astronomical Data' (Miklin 1982). The recommendations in this manual on designations (section 5.2) and units (section 8.1) are intended to assure that principle (d) is satisfied.

2.3.3 Conclusions. In general, each paper should include a final section that contains a general discussion of the principal results and of any further conclusions that can be drawn from them. This section should have a separate heading so that it is clearly distinct from the main text. It should not repeat the abstract, although in many respects it may be regarded as an extended abstract.

2.4 Tables and Illustrations

2.4.1 Tables. Careful consideration should be given to the design of tables in order to ensure that they are appropriate for their purpose. Copy for tables should be prepared in accordance with the recommendations given in section 3.4. The most important use of printed tables in astronomical papers is to provide a precise record of observational data in a form that is convenient for use by others. Tables should not normally be used when the objective is to show low precision data, for example, the properties of a system vary with the parameters that are used to characterise it; such relationships are usually best shown in graphical form. Redundancy between tables and graphs should normally be avoided. Similarly, tables should not normally be given when the relationship between respondent and argument can be expressed mathematically in a form that can be easily evaluated by calculators or computers.

Tables that are to be printed, or reproduced on microfiche, should be designed so that they fit conveniently on to the page (preferably in its normal orientation). The characters should be of adequate size, and there should be sufficient space between columns and rows to ensure that there is little risk of confusion in reading the numbers. Always ensure that data are not required to separate adjacent columns or lines. The column headings should be chosen carefully in order to ensure that the significance of each column in clear and the unit of tabulation is unambiguous. For example, it could be given in the form G10, where G is the symbol for the quantity and l0 is the symbol for the unit, including any appropriate power of ten. The sequence of the tabulation should be consistent with the most likely mode of use of the data; if necessary, each line should be numbered serially and appropriate indexes provided. The headings should be repeated if the table occupies more than one page.

Each table should have a caption that includes a title describing the content and scope of the table concisely but explicitly, and a brief statement giving any information that is necessary to define the meaning of the column headings or to specify the method of the tabulation. Notes on individual aspects, including citations, may be given either on the same lines or as footnotes, depending on their length and importance. More detailed explanatory notes may be given in the text, but ideally it should be possible to use each table without reference to the text, and correspondingly, it is usually desirable that the table should be intelligible without explicit reference to the text.

The editor should be consulted before any extensive table is prepared in final form.

2.4.2 Illustrations. The term 'Figure' is used to refer to a line drawing or other graphic image that can be produced by the same photolithographic technique as the text. The term 'plate' is used when the image cannot be reproduced by a special technique (e.g. colour printing) on a separate page; since the extra printing costs may be considerable the editor should be consulted in advance about their inclusion.
Figures should be carefully designed or chosen so that they are suited to their purpose. Theoretical, contour maps, photographs of equipment, and other line drawings should be kept as simple as possible; in particular, drawing titles should be avoided so that the area of the page may be a reasonable size. (It should be borne in mind that such a diagram may be a blackboard in a lecture, and so the heights of the letters and numerals should not be less than 1/4 of the height of the figure). Similarly, photographs should show clearly the object of interest and should not include a lot of confusing or irrelevant detail; colour should not be requested unless it is essential to the understanding of the point being illustrated.

Each illustration should have a caption that includes a concise, informative title and a legend that explains the significance of the symbols and labels used in it. The units in which quantities are measured, the scales of drawings and photographs, and the names of the objects illustrated should be shown clearly and unambiguously. The expressions chosen to label the axes, or to show what is represented by contour lines, should be parsimonious, such as g, y, s, or log(s) for the quantity and μ is the symbol for the unit. Top and right-hand borders with scale marks should always be given with a graph to facilitate the extraction of numerical values from it. Ideally, the illustration, including its caption, should be useful without reference to the text, although further information may be given there. Excessive redundancy between text and caption should be avoided.

2.5 References, footnotes and acknowledgments

2.51 References. The list of references forms an important part of an astronomical paper. Its primary function is to provide a means for those who wish to check the accuracy of the work and to show the diversity of the research. In particular, editors and referees should be discouraged from publishing papers without references to the work of preceding authors, and reviewers should comment on the significance of the papers that are cited and why the authors have not cited the current work. For the first edition, the list of references should be prepared: there is no value in listing papers that give incomplete preliminary accounts of work that has been published in full later or that do not contain any significant new results or insights.

It is now generally recognized that the most effective way of presenting references is by means of a consolidated list at the end of the text of the report, rather than by giving them in the text or as footnotes. Some journals insist on the use of numbered lists in the sequence of citation in the text, but the system adopted is at the discretion of the editor and the list should be in alphabetical/chronological sequence as described in detail in section 4.1.

In the JAI Reports on Astronomy it has been the practice to include in the text the author's name followed by the reference number of the entry in Astronomy and Astrophysics Abstracts. This practice is much less convenient for the user and is not now recommended.

2.52 Footnotes. The use of footnotes to provide additional information or to give the authors' names and thoughts is discouraged. In particular, information pertaining to research grants and other acknowledgment is normally best included in the acknowledgments at the end of the paper. Important information that is not directly relevant to the submission may be inserted in the text. If it is included in the acknowledgments, its conclusions should be given in a note at the end; attention may be drawn to this by the insertion of a simple reference at the appropriate place in the text.

2.53 Acknowledgments. Significant contributions by persons other than the authors to the preparation of the manuscript of the paper may be acknowledged at the end of the paper. Supervision by senior staff is assumed by including them as co-authors. This also applies where a person has provided equipment or software, but has not participated in the use for the investigation being reported. This is also the appropriate place for recording brief details of research grants or contracts when such an acknowledgement is a condition of the award.

Acknowledgments of the sources of copyrighted material may be given with such items or they may be collected together at the end. Authors are reminded that it is their responsibility to obtain permission to reproduce material from other publications that may be subject to copyright.

3. GENERAL DIRECTIONS FOR THE PREPARATION OF COPY

3.1 Preparation of typescripts for camera-ready copy

The following instructions apply specifically to the preparation of camera-ready copy by direct typing or with the aid of a word-processing system in which the output device is a typewriter or other printer with a limited choice of typefaces and of character and line spaces. Authors who use the typesetting software and laser printers aim to produce output that corresponds closely in style to ordinary typescripts so that ordinary readers will not be distracted by glaring differences between papers. In particular, the typefaces and typos (for text and headings) should be similar to those currently used in the series in which the paper is to be printed. Even with these restrictions, the reader will still obtain the subtle benefits of sharpness, proportionally-spaced characters and of better facilities for the setting of mathematical expressions.

3.11 General instructions for the typist. The camera-ready typescript must be absolutely clean and free from creases since it will be photographically reproduced. Whenever possible use the special sheets of paper that are issued by the editor or publisher; those sheets in light blue the frame within which the text must be typed. There are different forms for different series of publications and only the correct style of sheet should be used. If it is necessary to use plain paper, ensure that the typescript is prepared to the correct dimensions on good-quality paper.

Use an electric typewriter or printer that gives sharp characters of even density; dot-matrix printers must not be used unless they are of exceptional high quality. If possible use an elite typeface 12 characters per inch = 40 characters per cm and type the text at single spacing (6 lines per inch = 1 line/cm) on one side only of the sheet. If you have a choice, use a typeface that provides a good differentiation between the numerals zero and one and the letters o and lower case I; avoid using a monospaced font that is in good condition, with clear spaces between columns. Normal black ribbons may be used if they are replaced regularly to avoid fading. Unavailable characters or symbols should be drawn with a thin pen and black permanent ink at the correct size; a few special characters may be formed from two standard characters.

3.12 Corrections. Do not use an eraser on the typing sheets, and do not use white correcting fluids for typing over large errors, as these methods result in bad reproduction. A correction facility on the typewriter may be used for small corrections (if a few characters are involved); if not, it may be used for correcting a single character, but it must be thin and dry so that the over-typed character is of equal density. For large corrections (one whole line or more) it is better to type over the original line on a fresh sheet of typing paper. To correct the line on which it occurs and the following line(s) to the point where the correction begins. It can be placed without disturbing the remainder of the page. Such a correction line should be referred to the original typescript by noting the page number.
and line-number; it is not necessary to place each correction on a separate sheet. Type corrections with the same type-written and typeface on the same style of paper as the original.

3.13 Layout. Type, as far as possible, to the full width and length of the blue frame on the paper supplied by the publisher or to the specified dimensions. Do not leave extra margins within the blue frame. Text should not be justified (aligned on the edge of the right-hand margin) if a typewriter or printer with fixed-width spaces is used. In unjustified text it may be permissible for lines to extend occasionally over the right-hand margin by two or three characters, so as not to break a word unnaturally. The last line may cross the bottom line. In no circumstances should letters or lines be squeezed together to fit them into the printed outline. If possible avoid starting a new paragraph on the last line of a page or giving the last line of a paragraph at the top of a new page.

The layout of the preliminaries (title, authors, abstract) and of headings and paragraphs should conform with the instructions provided by the editor or otherwise indicated on the typing sheet. Typical instructions for papers for IAEI publications are as follows:

The title should be typed in capital letters starting flush left on the fifth line. It should be followed by at least two blank lines.

The names of the authors and their affiliations should be typed in capitals and small letters with an indent of 10 spaces (20mm). Each author's initials should precede the surname (family name). A forename (given name) may be given in full only if the author always uses this style. The affiliation should, where possible, be given in English, and should comprise the name of the Institution (with department if appropriate) and its location. Full stops (otherwise known as 'periods' or 'full points') should be omitted in acronyms, but should be given after initials and abbreviations; commas should not be given at the ends of the lines. If the authors have different affiliations, there should be one blank line between the information for each author (or set of authors at the same institution). The last affiliation should be followed by at least two blank lines.

The word ABSTRACT should be typed flush left in capitals and the text of the abstract should begin on the same line. The abstract should preferably be composed as a single paragraph.

The instructions on the layout of reports to be published in the Transactions of the IAEI are distributed directly to the President of the Commission.

3.14 Headings and subheadings. In IAEI publications the principal sections of the report should be indexed by numbered 'first-order headings' that are typed flush-left in small capitals and capitals. Such each heading should be preceded by two blank lines and followed by one blank line.

Subheadings should be numbered decimally (as in this manual) and typed flush-left in small capitals (except for the first word of the heading) and preceded by a second-order heading (one decimal place) should be preceded by one blank line and followed by one blank line. A third-order heading (two or more decimal places) should be preceded by one blank line, but the following text should be run on in the same line. In general, it is best to avoid more than three levels of numbered headings; two levels are often sufficient even in reports of medium length.

New paragraphs should be preceded by a blank line and should be indented 5 spaces (10 mm) from the left-hand margin. A series or list of items within a paragraph may be indicated by the use of the letters a, b, c, etc., enclosed in parentheses: the first line for each item should be indented by five spaces (10 mm). The item may be separated by blank lines if this appears to be appropriate.

The publisher will normally be responsible for the insertion of running heads (see subsection 2.21) and page numbers. The sheets (or 'folios') of the typescript should be numbered sequentially from 1 in the top right-hand corner of each sheet, using a light-blue pencil.

3.15 Numbering of tables, illustrations and equations. In general, tables, figures and equations should be numbered sequentially in Arabic numerals from 1. Illustrations, such as colour photographs, that are to be reproduced at higher resolution on separate pages as 'plates' may be numbered in the same sequence as figures that are to be printed with the text; in such a case, a reference in the text should be given in this form: "... in figure 23 (Plate 3) ...". For books and long papers with many tables, figures or equations it may be more convenient to the readers if a new sequence of numbers is started with each chapter or principal section; e.g., a cross-reference of the form "Table 3-5" would refer to the fifth table in chapter or section 3.

The number of an equation should be given within parentheses at the end of the line concerned, without brackets between the equation and the number; the cross-reference to the equation should not, however, include the parentheses. Individual equations within a group of related equations may be identified by using a decimal notation; e.g., "Equation 27.31 would refer to the third equation in the group of equations identified at the end of last line of the group by (27). It is not necessary to number an equation, or display mathematical expression, if there are no cross-references to it or if it could be easily identified by reference to the section in which it occurs.

3.16 Illustrations. Appropriate spaces must be left on the sheets of typescript for figures that are to be reproduced with the text. All such figures must be numbered in sequence, using Arabic numerals, and each must have a caption that is complete enough for the illustration to be appreciated without reference to the text. The caption may be typed at the appropriate place in the typescript even though copy for the figure itself may be provided separately. Recommendations on the preparation of the illustrations are given in section 3.5.

3.17 References. The format of citations in the text and bibliographic references in the list should follow the recommendations given in section 4, unless the editor has specified a different system.

3.2 Preparation of typescripts for printer's copy. A typescript that is to be used as printer's copy should be clear and neat so as to reduce the number of errors made by the compositor. (The correction of errors made by the compositor is costly, Lin-composing and a prolific source of further errors.) The typescript should be typed on only one side of the paper, whose size should conform to A4 (210 x 297 mm) or the corresponding American size (279 x 216 mm). It should be double spaced (2.5 mm line/hem) throughout, with adequate margins of at least 40 mm at the left and bottom. Otherwise, the instructions given in the preceding section usually apply.

Corrections must be legible and are best given at the appropriate place in the text, rather than in the margin. Instructions should be given in simple words, rather than by the use of proof-correction marks. White correcting fluid may be used freely, but heavily corrected pages should be retyped. Some publishers pass the typescripts through OCR (optical character recognition) readers to avoid the need for high-quality input of the text by the compositor, and so authors should aim to produce typescripts with the minimum of handwritten corrections.

Special characters and mathematical equations may be written in hand using black ink. Great letters and unusual symbols should be identified separately by marginal notes written in pencil. Further guidance on the presentation of mathematical formulae is given in section 5.2.

Notes for the attention of the editor should be clearly distinguished from text that is part of the presentation in type; for example, they may be encircled and preceded by the words TO EDITOR.

Extra copies should be supplied in accordance with the requirements of the journal.
3.3 Submission of copy in electronic or magnetic forms

Some publishers of astronomical journals and books are considering how best to utilize the new techniques for the transmission of information by electronic means (public telephone system or computer network) or in magnetic forms, such as disks and other floppy discs generated by desk-top computers. The former is appropriate when the 'electronic copy' is to be used to generate typescripts for consideration by the editor and referee; subsequent communications about the paper can also be by electronic mail and the final version can be used directly by the printer either for the production of camera-ready copy or for input to a typesetting system. Disks and other floppy discs may also be used to avoid the necessity for the printer to key in the paper from printer's copy. Disks and other floppy discs are also appropriate if the author is able to use text-processing software to generate a 'compuseript' that contains all the control characters required to specify the typographical format in full detail. Such control characters may be lost or changed if compuseript files are transmitted by electronic means. The author must ensure that the disks and the compuseript files are fully compatible with the system to be used by the printer. The Journal editor or the publisher may be expected to supply appropriate instructions, and possibly software, for the system concerned.

3.4 Preparation of copy for tables

3.4.1 Tables must be carefully designed to suit the method of printing, as well as to be appropriate to their purpose as discussed in section 2.4.

Short tables may be typed directly in camera-ready copy in the appropriate places and with their captions. Tables that do not require the full width of the page could be centred between the margins of the type area. Each table and caption should be typed above the table and to the same width. The caption should include the number of the table (in Arabic numerals) and a concise, informative title; further explanatory notes may be given either immediately after the title or after the table. The body of the table should be typed at single spacing (unless it includes subscripts or superscripts) with blank lines between every five lines (or other appropriate small number) to give greater legibility. At least two, preferably three, blank spaces should be allowed between successive columns. Camera-ready copy for large tables that occupy one page or more will usually be produced directly by a computer printer to save time in preparation and checking. Care must be taken to ensure that such print-outs have good contrast and are of constant density. If possible the caption and column headings should be printed at the same time; otherwise care should be taken to ensure that these are typed in a similar style and density.

Tables that are to be used as printers' copy should be typed at double spacing on separate sheets with their captions. Explicit instructions must be given for column headings, for spacings between columns and blocks of lines, and for any other special features of the table, such as the use of different fonts for arguments or constant respondents. The most appropriate place for the table should be indicated in the margin of the typescript.

Large tables will usually be required in camera-ready form even if the text is to be converted by the printer. Such tables will usually be reduced in size before they are printed and this should be taken into account in their design. The reduction is usually 70% of the original size and the author should ensure that the type size and the line length are consistent and that additional space is left for captions. If necessary, additional space may be provided by reducing the width of the columns. If space is not available, tables should be avoided, if necessary a table may be reproduced in landscape format with a margin of about 1 cm on either side.

3.4.2 Rules. If rules are to be included on camera-ready copy (and they are best avoided), they should be drawn by an expert with the proper tools to ensure uniformity of width and density. Great care is required to ensure that the rules are parallel or perpendicular to the lines of the table.

3.5 Preparation of copy for illustrations

3.5.1 Line drawings must be submitted as originals, drawn in black ink on good-quality tracing paper, draughtsman's film or white matt paper, or as glossy photographic prints. Photocopies, multiplies, Verifax or Xerox copies are not normally acceptable substitutes. In computer-drawn figures it is vital to ensure that the printer or matrix printer produces clean blank lines of an appropriate width and uniform density. Drawings for camera-ready copy must be finished to a size that is compatible with the permitted type area. The drawings will be reduced photographically with the typescript, and the size of lettering and the width of the lines must take this into account (see also subsection 2.4). Lettering should be done with a lettrine stencil or with press-on lettrine; free-hand or typewritten lettering is not recommended.

Drawings for submission with printer's copy should be finished to a size that will allow for a substantial reduction to the final printed size, which may be 50% (or less) of the original size. The thickness of lines and the size of the lettering must take this into account; there should be consistency in thickness and size between all elements in the illustrations. The scale of a drawing or photograph should be indicated in a manner that is independent of the reduction factor.

Each illustration for camera-ready copy should be mounted so that the edges of the illustration (and not the edges of the paper on which it is drawn) are appropriately indented (say 2cm) with respect to the margins or adjacent text. The caption should be typed below the figure and to the same width. Large illustrations may be aligned on the left-hand margin; if it is necessary to turn it to landscape (broadside) format then the top of the illustration should be at the left-hand margin of the page. If, for any reason, it is impossible to provide artwork of the correct finished size, leave enough space in the typescript for the incorporation of the illustration and supply the artwork to the publisher, who will take care of the photographic reduction and mounting.

Illustrations for printer's copy (or unscored illustrations for camera-ready copy) must be marked carefully (in Arabic numerals) and the appropriate orientation indicated if there can be any doubt about it. The place where each illustration would be best inserted should be indicated by a circled note in the margin of the typescript. Captions should be typed on a separate sheet of paper.

3.5.2 Photographs. The reproduction of photographs necessarily involves a slight loss of quality, particularly if the picture has to be enlarged, and so some photographs should be supplied as original prints that are large and glossy and that have good contrast in tone range and between subject and background. Photographs of prints are not acceptable. Photographs of illustrations from printed books and journals do not reproduce well and should be avoided if possible.

Any additional lettering, arrows, or scales should be marked on transparent overlays over the reverse marks. Be careful not to mark or score the photographs or to dent them when writing on the back. The photographs should, however, be appropriately marked so that they can be read clearly and picked up by the copy desk. Black photographs should be marked with a polyaniline pen; the appropriate orientation should be indicated if there can be any doubt about it. Captions must be typed on separate sheets of paper; scale factors should not normally be given in captions as the final reduction factor may not be the same as that expected. Paperclips, pins and staples should not be used to attach overlays or captions to the photographs, which should be protected by keeping them between sheets of cardboard.
3.6 Title pages for proceedings of IAU symposia and colloquia

Editors of the proceedings of symposia and colloquia that have been sponsored by IAU should ensure that the title page contains all the information necessary to identify the conference by the title, or by number, or by place and date. The title page should also give the name(s) and affiliation(s) of the editor(s) and the name and place of the publisher, which may be an observatory or other non-commercial organisation. The basic recommended format (where n represents a number in Arabic numerals) is as follows:

NAME OF UNION IN ENGLISH AND FRENCH

TITLE OF CONFERENCE

IN LARGE CAPITALS

PROCEEDINGS OF THE nTH SYMPOSIUM OF THE INTERNATIONAL ASTRONOMICAL UNION

HELD IN PLACE, COUNTRY

on-mm MONTH nnn

Details of cooperating IAU organisations if appropriate

EDITED BY

NAME IN CAPITALS

AFFILIATION, PLACE, COUNTRY

and

SECOND EDITOR

if appropriate

NAME OF PUBLISHER

PLACE(s) OF PUBLICATION

It is desirable that full information be given on a separate title page when the papers are published in a regular or special issue of a journal or other serial; such a page is useful for classification, indexing and abstracting purposes. If, however, the material is reprinted as a separate book, this title page should also specify the name, volume and date of the journal or serial; this additional information should be given after the name of the editors.

If appropriate, the support of other organisations should be indicated by the words ‘Organized by the IAU in cooperation with...’ in which the list of organisations is limited to the Scientific Unions, the Scientific Committees and Inter-Union Commissions of IAU. Participation of UNESCO will be acknowledged by the following wording at the foot of the title page, ‘Published for the International Council of Scientific Unions with financial assistance from UNESCO’.

3.7 Checking and correcting copy

All copy should be carefully checked before it is sent to the printer, either for reproduction or composition. Any errors left in camera-ready copy will probably appear in the printed version (unless they are noticed by the editor or copyeditor) since proofs are not normally supplied to authors. Non-trivial errors on the printer's copy are likely to appear in print unless an adequate time is allowed for proofreading; trivial errors may be noticed on proof but their correction may itself lead to other errors. If the copy is well written in the printed version, it should be carried out in separate stages: for completeness, for sense, and for detail.

3.7.1 Sense. A refereed or a colleague who comes fresh to the paper is usually in a better position than the author to notice any error or omission of a general character. A sentence may be ambiguous or may not convey the idea intended by the author; a figure may not actually illustrate the effect claimed in the text; a significant fact may have been overlooked either in the investigation itself or in the paper on it; the abstract may not be a proper summary of the paper; or the conclusions may not be justified in the main text. For these reasons the paper should be read critically in order to find faults of this kind before the final copy is sent to the printer.

3.7.2 Detail. The checking to find errors of detail should be carried out quite separately from the more general checks. If possible, separate examinations should be made for the following types of errors:

(a) Errors in numerical values, including dates, in the text, tables and figures: the typed values should be checked independently of the manuscript whenever this is possible; tables should be checked systematically.

(b) Errors in, or omission of, the units associated with numerical values, especially in figures and tables: also the use of units that are not in accordance with the recommendations given in section 5.1.

(c) Errors in references: names, titles, data, volume numbers and page numbers should be checked against the sources cited and not against other lists; the abbreviations for the titles of serials should follow the recommendations given in section 4.4. It is at present unknown for authors to make errors in references to their own papers.

(d) Errors in spelling and in grammar: these may not appear to be important, but their presence is often indicative of a lack of care in other aspects of the preparation of the report, and they may be taken to indicate a lack of thoroughness in the investigation to which the report refers.

(e) Errors and ambiguities in formulas and equations: these may be detected by consistency checks or by reference to original sources.

(f) Errors and ambiguities in the designations of astronomical objects: the principles and recommendations given in section 7 should be followed.

4. Citations and lists of references

The style of citations and bibliographic references described here must be used in all IAU documents: it is the Harvard system. There is, however, no system of referencing that is acceptable to all international organisations. Journal editors are sometimes selective in what they accept, and it is hoped that the system recommended here will be well received by editors of major astronomical journals; it is intended to simplify both typing and reading, and to be appropriate for computer-based information-retrieval systems. It follows in general the standards adopted by many national and international scientific organisations [ASI 1970, 1976, 1984; ICSU AB 1978; IAU 1972, 1974].
4.1 Form of citations in the text

The citation in the text should be sufficient only to identify the appropriate entry in the list of references or to indicate the source of information that cannot be retrieved by the readers. In the former case the citation should identify the author and give the year of publication since these two items are used to determine the sequence of references in the list; the following rules should be followed:

(a) If the name of the author occurs naturally in the text, the year should be given afterwards in parentheses. Otherwise the name of the author and the year should be given in parentheses at the appropriate place in the text, without any punctuation mark between them.

(b) If there are two authors, their names should be linked by an ampersand or by the word 'and' if the symbol & is not available on the typewriter.

(c) If there are three or more authors, the name of the first should be followed by the abbreviation 'et al.', meaning 'and others', even if other such citations refer to papers by the same first author with different sets of other authors.

(d) If two or more authors have the same family name and the references are to the same year, their initials should be given after the family name; otherwise, initials should be omitted in the citation.

(e) If there are two or more references with the same author (or joint author) and year, the letters a, b, c, . . . should be appended to the year to distinguish between them.

(f) If several citations for one author (or joint author) occur at the same place in the text, the years should be separated by semicolons; the name should not be repeated.

(g) If two or more citations for different authors occur at the same place in the text, they should be separated by semi-colons.

(h) If the citation is to a paper (or other source of information) that does not explicitly name the person (or persons) who have written or edited the paper, the citation should give a short name that is sufficient to identify the corresponding entry in the reference list where the full details are given. This short name could be, for example, the acronym for the organization concerned or the name of the chairman of a working group; otherwise the author should be given as 'unknown'.

(i) If there are several citations to different places in the same source document, it is helpful to give in each citation the relevant page or pages after the year. If there are many citations to the same document it may be worthwhile to refer to it in such a way that it is not necessary to repeat the name of the author and the year on each occasion.

(j) The names of authors of papers that are not printed in a Latin-type alphabet should be transliterated in accordance with the recommendations given in section 2.3.

Citations that refer to information that has not been published or that is not otherwise available for reference should give appropriate information about the source in the text, usually in the form: name of person concerned, the year, and the type of communication; examples include: 'in preparation', 'unpublished work', 'personal letter', 'oral communication'. This does not apply if a paper is in press' in the sense that it has been accepted and all bibliographic details except volume and page numbers are given. A reference may be given if the section at which the information was presented can be specified or if an abstract of a paper has been published. If the source of information in an unpublished document is available (for reference or copying) an archive or library, the identification number and place should be given in the list of references in an appropriate format.

4.2 Format of bibliographic references

The information to be given in a bibliographic reference depends on the type of publication concerned.

(a) A full reference to a paper in a serial publication should give the following elements: (1) the name of the author(s) and the year; (2) the title of the paper; and (3) the abbreviated title and volume number of the serial, together with the number of the first and last pages separated by a hyphen. The title of the paper can provide useful information for editors and referees as well as for readers; it is, however, the general practice in IAU publications and in many other journals to omit the title of the paper. Titles of papers may be given in IAU publications if they do not cause thecamera-ready copy to run over another page. The title of the serial should be abbreviated in accordance with the recommendations in section 4.4 unless the publisher insists on the use of a different system. Some journals give only the first page number, but the inclusion of the last page number can be very helpful to readers who do not have easy direct access to the serial concerned.

(b) If the reference is to a monograph by the author cited, then it should contain the following elements: (1) the author and year; (2) the title of the monograph and the edition, if relevant; and (3) the place of publication and the name of the publisher. If the publisher operates in several places it is sufficient to give the name of the first place listed after the publisher's name on the title page of the book; the name of the town should be followed by the name of the country unless it is a well-known city. The name of the town may be omitted if it is included in the name of the publisher. The international standard book number (ISBN) may be given as an aid to identification.

(c) If the reference is to a paper within a book edited by others, then the following elements are to be given: (1) author and year; and (2) the reference for the book as in (b), followed by the page numbers concerned. If, as often occurs, there are only general references to papers in the same book, then the name of the editor should be given. The reference list should be shortened by giving in each case the second element in the form of a citation to a separate reference for the book. In both forms the second element should be preceded by 'in': if the journal allows the inclusion of the title of the paper itself, then this should be given after the first element.

(d) If the reference is to a paper that is published in a book as part of the record of the proceedings of a conference, then the reference should include the name of the conference (s), the title of the conference (if this is not included in the title, the place and date of the conference, and the identification of the publisher (place and name).

The names of the authors should normally be given in the list of references in exactly the same form as in the original papers, except that the initials should always be given after the surname, which should be followed by a comma when two or more authors have the same surname. In multi-authored papers all names after the first eight should be omitted and replaced by 'et al.'.

Items within each element of the reference should be separated from each other by commas; the end of each element should be indicated by a full stop. The title of serials and books should not be underlined in camera-ready copy; they may be typed in italic if this facility is available to the author. Volume numbers should be given in arabic numerals; they should not be underlined, although they may be made bold. Underlining or putting a copy of titles in the name should normally be left to the copyeditor.
Examples of the application of these recommendations are to be found in the list of references at the end of this manual. It is recommended that authors should always refer to the instructions provided by the editor, or to previous issues of the serial, or to other similar books by the same publisher, in order to establish the format to be used in any particular case.

4.3 Sequence of references

In IAU publications, in which the citation in the text is based on the name of the author(s) and the date, the sequence to be adopted in the list of references is based, firstly, on the alphabetical sequence of the surname of the first author, and secondly, on the numerical sequence of the date for each author. The standard alphabetical sequence to be used is as follows:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Accounts and other discursive works should normally be ignored. Any prefix (such as 'van') should be regarded as a part of the surname; a space within the surname should be spelt as 's', and any hyphens should be ignored. No distinction is to be made between upper- and lower-case letters.

All references with the same first author should be collected together, giving firstly those where he is the sole author, arranged in chronological sequence, then those where there are two authors, arranged firstly in the alphabetical sequence of the name of the second author, and secondly in chronological sequence, and finally those where there are three or more authors; within the latter group the sequence may be by date, regardless of the names of the other authors, since they are not specified in the citation in the text. If there are two authors with the same surname then the sequence should be that of their initials. On the other hand, initials should be ignored if the surname of one author begins with the surname of another author; the shorter name should precede the longer name.

The following example illustrates the use of these rules for the sequence of references and for punctuation in the element giving the author(s) and the date.

In the list of references:

Brown, R. J., 1977.
Brown, R., Green, B. V., 1976.
Brown, R., White, C., Green, B. V., 1974.

4.4 Abbreviations to be used for the titles of serials

4.4.1 Standard rules. In the preparation of camera-ready copy for IAU publications, the titles of serials should be abbreviated in accordance with the list given in Astronomy and Astrophysics Abstracts, which is in turn based on the recommendations of the appropriate international organisations (e.g., see ICAR AB 1978). The following guidelines should be adopted for any words not included in this list: (a) articles, conjunctions and prepositions should usually be ignored; (b) a sufficient number of letters of other words should be included to suggest to a scientist the full word and to avoid ambiguity; and (c) the names of places, except principal capital cities, should be given in full. The initial letters of the abbreviations for an adjective should be given in full; for nouns in the singular, except when given in lower case (small type), whereas where there is no part of a proper name. An acronym should normally be used for the name of an organisation unless it is used in the full title of the serial. If a title consists of one word it is usually given in full. A list of the principal abbreviations that are recommended for use in astronomical publications is given in Table 1A.

A full list of recommended abbreviations is given in Astronomy and Astrophysics Abstracts.

B. Short abbreviations used in some astronomical publications.

The space between the base units is important in such a case since $\text{m}^{-1}$ could be interpreted as a frequency of 1000 Hz; a space is not necessary if the preceding SI unit ends in a superscript; a full stop (period) may be inserted between units to remove any ambiguity; the symbol should only be used in simple expressions and must never be used twice in the same compound unit.

<table>
<thead>
<tr>
<th>Table 3. Special names and symbols for SI derived units.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantity</strong></td>
</tr>
<tr>
<td>frequency</td>
</tr>
<tr>
<td>force</td>
</tr>
<tr>
<td>pressure, stress</td>
</tr>
<tr>
<td>energy</td>
</tr>
<tr>
<td>power</td>
</tr>
<tr>
<td>electric charge</td>
</tr>
<tr>
<td>electric potential</td>
</tr>
<tr>
<td>electric resistance</td>
</tr>
<tr>
<td>electric conductance</td>
</tr>
<tr>
<td>electric capacitance</td>
</tr>
<tr>
<td>magnetic flux</td>
</tr>
<tr>
<td>magnetic flux density</td>
</tr>
<tr>
<td>inductance</td>
</tr>
<tr>
<td>luminous flux</td>
</tr>
<tr>
<td>illuminance</td>
</tr>
</tbody>
</table>

(1) The abbreviation sec should not be used to denote a second of time.

The abbreviations for SI units are given in Table 4.
Table 4. Examples of SI derived units with compound names.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>SI unit</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>density (mass)</td>
<td>kilogram per cubic metre</td>
<td>kg m⁻³</td>
</tr>
<tr>
<td>current density</td>
<td>amperes per square metre</td>
<td>A m⁻²</td>
</tr>
<tr>
<td>electric field strength</td>
<td>volt per metre</td>
<td>V m⁻¹</td>
</tr>
<tr>
<td>dynamic viscosity</td>
<td>poise</td>
<td>Pa s</td>
</tr>
<tr>
<td>heat flux density</td>
<td>watt per square metre</td>
<td>W m⁻²</td>
</tr>
<tr>
<td>heat capacity, enthalpy</td>
<td>joule per kelvin</td>
<td>J K⁻¹</td>
</tr>
<tr>
<td>energy density</td>
<td>joule per cubic metre</td>
<td>J m⁻³</td>
</tr>
<tr>
<td>permittivity</td>
<td>farad per metre</td>
<td>F m⁻¹</td>
</tr>
<tr>
<td>permeability</td>
<td>henry per metre</td>
<td>H m⁻¹</td>
</tr>
<tr>
<td>radiant intensity</td>
<td>watt per steradian</td>
<td>W sr⁻¹</td>
</tr>
<tr>
<td>luminance</td>
<td>candela per square metre per steradian</td>
<td>cd m⁻² sr⁻¹</td>
</tr>
</tbody>
</table>

Table 5. SI prefixes and symbols for multiples and submultiples.

<table>
<thead>
<tr>
<th>Submultiple</th>
<th>Prefix</th>
<th>Symbol</th>
<th>Multiple</th>
<th>Prefix</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>10⁻¹</td>
<td>centi</td>
<td>c</td>
<td>10⁻¹</td>
<td>deci</td>
<td>d</td>
</tr>
<tr>
<td>10⁻²</td>
<td>milli</td>
<td>m</td>
<td>10⁻²</td>
<td>micro</td>
<td>µ</td>
</tr>
<tr>
<td>10⁻³</td>
<td>nano</td>
<td>n</td>
<td>10⁻³</td>
<td>pico</td>
<td>p</td>
</tr>
<tr>
<td>10⁻⁶</td>
<td>femto</td>
<td>f</td>
<td>10⁻⁶</td>
<td>atto</td>
<td>a</td>
</tr>
</tbody>
</table>

Note: Decimal multiples and submultiples of the kilogram should be formed by attaching the appropriate SI prefix and symbol to gram and kg, not to kilogram and kg.

5.12 SI prefixes. Decimal multiples and submultiples of the SI units, except the kilogram, are formed by attaching the names or symbols of the appropriate prefixes to the name or symbols of the units. The combination of the symbols for a prefix and unit is regarded as a single symbol which may be raised to a power without the use of parentheses. The recognized list of prefixes and symbols is given in Table 5. These prefixes may be attached to one or more of the unit symbols in an expression for a compound unit and to the symbol for a non-SI unit. Compound prefixes should not be used.

5.13 Non-SI units. It is recognised that some units that are not part of the international system will continue to be used in appropriate contexts. Such units are listed in Table 6; they are either defined exactly in terms of SI units or are defined in other ways and are determined by measurement. Other non-SI units, such as imperial units and others listed in Table 7, should not normally be used.

Table 6. Non-SI units that are recognised for use in astronomy.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Unit Name</th>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>time (1)</td>
<td>minute</td>
<td>min</td>
<td>60 s</td>
</tr>
<tr>
<td>time (2)</td>
<td>hour</td>
<td>h</td>
<td>3600 s = 60 min</td>
</tr>
<tr>
<td>time (3)</td>
<td>day</td>
<td>d</td>
<td>86 400 s = 24 h</td>
</tr>
<tr>
<td>time (4)</td>
<td>year (Julian)</td>
<td>a</td>
<td>31.5567 ns = 365.25 d</td>
</tr>
<tr>
<td>angle (2)</td>
<td>second of arc</td>
<td>°</td>
<td>(1/60) rad</td>
</tr>
<tr>
<td>angle (3)</td>
<td>minute of arc</td>
<td>′</td>
<td>(1/60) rad</td>
</tr>
<tr>
<td>angle (4)</td>
<td>degree</td>
<td>°</td>
<td>(1/100) rad</td>
</tr>
<tr>
<td>angle (5)</td>
<td>revolution (cycle)</td>
<td>°</td>
<td>2π rad</td>
</tr>
<tr>
<td>length</td>
<td>astronomical unit</td>
<td>au</td>
<td>149 597 870 km</td>
</tr>
<tr>
<td>length</td>
<td>parsec</td>
<td>pc</td>
<td>30 857 775 au</td>
</tr>
<tr>
<td>mass</td>
<td>solar mass</td>
<td>M☉</td>
<td>1.989 x 10³³ kg</td>
</tr>
<tr>
<td>mass</td>
<td>unified atomic mass unit</td>
<td>u</td>
<td>1.660 540 x 10⁻²⁵ kg</td>
</tr>
<tr>
<td>energy</td>
<td>electron volt</td>
<td>eV</td>
<td>1.602 x 10⁻¹⁹ W s</td>
</tr>
<tr>
<td>flux density</td>
<td>jouansky (4)</td>
<td>Jy</td>
<td>10⁻²⁹ W m⁻² Hz⁻¹</td>
</tr>
</tbody>
</table>

(1) The alternative symbol is not formally recognised in the SI system.
(2) The symbol is often used for a milliarcsecond (0.001). The unit is not formally recognised in the SI system.
(3) The unit and symbols are not formally recognised in the SI system.
(4) The jansky is only used in radio astronomy.
(5) The degree Celsius (°C) is used in specifying temperature for geological purposes, but otherwise the kelvin (K) should be used.

5.14 Time and angle. The units for non-SI units of time and angle are included in Table 6. The names of the units of angle may be prefixed by 'arc' whenever there could be confusion with the units of time. The symbol for these are to be typed or printed as superscripts immediately following the numerical values; if the last non-SI unit is divided by 100, the decimal point should be placed under, or after, the symbol for the unit; leading zeros should be inserted in non-SI numbers as indicated in the following examples.

- 12° 07' 55.26"
- 00° 19' 05"26" 120° 59' 08"18"

These non-SI units should not normally be used for expressing intervals of time or angle that are to be used in combination with other units.

In expressing the precision or resolution of angular measurement, it is becoming common in astronomy to use the milliarcsecond as the unit, and to represent this by the symbol m as; this is preferable to other abbreviations, but its meaning should be made clear at its first occurrence. The most appropriate SI unit would be the nanoradian (rad = 0.2 mrad). In general, the degree with decimal subdivision is recommended for use when the radius is not suitable and when there is no requirement to use the non-SI unit, for example, to describe an angle in terms of complete revolutions (or rotations or turns or cycles), then the most appropriate symbol appears to be a letter °; this may be used in a superior position as 2° = 360° = 2 rad = 1 rev, but it may be used in a normal position as 2° = 2 2 = 2 0°.

The use of units of time for the representation of angular quantities, such as hour angle, right ascension and sidereal time, is common in astronomy, but it is a source of confusion and error in some contexts, especially in formulae for numerical calculation. The symbol for a variable followed by the superscript for a unit may be used to indicate the numerical value of that variable when measured in that unit.
5.15 Astronomical units. The IAU System of Astronomical Constants recognizes a set of astronomical units of length, mass and time for use in connection with motions in the Solar System; they are related to each other through the adopted values of the gravitational constant in these units (IAU 1976). The symbol for the astronomical unit of length is AU. The unit of time is 1 day (d) of 86 400 SI seconds; the astronomical unit of mass is equal to the mass of the Sun and is often denoted by M☉, but the special symbol AU makes this inconvenient for general use.

An appropriate unit of length for studies of structure of the Galaxy is the parsec (pc), which is defined in terms of the astronomical unit of length (AU). The unit known as the light-year is appropriate to popular expositions on astronomy and is sometimes used in scientific papers as an indicator of distance.

The IAU has used the Julian century of 36 525 days in the fundamental formula for precession, but the more basic unit of time for such purposes and for expressing very long periods in the year. The recognized symbol for a year is the letter a, rather than yr, which is often used in papers in English; the corresponding symbol for a century (bc and cp) should not be used. Although there are several different kinds of year (as there are several kinds of day), it is best to regard a year as a Julian year of 365.25 days (31556 96 sec) unless otherwise specified.

It should be noted that sidereal, solar and universal time are best regarded as measures of hour angle expressed in time measure; they can be used to identify instants of time, but they are not suitable for use as precise measure of intervals of time since the rates of rotation of Earth, on which they depend, are variable with respect to the SI second.

5.16 Obsolete units. It is strongly recommended that the non-SI units listed in Table 7 are no longer used. Some of the units listed are rarely used in current literature, but they have been included for use in the study of past literature. Imperial and other non-metric units should not be used in connection with processes or phenomena, but there are a few situations where their use may be justified (as in "The Hale 200 inch telescope on Mount Palomar"). The equivalent values in SI units should be given in parentheses if this is likely to be helpful.

<table>
<thead>
<tr>
<th>Table 7. Non-SI units and symbols whose continued use is deprecated.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td>length</td>
</tr>
<tr>
<td>length</td>
</tr>
<tr>
<td>length</td>
</tr>
<tr>
<td>area</td>
</tr>
<tr>
<td>volume</td>
</tr>
<tr>
<td>energy</td>
</tr>
<tr>
<td>energy (2)</td>
</tr>
<tr>
<td>pressure</td>
</tr>
<tr>
<td>pressure</td>
</tr>
<tr>
<td>acceleration (gravity)</td>
</tr>
<tr>
<td>gravitational mass</td>
</tr>
<tr>
<td>magnetic flux</td>
</tr>
<tr>
<td>magnetic flux</td>
</tr>
<tr>
<td>magnetic field</td>
</tr>
</tbody>
</table>

The definitions of the SI units and an extensive list of conversion factors for obsolete units are given by Anderson (1981b). In particular, wavelengths should be expressed in metres with the appropriate SI prefix, e.g., for wavelengths in the visual range the nanometre (nm) should be used instead of the angstrom (Å). For incoherent light in frequencies with longer and shorter wavelengths expressed in recognized SI units. The notation of the form X followed by a number (e.g., in the flux which represents the wavelength in angstroms) should also be abandoned. The new name micron and symbol μ should be used instead of minute and μ. In all cases the spelling metre should be used for the unit, while the spelling meter should be used for a measuring instrument (as in micrometer). The word kilometre should be pronounced kilo- meter, not kilo- me- ter.

If wavelengths are stated they should be based on the metre, not the centimetre; in any case the unit (cm² or cm³) should be stated since they are not dimensionless quantities. The units of frequency (in Hz) at radio wavelengths and energy (in eV) at X-ray wavelengths are appropriate for some purposes, but they serve to obscure the essential unity of the electromagnetic spectrum, and so it may be helpful to give the wavelength as well as the first occurrence; the correspondences between these units and wavelengths are as follows:

<table>
<thead>
<tr>
<th>wavelength in metres</th>
<th>= 3·997 924 58 x 10⁸/frequency in hertz</th>
</tr>
</thead>
<tbody>
<tr>
<td>or</td>
<td>= 1·339 842 4 x 10⁶/energy in electron-volts</td>
</tr>
</tbody>
</table>

5.17 Magnitude. The concept of apparent and absolute magnitude in connection with the brightness or luminosity of a star or other astronomical object will continue to be used in astronomy even though it is difficult to relate the scale of magnitude to photometric measures in the SI system. Magnitude, being the logarithm of a ratio, is to be regarded as a dimensionless quantity; the name may be abbreviated to mag without a full stop, and it should be written without a number. The use of a superscript (°) is not recommended. The method of determination of a magnitude or its wavelength range may be indicated by appropriate letters in italic type as in L, B, V. The photometric system used should be clearly specified when precise magnitudes are given.

5.2 Symbols, formulas and technical abbreviations

5.2.1 Symbols. Particular attention must be paid during the preparation of both camera-ready copy and printer’s copy to the presentation of symbols, especially the use of the typewriter or printer being used has only a normal keyboard. In preparing a manuscript for a typist, the author should be careful to distinguish between the following characters which may be confused when written carelessly or in script.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>angle</td>
</tr>
<tr>
<td>g</td>
<td>gram</td>
</tr>
<tr>
<td>ê</td>
<td>electric field strength</td>
</tr>
<tr>
<td>n</td>
<td>number</td>
</tr>
<tr>
<td>ê</td>
<td>electric flux density</td>
</tr>
<tr>
<td>n</td>
<td>number</td>
</tr>
<tr>
<td>ê</td>
<td>magnetic flux density</td>
</tr>
<tr>
<td>n</td>
<td>number</td>
</tr>
<tr>
<td>ê</td>
<td>magnetic field strength</td>
</tr>
<tr>
<td>n</td>
<td>number</td>
</tr>
</tbody>
</table>

The author should mark clearly superscripts and subscripts, and distinguish between a subscript figure 1 and a comma, and between a superscript figure 1 and a prime (single quote).

Most typewriters and printers do not distinguish between the upper-case letter 1 and the lower-case letter l; or between the figure zero 0 and the letter o; or between typos, dubs and miss signs. These ambiguities are of no consequence on camera-ready copy if the meaning is clear from the context, but the differences can be important in designations, and so authors should give the reader if confusion could occur. Printer’s copy should be marked appropriately so that the compositor will use the correct typefaces.

Characters or symbols that are not available on the typewriter or printer (either directly or by combining two simpler characters), should be drawn carefully or camera-ready copy with a thin pen and black permanent ink. This applies also to printer’s copy that contains only simple mathematical formulas and few special symbols.
5.21 Variables. Characters for mathematical variables that are to be set in italic should be marked by underlining in pencil in the text, but it is not normally necessary to repeat such characters in displayed equations since the compositor should be aware of the standard rules. Functional operators, such as sin, cos, exp, log, are always set in roman type. Characters for variables that are to be set in bold type should be marked by a very underlining, or by a general instruction that is unambiguous. Underlining on camera-ready copy is best avoided, but it may be necessary in some cases to avoid ambiguity.

5.22 Formulas. Authors should lay out formulas in such a way as to simplify the typing or composition and to avoid ambiguity; for example:

\[ y^x \text{ or } y/\sqrt{x} \]

5.23 Chemical and spectroscopic symbols. The symbols for chemical elements are printed in upright type; the first letter only is a capital, as in Ca; and the symbol is not followed by a full stop. The nuclear number may be indicated as a left superscript, as in \(^{40}\)K, while the atomic number may be indicated by a left subscript, as in \(^{40}\)Ca. The use of Roman numerals is still common in astronomy, but should be avoided, except perhaps in such terms as "III regions".

5.24 Particles and quanta. Uppercase letters are used to indicate the various types of particle and quanta. Capital Greek letters are used for hypervar and lower-case Greek letters are used for mesons. Lower-case letters are used for nucleons.

- Electron \(e\)
- Positron \(\bar{e}\)
- Neutron \(n\)
- Proton \(p\)
- Deuteron \(d\)
- Muon \(\mu\)
- Photon \(\gamma\)

The charge of a particle is indicated by the appropriate sign as a superscript, as in \(e^+\), \(e^-\). If no sign is shown then \(e\) refer to positive protons and negative electrons, respectively. Antiparticles are indicated by an overline above the symbol for the particle, as \(\bar{e}\) for an antineutrino.

The symbol representing the particles involved in a nuclear reaction should be specified in the following form.

- Initial \((n, p)\) \(\rightarrow\)
- Final \((\alpha, \gamma)\) \(\rightarrow\)
- Total \((\text{nuclides})\) \(\rightarrow\)

For example: \(^{14}\)N \((\alpha, p)\) \(\rightarrow\) \(^{18}\)O \((\text{nuclides})\) \(\rightarrow\)

5.25 Astronomical symbols and names. In general, the special symbols for the names of planets, stars, or astronomical phenomena, such as conjunctions, should not be used. (A key should always be given if any such special symbols are used.) The names of planets, bright stars and other individual objects should be spelled with initial capital letters, but alphabetical terms should begin with a small letter, as: Jupiter, jovian satellites; the Galaxy, galactic coordinates.

In the column headings of tables, for example, the following symbols may be used for the names of the principal planets.

- Mercury \(M\)
- Venus \(V\)
- Earth \(E\)
- Mars \(M\)
- Jupiter \(J\)
- Saturn \(S\)
- Uranus \(U\)
- Neptune \(N\)
- Pluto \(P\)

The Bayer designations of bright stars should be printed in upright type with lower-case Greek letters followed by the standard three-letter abbreviations for the names of the constellations that are given in Table 11. If Greek type is not available, the English name of the Greek letter should be spelt out in full. The English names for the letters of the Greek alphabet are given in section 5.32. General rules for the designation of astronomical objects are given in section 7.

The spectral classifications of stars and other similar symbols and abbreviations should be printed in upright type; as in B and O. Abbreviations for the types of catalogues are expressed in upright type without full stops, as in PKS and SDO.
5.26 Dates and times. The instant at which an event (such as an observation) occurred is usually best represented by giving either the Julian date (JD) with an appropriate number of decimal places or the calendar date followed by the time of day in conventional form. In an astronomical context the calendar date is best expressed in the sequence year-month-day; and this sequence should always be used in accordance with the international standard (ISO 2014:1976) if the date is expressed in purely numerical form. The months and days should be represented by two-digit numbers from 01 to 12 for January to December, as in Table 6, and from 01 to 31 for the days of the month; roman numerals should not be used. This sequence is the most convenient for use in computers; for example, dates (including time of day) can be sorted into chronological sequence by treating them as if they were decimal numbers; it also avoids the ambiguity associated with the alternative systems used in Europe and the USA in which, for example, 5/3/88 could mean either 5 March or May 3, 1988. On the printed page the elements of the date (and time) should be separated by spaces or hyphens. In appropriate contexts, such as in epheides, the value for the day of the month may be outside the normal range, it is then understood to refer to the preceding or following month; for example, 1989 December 31 may be represented as 1989 January 0. Abbreviations for the names of the months are given in Table 6.

---

Table 6. Abbreviations for the names of the months.
The recommended abbreviations for the names (in English and French) of the months of the Julian and Gregorian calendars are given below; 3/4-letter abbreviations should be used in text, but the language-independent two-letter abbreviations may be used in tables.

<table>
<thead>
<tr>
<th>English</th>
<th>French</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan.</td>
<td>Jan. JR</td>
</tr>
<tr>
<td>Feb.</td>
<td>Feb. FE</td>
</tr>
<tr>
<td>Mar.</td>
<td>Mars MR</td>
</tr>
<tr>
<td>Apr.</td>
<td>Apr. AR</td>
</tr>
<tr>
<td>May</td>
<td>Mai MA</td>
</tr>
<tr>
<td>June</td>
<td>Jun. JN</td>
</tr>
</tbody>
</table>

English | French
01 | 07 July | Juli JL
02 | 08 Aug. | Augt. A|
03 | 09 Sep. | Sep. SEP |
04 | 10 Oct. | Oct. OT |
05 | 11 Nov. | Nov. NO |
06 | 12 Dec. | Dec. DEC. |

It is essential that the basis of the date and time system used for reporting observations or predictions be clearly stated since no system is free from ambiguity. The current Gregorian calendar was first introduced in 1582 but the Julian calendar continued to be used in some countries for several centuries. The Julian calendar may be used for specifying calendar dates before it was adopted; it is then referred to as the Julian proleptic calendar. References to calendar dates earlier than, say, 1600 should specify which calendrical system is being used. The calendar year 1 BC is followed by the year AD in the ordinary historical usage; for astronomical purposes it is convenient to denote the year 1 BC as year 0 and, more generally, the year n BC as year -(n+1).

The precision with which the time should be specified varies according to the circumstances, but it should be borne in mind that an observation may be used in many different contexts. For most purposes, current observations should be reported in the system of coordinated universal time (UTC), but the difference from universal time (UT) is less than one second and may often be ignored. Observations that are timed very precisely and that span several years may be better reported in the system of international atomic time (TAI) since this is free from step-adjustments. Current papers that deal with observations made before 1975 should specify what assumptions, if any, have been made in reducing the timescale used in the original report to that used in the new paper. For example, the adopted values of the difference between clock time and UT or between ephemeris time (ET) and UT should be stated.
6. LANGUAGE, SPELLING AND TRANSLATION

6.1 Use of various languages

6.11 Languages used by IAU. The scientific and administrative reports of the IAU are published in English or in French, whereas in both languages the bibliographic references shall be transliterated into the Latin alphabet where necessary. Certain items, such as speech acts at official openings, may be published in other languages and alphabets (or ideographs). American or British spelling and syntax may be used in English texts provided that one system is used consistently in each text and that no ambiguity of meaning is introduced.

6.12 Accents and diacritical marks should be given whenever this is customary; they should be marked carefully on camera-ready copy using a thin pen if they are not available on the typewriter or printer. Accents are usually omitted from capital letters in French.

6.13 Initial capitals. The use of capital letters for the initial letters of words is much more common in English (and German) than in French. It is recommended that the following rules be adopted in both languages in IAU publications. The initial letter of a word should be typed or printed as a capital in the following cases: the first word of a sentence or title; names and titles of persons, but small letters are usually used in acronyms or words used as an adjective or as the name of a unit, unless it forms part of the name of an individual object (Sedna, Newton, telescope). Initial capital letters should not be used for physical quantities and concepts such as right ascension; in English they are, however, normally used for languages and nationalities. Initial capitals are usually used in references to tables, figures and equations in order to highlight them.

6.14 Hyphens are used for three principal purposes: (a) to form a compound word that represents a new concept, (b) to link words that are used together as an adjective, and (c) to indicate that a word has been split at the end of a line. There are, unfortunately, no rules that are usually accepted and free from difficulty, but some guidance may be given for each type of usage.

(a) A hyphen appears to be a growing tendency to omit the hyphen when two words are combined together to form a new concept, such as database or postcard; many common combinations continue, however, to be printed as two separate words. Hyphens are usually omitted after prefixes, even in such words as coordinate.

(b) A hyphen should normally be included in a compound adjective when one of the two words is a noun, as in second-decisecond and 4.2-meter telescope, even though the two words would not otherwise be joined by a hyphen.

(c) Long words at the ends of lines may be split between syllables in order to avoid excessive interword spacing in justified text; a hyphen is then inserted at the end of the line, not at the beginning of the next line. Each part of the word should include at least three letters.

6.15 Inverted commas or primes are used to indicate the beginning and end of a direct quotation from another text and to highlight a particular word or phrase. If a quotation is displayed there is no need to enclose it in inverted commas; it may be indented or printed in a smaller typeface. Attention may be drawn to a word or phrase by printing it in italics. These different uses of inverted commas may be distinguished by the use of double primes as in "this is a quotation", and by the use of single primes to indicate a 'highlight', a colloquialism, or the title of a book. It should be noticed that the punctuation of the main sentence should be outside the inverted commas. Single primes should be used for both usages if the typewriter does not have a double prime as a single character.
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC</td>
<td>American Astronomical Society</td>
</tr>
<tr>
<td>AG</td>
<td>Astronomische Gesellschaft (Germany)</td>
</tr>
<tr>
<td>AIG</td>
<td>American Geophysical Union</td>
</tr>
<tr>
<td>AIA</td>
<td>American Institute of Aeronautics and Astronautics</td>
</tr>
<tr>
<td>AGIU</td>
<td>Association Internationale de l'Astronomie</td>
</tr>
<tr>
<td>AIS</td>
<td>American Astronomical Society of Australia</td>
</tr>
<tr>
<td>ASP</td>
<td>Astronomical Society of the Pacific</td>
</tr>
<tr>
<td>ASA</td>
<td>Astronomical Society of South Africa</td>
</tr>
<tr>
<td>BAD</td>
<td>British Astronomical Association</td>
</tr>
<tr>
<td>BIP</td>
<td>Bureau International de l’Heure</td>
</tr>
<tr>
<td>CIP</td>
<td>Bureau International des Poids et Mesures</td>
</tr>
<tr>
<td>CITE</td>
<td>Comité Consultatif International des Radiocommunications</td>
</tr>
<tr>
<td>COG</td>
<td>Comité de Coopération Radio (Strasbourg, France)</td>
</tr>
<tr>
<td>CEST</td>
<td>Committee on Extraterrestrial Exploration</td>
</tr>
<tr>
<td>CENS</td>
<td>Comité National des Études Spatiales (France)</td>
</tr>
<tr>
<td>COGEO</td>
<td>Committee on Data for Science and Technology (ICES)</td>
</tr>
<tr>
<td>COSS</td>
<td>Committee on Space Research (ICRS)</td>
</tr>
<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
</tr>
<tr>
<td>EPS</td>
<td>European Physical Society</td>
</tr>
<tr>
<td>ESA</td>
<td>European Space Agency</td>
</tr>
<tr>
<td>ESO</td>
<td>European Southern Observatory</td>
</tr>
<tr>
<td>FAS</td>
<td>Federation of Astronomical and Geophysical Data Analysis Services</td>
</tr>
<tr>
<td>GSFC</td>
<td>Goddard Space Flight Center (USA)</td>
</tr>
<tr>
<td>IAG</td>
<td>International Association of Geophysics</td>
</tr>
<tr>
<td>IAGA</td>
<td>International Astronautical Federation</td>
</tr>
<tr>
<td>IAA</td>
<td>International Astronomical Union</td>
</tr>
<tr>
<td>ICSTI</td>
<td>International Council for Scientific and Technical Information</td>
</tr>
<tr>
<td>ICSSU</td>
<td>International Council of Scientific Unions</td>
</tr>
<tr>
<td>ICSU</td>
<td>International Council of Scientific Unions</td>
</tr>
<tr>
<td>ICSU-3</td>
<td>Replacing Board of ICUS; now replaced by ICSU</td>
</tr>
<tr>
<td>IEK</td>
<td>Institute of Electrical and Electronics Engineers (USA)</td>
</tr>
<tr>
<td>IERS</td>
<td>International Earth Rotation Service</td>
</tr>
<tr>
<td>INFRAC</td>
<td>Information Services for the Physical and Engineering Communities</td>
</tr>
<tr>
<td>IPS</td>
<td>International Polar Year Service; now replaced by IES</td>
</tr>
<tr>
<td>INCO</td>
<td>International Standards Organization</td>
</tr>
<tr>
<td>ISTU</td>
<td>International Telecommunication Union</td>
</tr>
<tr>
<td>IUPAC</td>
<td>Inter-Union Committee on Nomenclature for Radio and Space Science</td>
</tr>
<tr>
<td>ICUC</td>
<td>Inter-Congress Committee on Astronomy and Astrophysics</td>
</tr>
<tr>
<td>IUI</td>
<td>Inter-Union Commission on Solar-Terrestrial Physics</td>
</tr>
<tr>
<td>IUGP</td>
<td>International Union of Geodesy and Geophysics</td>
</tr>
<tr>
<td>IUGS</td>
<td>International Union of Physics of Science and Application of Science</td>
</tr>
<tr>
<td>IUPAP</td>
<td>International Union of Pure and Applied Chemistry</td>
</tr>
<tr>
<td>IUPAPBP</td>
<td>International Union of Pure and Applied Physics</td>
</tr>
<tr>
<td>IUTAM</td>
<td>International Union of Theoretical and Applied Mechanics</td>
</tr>
<tr>
<td>IUGG</td>
<td>International Union of Geodesy and Geophysics</td>
</tr>
<tr>
<td>JOBS</td>
<td>Joint Organisation for Solar Observations</td>
</tr>
<tr>
<td>JPL</td>
<td>Jet Propulsion Laboratory (USA)</td>
</tr>
<tr>
<td>MIT</td>
<td>Massachusetts Institute of Technology (USA)</td>
</tr>
<tr>
<td>MPI</td>
<td>Max Planck Institute (Germany)</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics and Space Administration (USA)</td>
</tr>
<tr>
<td>NSF</td>
<td>National Science Foundation (USA)</td>
</tr>
<tr>
<td>RAS</td>
<td>Royal Astronomical Society (UK)</td>
</tr>
<tr>
<td>RASC</td>
<td>Royal Astronomical Society of Canada</td>
</tr>
<tr>
<td>RAMA</td>
<td>Royal Astronomical Society of New Zealand</td>
</tr>
</tbody>
</table>

**Table 9. Acronyms for the names of organisations (continued).**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAAO</td>
<td>South African Astronomical Observatory</td>
</tr>
<tr>
<td>SAV</td>
<td>Société Astronomique de France</td>
</tr>
<tr>
<td>SAC</td>
<td>Società Astronomica Italiana</td>
</tr>
<tr>
<td>SNO</td>
<td>Smithsonian Astrophysical Observatory (USA)</td>
</tr>
<tr>
<td>SENC</td>
<td>Science and Engineering Research Council (UK)</td>
</tr>
<tr>
<td>SPARO</td>
<td>Solar Particle and Radiation Monitoring Organization</td>
</tr>
<tr>
<td>UNII</td>
<td>Union Astronómica Internacional</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>USNCOC</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
</tr>
<tr>
<td>URSC</td>
<td>Union Radio-Scientifique Internationale</td>
</tr>
<tr>
<td>WDC</td>
<td>World Data Center</td>
</tr>
<tr>
<td>WMO</td>
<td>World Meteorological Organization</td>
</tr>
</tbody>
</table>

**Table 10. Acronyms for astronomical activities and publications.**

The following acronyms for some astronomical activities and publications are in common use, but the meanings of these and other similar acronyms should be given on first use in any context where they may not be familiar to most readers.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>Astronomy and Astrophysics Abstracts</td>
</tr>
<tr>
<td>AGA</td>
<td>Astronomical Society of the Pacific Journal</td>
</tr>
<tr>
<td>AIB</td>
<td>Astronomischer Jahrbuch</td>
</tr>
<tr>
<td>APPS</td>
<td>Annual Reports of Fundamental Stars</td>
</tr>
<tr>
<td>BDR</td>
<td>Bonner Discoverer</td>
</tr>
<tr>
<td>BSC</td>
<td>Bright Star Catalogue (Vale)</td>
</tr>
<tr>
<td>CG</td>
<td>Cordoba Conferences</td>
</tr>
<tr>
<td>CMW</td>
<td>Cosmic microwave background</td>
</tr>
<tr>
<td>CPO</td>
<td>Cape Photographic Database</td>
</tr>
<tr>
<td>KFA</td>
<td>Fundamental Catalogue Number n</td>
</tr>
<tr>
<td>GC</td>
<td>General Catalogue (Washington, 1997)</td>
</tr>
<tr>
<td>GCVS</td>
<td>General Catalogue of Variable Stars</td>
</tr>
<tr>
<td>HDS</td>
<td>Henry Draper Catalogue</td>
</tr>
<tr>
<td>HDS</td>
<td>Henry Draper Catalogue Extension</td>
</tr>
<tr>
<td>HSRO</td>
<td>High-Sensitivity Astronomical Observatory</td>
</tr>
<tr>
<td>HS</td>
<td>Hamburg-Bonn Survey</td>
</tr>
<tr>
<td>HS</td>
<td>Harvard Revised Photoelectric Catalog</td>
</tr>
<tr>
<td>HST</td>
<td>Hubble Space Telescope</td>
</tr>
<tr>
<td>IC</td>
<td>Index Catalogue of Nebulae...</td>
</tr>
<tr>
<td>IDS</td>
<td>Index Catalogue of Visual Double Stars</td>
</tr>
<tr>
<td>IGY</td>
<td>International Geophysical Year (1957/58)</td>
</tr>
<tr>
<td>IGSY</td>
<td>International Geophysical Year (1964/5)</td>
</tr>
<tr>
<td>ITAS</td>
<td>Infrared Astronomical Satellite</td>
</tr>
<tr>
<td>IUE</td>
<td>International Ultraviolet Explorer satellite</td>
</tr>
<tr>
<td>ISAV</td>
<td>International Ultraviolet Explorer satellite</td>
</tr>
<tr>
<td>KER</td>
<td>Kruger Earth-Rotation and Interferometry Satellite</td>
</tr>
<tr>
<td>KER</td>
<td>Kruger Earth-Rotation and Interferometry Satellite</td>
</tr>
<tr>
<td>LNG</td>
<td>New General Catalogue of Nebulae...</td>
</tr>
<tr>
<td>MDR</td>
<td>Magnetic Dipole Radiation (Also known as hydrogen)</td>
</tr>
<tr>
<td>NFT</td>
<td>National Fairfield Telescope</td>
</tr>
<tr>
<td>PC</td>
<td>Purple Mountain Observatory</td>
</tr>
<tr>
<td>SAG</td>
<td>Smithsonian Astrophysical Observatory Star Catalog</td>
</tr>
<tr>
<td>SIR</td>
<td>Systemic Identification and Reference Database</td>
</tr>
<tr>
<td>SED</td>
<td>OBS Database: Set of Identities, Measurements, and Bibliography for Observational Data</td>
</tr>
<tr>
<td>SRS</td>
<td>Southern Survey System</td>
</tr>
<tr>
<td>VLB</td>
<td>Very-long-baseline radio interferometer</td>
</tr>
<tr>
<td>WAMS</td>
<td>VLA Digital Main Sequence database</td>
</tr>
</tbody>
</table>
Table 11. Names and standard abbreviations of constellations.
The following list of constellation names and abbreviations is in accordance with those of the International Astronomical Union (IAU, 1970; 1982; 1989, 1991). The boundaries of the constellations are fixed at 10 degrees latitude. Right ascension and declination are for the mean equinox of 1950.0.

<table>
<thead>
<tr>
<th>Nominative</th>
<th>Genitive</th>
<th>Nominative</th>
<th>Genitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andromeda</td>
<td>Andromeda</td>
<td>Lacerta</td>
<td>Lacerta</td>
</tr>
<tr>
<td>Antlia</td>
<td>Antlia</td>
<td>Leo</td>
<td>Leo Minor</td>
</tr>
<tr>
<td>Aquarius</td>
<td>Aquarius</td>
<td>Libra</td>
<td>Libra Minor</td>
</tr>
<tr>
<td>Aquila</td>
<td>Aquila</td>
<td>Lyr</td>
<td>Lynx</td>
</tr>
<tr>
<td>Aries</td>
<td>Aries</td>
<td>Lyr</td>
<td>Lynx</td>
</tr>
<tr>
<td>Argo</td>
<td>Argo</td>
<td>Monoceros</td>
<td>Monoceros</td>
</tr>
<tr>
<td>Aurochs</td>
<td>Aurochs</td>
<td>Musca</td>
<td>Musca</td>
</tr>
<tr>
<td>Camelopardalis</td>
<td>Camelopardalis</td>
<td>Norma</td>
<td>Norma</td>
</tr>
<tr>
<td>Cancer</td>
<td>Cancer</td>
<td>Octans</td>
<td>Octans</td>
</tr>
<tr>
<td>Canis Major</td>
<td>Canis Major</td>
<td>Orione</td>
<td>Orione</td>
</tr>
<tr>
<td>Canis Minor</td>
<td>Canis Minor</td>
<td>Ori</td>
<td>Ori</td>
</tr>
<tr>
<td>Capricornus</td>
<td>Capricornus</td>
<td>Pavo</td>
<td>Pavo</td>
</tr>
<tr>
<td>Carina</td>
<td>Carina</td>
<td>Pegasi</td>
<td>Pegasi</td>
</tr>
<tr>
<td>Cassiopeia</td>
<td>Cassiopeia</td>
<td>Perseus</td>
<td>Perseus</td>
</tr>
<tr>
<td>Centaurus</td>
<td>Centaurus</td>
<td>Phoenix</td>
<td>Phoenix</td>
</tr>
<tr>
<td>Cepheus</td>
<td>Cepheus</td>
<td>Pictoris</td>
<td>Pictoris</td>
</tr>
<tr>
<td>Chamaeleon</td>
<td>Chamaeleon</td>
<td>Piscis</td>
<td>Piscis</td>
</tr>
<tr>
<td>Circinus</td>
<td>Circinus</td>
<td>Puppis</td>
<td>Puppis</td>
</tr>
<tr>
<td>Columba</td>
<td>Columba</td>
<td>Pyxis</td>
<td>Pyxis</td>
</tr>
<tr>
<td>Crux</td>
<td>Crux</td>
<td>Sagitta</td>
<td>Sagitta</td>
</tr>
<tr>
<td>Cygnus</td>
<td>Cygnus</td>
<td>Scutum</td>
<td>Scutum</td>
</tr>
<tr>
<td>Delphinus</td>
<td>Delphinus</td>
<td>Serpens Caput</td>
<td>Serpens Caput</td>
</tr>
<tr>
<td>Dorado</td>
<td>Dorado</td>
<td>Serpens Cauda</td>
<td>Serpens Cauda</td>
</tr>
<tr>
<td>Draco</td>
<td>Draco</td>
<td>Serpens Australe</td>
<td>Serpens Australe</td>
</tr>
<tr>
<td>Eridanus</td>
<td>Eridanus</td>
<td>Sexentarum</td>
<td>Sexentarum</td>
</tr>
<tr>
<td>Equuleus</td>
<td>Equuleus</td>
<td>Triangulum</td>
<td>Triangulum</td>
</tr>
<tr>
<td>Eridanus</td>
<td>Eridanus</td>
<td>Triangulum Australe</td>
<td>Triangulum Australe</td>
</tr>
<tr>
<td>Fornax</td>
<td>Fornax</td>
<td>Vela</td>
<td>Vela</td>
</tr>
<tr>
<td>Geminorum</td>
<td>Geminorum</td>
<td>Vela</td>
<td>Velorum</td>
</tr>
<tr>
<td>Gruis</td>
<td>Gruis</td>
<td>Virgo</td>
<td>Virgo</td>
</tr>
<tr>
<td>Hyades</td>
<td>Hyades</td>
<td>Volans</td>
<td>Volans</td>
</tr>
<tr>
<td>Hydra</td>
<td>Hydra</td>
<td>Volans</td>
<td>Volans</td>
</tr>
<tr>
<td>Indus</td>
<td>Indus</td>
<td>Vulpecula</td>
<td>Vulpecula</td>
</tr>
</tbody>
</table>

In modern usage Argo is divided into Carina, Puppis, and Vela.

Auriga is sometimes used, both nominative and genitive.

Serpens may be divided into Serpens Caput and Serpens Cauda.

Notes:
1. "Auriga" is an alternative form of "Auriga".
2. "Hyades" is an alternative form of "Hyades".
3. "Vela" is an alternative form of "Vela".
4. "Hydra" is an alternative form of "Hydra".
5. "Vulpecula" is an alternative form of "Vulpecula".

Table 12. The Greek alphabet.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Greek</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Α</td>
<td>Alpha</td>
<td>A</td>
</tr>
<tr>
<td>Β</td>
<td>Beta</td>
<td>B</td>
</tr>
<tr>
<td>Γ</td>
<td>Gamma</td>
<td>C</td>
</tr>
<tr>
<td>Δ</td>
<td>Delta</td>
<td>Δ</td>
</tr>
<tr>
<td>Ε</td>
<td>Epsilon</td>
<td>E</td>
</tr>
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<td>Ξ</td>
<td>Xi</td>
<td>X</td>
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<tr>
<td>Ο</td>
<td>Omega</td>
<td>O</td>
</tr>
</tbody>
</table>

* "Ω" is an alternative form of "ω" for use in mathematics.
The following precepts should be followed in constructing the positional component of a new designation:

- Give truncated coordinates (not rounded);
- Give explicitly leading zeros and the sign of declination or latitude;
- Give decimal points if appropriate, but do not include spaces between the numerals;
- Give right ascension (in time units) before declination (in arc units) in the format hms,ss,sn.nn.nn, s, or give galactic longitude and latitude (both in degrees and decimals) with the prefix G in the format GGGG.ddd.ddddd d;
- Precede the right ascension with the letter J to indicate that the position is for the reference system of Julian epoch J2000.0 or with B for the system of Besselian epoch B1950.0.

Designations including positions should not be changed each time better positions are determined. Supplementary indicators may be added to distinguish between close objects, to indicate association with a larger body, or to specify other object parameters.

The designations of individual objects inside a larger object should specify first the larger object followed by a colon (:) and then an appropriate type or catalogue code and the coordinates or number for the object itself.

Temporary designations may be based on identifications on a finding chart; it is important that the coordinate system, scale and orientation (i.e., and k-n) of the chart be indicated clearly.

A Working Group of IAU Commission 34 has developed a note on "specifications concerning names, designations, and nomenclature for astronomical radiation sources outside the solar system"; it is reproduced in appendix D. The generalised form of a designation is specified as:

\[ \text{Origin} / \text{Sequence} / \text{Specifier} \]

where \( \_ \) denotes a blank space; \( \text{Origin} \) and \( \text{Sequence} \) must be given, but a \( \text{Specifier} \) is optional. The \( \text{Origin} \) is the code name for the catalogue or type of source; the \( \text{Sequence} \) is the reference number in the catalogue or the positional information; whereas the \( \text{Specifier} \) may contain supplementary information to assist in the identification of the source. The note contains examples and other guidance.

7.2 Designation of objects in the Solar System

7.2.1 Planets, satellites, and rings. There is an IAU Working Group for Planetary System Nomenclature that is responsible for the adoption of names for the surface features of planets and satellites and for newly discovered members of the planetary system (excluding minor planets and comets). Satellites are also designated by means of designations that are assigned in the chronological sequence of discovery. Discovery claims should be sent with appropriate details to the IAU Telegram Bureau. The decisions of the Working Group are reported in the Transactions of the IAU from time to time.

7.2.2 Minor planets (asteroids) and comets. Numerical designations are assigned to minor planets (otherwise known as asteroids) when available orbital elements have been determined. The observers, or persons who determined the orbits, are allowed to retain the first letter of their name, usually of persons or mythological characters, that are accurate to confirmation by Commission 20; proposals should be sent to the Director of the IAU Minor Planet Center.

 Newly discovered comets are assigned temporary designations such consisting of the year of discovery followed by a lower-case letter that indicates the chronological sequence of the discoveries. When the discovery is confirmed the comet is also usually known by the name(s) of the discover(s). Subsequently, permanent numbers...
7.3 Designation of objects outside the Solar System

7.3.1 Bright stars. About 1,000 stars have individual proper names that are derived from early Arabic names or that have been assigned in recent times because of their peculiar characteristics or values for particular purposes (such as astrometry). A more precise identification of the star should always be given if such a name is used, especially as the names are often different in English, French, and other languages. About 900 such names are listed in the Yale Bright Star Catalogue (YBC, Hoffleit 1952), which gives information about over 9,000 stars brighter than magnitude 6.5. It also gives names based on the Bayer system (Greek letter followed by constellation name) or on Flamsteed's catalogue (number and constellation). About 1,500 bright stars are listed in the Astronomical Almanac; the tabulation gives the corresponding Bayer, Flamsteed, and RC designations, as well as the mean position and other information about each star.

The 'classical' and other catalogues that are often used for the designation of stars brighter than about magnitude 10 are represented by the following abbreviations:

- B1601
- HD
- BD
- CD
- CPD
- KK
- OB
- HA
- NGC
- B50
- IC
- SC

The full names of these catalogues are given in Table 1. These abbreviations may normally be used in IAU publications without further explanation; other abbreviations for these catalogues must not be used. These abbreviations should not be used for other catalogues, but IC is already in use for the ICU catalogue of clusters of galaxies.

7.3.2 Fixed stars. For stars not included in the catalogues listed above and for which designations have not been given in other catalogues, it is recommended that designations be assigned in the form of an astronomical number and position in the standard form specified in section 7.3.3.

7.3.3 Double stars. The standard form for the name of a component of a double or multiple star is IDS hnn.nnmm, where the position is given by equatorial coordinates for the epoch of 1900.0, ι or θ is used to indicate northern (+) or southern (−) declinations, and A or B or C ... specifies a component. The IDS catalogue is updated at the U.S. Naval Observatory as NDB. The brighter double stars have alternative designations in bright-star catalogues, as well as in special lists of double or variable stars.

7.3.4 Variable stars. The 'classical' names of variable stars not having Bayer-type names consist of the name of the constellation preceded by (a) a code of one or two capital letters or (b) the letter V followed by a number. Harvard designations consisting of the letters H followed by a numerical code have also been widely used for faint variables. The General Catalogue of Variable Stars and SIMBAD provide other designations and cross references. When it exists the classical name should be used in titles.

7.3.5 Novae. When a nova is discovered it is given a designation of the form Nova constellation. The year is followed by a lower-case letter; for example, the nova is discovered in a constellation in the same year. A nova may subsequently be assigned a standard designation as a variable star.
REFERENCES


Regulation A.3 Improvement of Publications

The XXth General Assembly of the International Astronomical Union recommends:

1. The need to develop clear lines of communication between the various branches of astronomy and other related scientific disciplines;
2. The desirability of promoting ease of access to information contained in the astronomical literature;
3. The advantages that would follow from a reduction in the variety of the editorial requirements for the submission of papers and reports;
4. The importance of identifying astronomical objects by clear and unambiguous designations;

Noting:

1. The growth in the cadres of young scientists trained in the use of the International System (SI) of units and widespread adoption of SI in other scientific and technical areas;
2. The substantial measure of agreement that has been reached during the drafting of the new IAU Style Manual for the preparation of astronomical papers, reports and books;

Recommends:

That the authors and the editors of the metronomology literature adopt the recommendations in the IAU Style Manual, which is to be published in the Transactions of the Union and reprinted for wide distribution and greater convenience.

In particular, it urges authors and editors:

1. To use only the standard SI units and those additional units that are recognized for use in astronomy, as recommended by Commission 5;
2. To adopt the conventions for citations and references that are given in the IAU Style Manual and that are exemplified in Astronomy and Astrophysics Abstracts and:
3. To ensure that all astronomical objects referred to in the literature are designated clearly and unambiguously in accordance with the recommendations of the Union.

Note:

The Executive Committee recognizes that the replacement of COS by SI units will require an adjustment of practices on the part of many astronomers that this will no doubt take time. Consequently, we urge that the total conversion from COS to SI units by all organs of communication shall be accomplished by the time of the next General Assembly (1993).

In the meantime we request that the major journals should publish, once a year, a table of conversions between COS and SI units, as provided by Commission 5.

SI International System (units):

CGS:

Centimeter, Gramme, Second (units)
The IAU Style Manual (1969)

APPENDIX C

EXTRACTS FROM IAU RULES FOR SCIENTIFIC MEETINGS

The following notes on the publication of the proceedings of conferences sponsored by the IAU have been taken from the 'Rules for Scientific Meetings' given in IAU Information Bulletin 56 (June 1987). Some additional notes are given in No. 61 (May 1989).

Proceedings of IAU Symposia

The IAU believes that the Proceedings of Symposia remain of general interest for a considerable period of time and that early publication in uniform style to a high standard is desirable. Publication and distribution have therefore been entrusted to a commercial publishing house.

The main responsibility of the IAU as joint publisher is the maintenance of a high standard of scientific value, originality and accuracy. The commercial publishing house has been contracted to ensure early publication and thereafter to take financial responsibility.

The Executive Committee, by approving the choice of Editor or Editors, places the main burden of maintaining the desired standard on the work of the person or persons, which are selected from the scientific community, and is responsible for the manner in which the selected Editor or Editors handle the scientific content of the proceedings.

It is essential that the Editor, or one of the Joint Editors, should have an excellent knowledge of the English language. The Editor is responsible for the scientific value, the appearance and delivery to the Publisher (usually within three months of the end of the Symposium) of the copy for the Proceedings. The main editorial tasks are:

(a) To inform participants in ample time before the meeting in what general form their contributions should be submitted and what arrangements have been made with the publisher for receipt of camera-ready copy. The number of printed pages available to each contributor should be determined in good time.

(b) To inform the participants about IAU rules for publication of IAU Proceedings and to emphasize that any contributed papers must be refereed before acceptance for publication.

(c) In advance of the Symposium, in close consultation with the SOC and LOC, to agree and arrange the precise details for recording and reporting the scientific discussion that takes place at the meeting. Difficulties in this respect may not cause undue delay in preparing for publication — it is better to sacrifice discussion rather than hold up publication.

(d) To arrange with members of the SOC for the refereeing of any contributed paper if an Editor is unable to do so.

(e) To reduce the length of papers and discussion, to avoid duplication and to improve presentation where necessary.

(f) To check whether IAU rules have been followed in each contribution and to arrange for retyping if necessary.

(g) To write the Introduction, Table of Contents, and obtain a final summary of the Symposium, maintaining uniformity with recent IAU Symposium Proceedings.

(h) To maintain all necessary contact with the Publishing House, in accordance with current "Instructions for Editors" available from the Assistant General Secretary.

(i) To maintain close contact with the Assistant General Secretary on all matters affecting progress of publication arrangements, especially keeping him informed of the material sent to the publishers and of any unexpected delays or alterations.

In the proceedings of Symposium volumes, Invited Reviews and Invited Papers will be allowed extended publication subject to a normal number (decided by the SOC) of camera-ready pages. Editorial discretion will be used to ensure that material previously published elsewhere is not duplicated. It should be noted that in extended publication of the number of observations and other tabular data are inappropriate in a Symposium volume.

The SOC has discretion to make the decision whether or not the contributed papers (oral and poster) are published in the Symposium proceedings. If a decision to publish is taken, then contributed papers (including posters), after editorial refereeing, will be published in no more than two camera-ready pages. Should the SOC decide that any contributed paper is given more extended publication, the same rules as for invited reviews and invited papers will apply.

It is the policy of the IAU and that of their publishers to publish in camera-ready form. It is found that such a policy gives reasonable uniformity of appearance combined with speed of production. Authors will be sent camera-ready sheets, instructions for their use and the total amount of space available to them, by the publishers prior to the Symposium. The final camera-ready manuscripts should be sent to the Editor(s) either before the beginning of the Symposium or handed over at the Symposium. Papers not available to the Editor(s) in camera-ready form by the end of the Symposium will be deemed to have been withdrawn from publication.

In order to obtain a presentation that will indicate that the volume of IAU symposia form a series, it is requested that Editors adhere to the following recommendations:

(3) The title page should have the format specified in section 3.6.

(4) The Editor’s introduction should mention circumstances of the organization of the Symposium, and should list the supporting organizations and the members of the Scientific and Local Organizing Committees. It should express appreciation to those to whom it is due. The support of the IAU and other Unions, etc., should be recognized as well as that of other international, national, or local organizations.

(5) The Editors should provide an alphabetical index of names and subject headings in accordance with the instructions of the publishers.

Symposium volumes should be published 6-8 months after the Symposium.

Proceedings of IAU Colloquia

The publication of IAU Colloquia should follow the same guidelines as for IAU Symposia. However, unless produced by the IAU publisher, the relevant manuscripts need not be in camera-ready form and some variation is allowed. Manuscript length is at the discretion of the SOC who have responsibility for the decision on whether or not to publish and the format of the publication. However, in order to facilitate archival retrieval all published IAU Colloquia proceedings must adopt the same form of title page. The title page should follow the same format as for Symposia replacing by "Colloquium" as appropriate.

Proceedings of IAU Regional Meetings

If it is decided to publish the proceedings of a Regional Meeting, the same guidelines as for an IAU Symposium or Colloquium should be followed as far as practicable given the format of the meeting and the method of publication adopted. In cases to facilitate archival retrieval the title page should indicate explicitly below any other titles of the meeting.

Proceeding of the ... Regional Meeting of the International Astronomical Union, held in "place", "country", "date" followed, if appropriate by the words "organized by the IAU in cooperation with ...."
If coordinates in any form are used to encode an object, the following rules apply:

- Coordinates shall be preceded by a code for the reference frame, specifically G for galactic coordinates, and J for Besselian 1950 or J for Julian 2000 equatorial coordinates if confusion might be possible.
- Coordinates shall be specified as L.L.L.LL.BB.BB for galactic coordinates and for equatorial coordinates as RHHH.HH.MMSS.SS., without spaces; fewer digits may be used as appropriate.
- Coordinates shall be truncated (not rounded), thus defining a unique (small) field on the sky in which the object is located.
- Coordinates shall contain leading zeroes if necessary, and the plus or minus sign: ±198.59° or ±595959.8°
- Coordinates used in designations shall be considered as names; therefore, they shall not be changed even if the positions become more accurately known (e.g., at a different epoch: BD +25 746 stays, even though its declination is now −24°).
- If at some stage subcomponents or multiplicity of objects is recognized, the best designation solution is to name these subcomponents with letters or numerals, which then are added to sequence with a colon, e.g., "NGC 1001:1"

The specifier is optional and allows one to indicate association with larger radiating sources (e.g., "3C 120", "W43") or to indicate other object parameters. However, they are not required syntax and are enclosed in parentheses.

Examples of complete designations are:

- Designation: NGC 206, PEG 1847, CD +41°2850.0, HD 81234, G205
- Position: RA (2000) = 00 02 02.4, DEC (2000) = −25 08 29
- BD = −3 5750, E = 24 46 37.3, μ = 47 32 47
- AG 211 (+16 2127; +11° 59' 59"
- PK 2001.2=00.3, B 1395:43

There exists a multitude of improper, confusing or unclear designations in the literature. General rules and advice on how to generate designations can be found in "The First Dictionary of the Nomenclature...", cited below. Examples of improper use of designations are:

- BD 4° 14... declination sign is missing
- X221... unclear source: NGC or N in LMC?
- ZRAS 5804+220... leading zero missing; poor position
- P 83578... one-letter origin is ambiguous

The specification is normally a numerical field to uniquely determine the object within a catalog or collection. It may be a sequence number within a catalog (e.g., HD 2345), or it may be based on coordinates.