

Template AAST_EX PASP Article with Examples: v7.0.1*

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ABSTRACT

This example manuscript is intended to serve as a tutorial and template for authors to use when writing their own PASP Journal articles. This template is a modified version of the AAST_EX Template for submissions to *AAS Journals*. The manuscript includes a history of AAST_EX and documents the new features in the previous versions as well as the new features in version 7. Information on features not explicitly mentioned in the article can be viewed in the manuscript comments or more extensive online documentation. Authors are welcome to replace the text, tables, figures, and bibliography with their own and submit the resulting manuscript to the PASP peer review system. The first lesson in the tutorial is to remind authors that PASP has a 300 word limit for the abstract^{a)}. If you exceed this length we may rescind the manuscript and ask you to re-write it. This abstract has 144 words.

Keywords: Classical Novae (251) — Ultraviolet astronomy (1736) — History of astronomy (1868) — Interdisciplinary astronomy (804)

1. A SHORT HISTORY OF AASTEX

La_TE_X⁴ is a document markup language that is particularly well suited for the publication of mathematical and scientific articles (L. Lamport 1994). La_TE_X was written in 1985 by Leslie Lamport who based it on the T_EX typesetting language which itself was created by Donald E. Knuth in 1978. In 1988 a suite of La_TE_X macros were developed to investigate electronic submission and publication of AAS Journal articles (R. J. Hanisch & C. D. Biemesderfer 1989). Shortly afterwards, Chris Biemesdefer merged these macros and more into a La_TE_X 2.08 style file called AAST_EX. These early AAST_EX versions introduced many common commands and practices that authors take for granted today. Substantial revisions were made by Lee Brotzman and Pierre Landau when the package was updated to v4.0. AAST_EX v5.0, written in 1995 by Arthur Ogawa, upgraded to La_TE_X 2e which uses the document class in lieu of a style file. Other improvements to version 5 included hypertext support, landscape deluxetables and improved figure support to facilitate electronic submission. AAST_EX v5.2 was released in 2005 and introduced additional graphics support plus new mark up to identifier astronomical objects, datasets and facilities.

In 1996 Maxim Markevitch modified the AAS preprint style file, `aaspp4.sty`, to closely emulate the very tight, two column style of a typeset *Astrophysical Journal* article. The result was `emulateapj.sty`. A year later Alexey Vikhlinin took over development and maintenance⁵. In 2001 he converted `emulateapj` into a class file in La_TE_X 2e and in 2003 Vikhlinin completely rewrote `emulateapj` based on the APS Journal's REV_TE_X class.

During this time `emulateapj` gained growing acceptance in the astronomical community as it filled an author need to obtain an approximate number of manuscript pages prior to submission for cost and length estimates. The tighter typeset also had the added advantage of saving paper when printing hard copies.

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^{a)} Abstracts for Publications of the Astronomical Society of the Pacific are limited to 300 words

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⁴ <http://www.latex-project.org/>

⁵ <https://hea-www.harvard.edu/~alexey/emulateapj/>

38 The `emulateapj` class file proved to be extremely popular with AAS Journal authors. An analysis of submitted
 39 LaTeX manuscripts in 2015 revealed that $\sim 30\%$ either called `emulateapj` or had a commented `emulateapj` classfile call
 40 indicating it was used at some stage of the manuscript construction. Clearly authors wanted to have access to a tightly
 41 typeset version of the article when editing with co-authors and for preprint submissions.

42 When planning the next AASTeX release the popularity of `emulateapj` played an important roll in the decision to
 43 drop the old base code and adopt and modify `emulateapj` for AASTeX v6.+ . Those changes brought AASTeX inline
 44 with what the majority of authors were already using while still delivering new and improved features. AASTeX v6.0
 45 through v6.31 were developed by Amy Hendrickson⁶. The release dates for the AASTeX6 versions were January 2016
 46 (v6.0), October 2016 (v6.1), January 2018 (v6.2), June 2019 (v6.3), and March 2020 (v6.3.1), respectively.

47 AASTeX's reliance on REVTeX, specifically v4-1, proved to be problematic when it was superseded in in January
 48 2019. Rather than continue with REVTeX v4-2 as the base package of AASTeX, Aptara⁷ was hired to rewrite
 49 AASTeX from scratch while keeping the core functionality in early 2024. This new version, v7.0, was released in
 50 January 2025. The first bug fix was release in May 2025 as v7.0.1. Users of v6.3.1 will have little difficulty migrating
 51 to this new version with the core difference being that an email address is required for each author in v7+.

52 The rest of this article provides information and examples on how to create your own PASP manuscript with v7+.
 53 Special emphasis is placed on how to use the full potential of AASTeX. Note that some of the examples are commented
 54 out in this latex manuscript. The next section describes the different manuscript styles available. Section 3 describes
 55 table and figure placement. Specific examples of different tables are provided, Section 3.1. Section 4 discusses how
 56 to properly highlight text added during revisions. The last section, 5, shows how to recognize software and external
 57 data as first class references in the manuscript bibliography. An appendix is included for additional information
 58 readers might find useful. More documentation is embedded in the comments of this LaTeX file and in the online
 59 documentation at <http://journals.aas.org/authors/aastex.html>.

60 2. MANUSCRIPT STYLES

61 The default style in AASTeX v7+ is a tight single column style, e.g. 10 point font, single spaced. The single column
 62 style is very useful for articles with wide equations. It is also the easiest style to work with since figures and tables,
 63 see Section 3, will span the entire page, reducing the need for address float sizing.

64 To invoke a two column style similar to what is produced in the published PDF copy use:

```
65 \documentclass[twocolumn]{aastex7}.
```

66 Note that in the two column style figures and tables will only span one column unless specifically ordered across both
 67 with the "*" flag, e.g.

```
70 \begin{figure*} ... \end{figure*},  

  71 \begin{table*} ... \end{table*}, and  

  72 \begin{deluxetable*} ... \end{deluxetable*}.
```

73 This option is ignored in the `onecolumn` style.

74 All authors should have the `linenumbers` style included so that the compiled PDF has each row numbered in the
 75 left margin. Line numbering is mandatory as it helps reviewers quickly identify locations in the text.

76 The `anonymous` option will prevent the author and affiliations from being shown in the compiled pdf copy. This
 77 option allows the author to keep this critical information in the latex file but prevent the reviewer from seeing it during
 78 peer review if dual anonymous review (DAR) is requested. Likewise, acknowledgments and author contributions can
 79 also be hidden if placed in the `\begin{acknowledgments} ... \end{acknowledgments}` and `\begin{contribution}`
 80 `... \end{contribution}` environments. The use of this option is highly recommended for PASP submissions. Advice
 81 for anonymizing your manuscript for DAR is provided at <https://journals.aas.org/manuscript-preparation/#dar>.

82 Another reason to use the `\begin{acknowledgments} ... \end{acknowledgments}` and `\begin{contribution} ...`
 83 `\end{contribution}` environments is that the word counter in our peer review system will **not** count the contents

6 <https://www.texnology.com/about.htm>

7 <https://www.aptaracorp.com>

86 of these environments. If authors put acknowledgments and contribution text in other locations, these words will be
 87 counted and authors may be overcharged on their author publication charges.

88 Multiple style options are allowed, e.g.

89
 90 `\documentclass[linenumbers,trackchanges,anonymous]{aastex7}`.
 91

92 3. FLOATS

93 Floats are non-text items that generally cannot be split over a page. They also have captions and can be numbered
 94 for reference. Primarily these are figures and tables but authors can define their own. LaTeX tries to place a float
 95 where indicated in the manuscript but will move it later if there is not enough room at that location, hence the term
 96 “float”.

97 Authors are encouraged to embed their tables and figures within the text as they are mentioned. Editors and the
 98 vast majority of referees find it much easier to read a manuscript with embedded figures and tables.

99 Depending on the number of floats and the particular amount of text and equations present in a manuscript the
 100 ultimate location of any specific float can be hard to predict prior to compilation. It is recommended that authors **not**
 101 spend significant time trying to get float placement perfect for peer review. The PASP’s publisher has sophisticated
 102 typesetting software that will produce the optimal layout during production.

103 Note that authors of Research Notes are only allowed one float, either one table or one figure.

104 For authors that do want to take the time to optimize the locations of their floats there are some techniques that can
 105 be used. The simplest solution is to place a float earlier in the text to get the position right but this option will break
 106 down if the manuscript is altered. A better method is to force LaTeX to place a float in a general area with the use of
 107 the optional [placement specifier] parameter for figures and tables. This parameter goes after `\begin{figure}`,
 108 `\begin{table}`, and `\begin{deluxetable}`. The main arguments the specifier takes are “h”, “t”, “b”, and “!”. These
 109 tell LaTeX to place the float here (or as close as possible to this location as possible), at the top of the page, and at
 110 the bottom of the page. The last argument, “!”, tells LaTeX to override its internal method of calculating the float
 111 position. A sequence of rules can be created by using multiple arguments. For example, `\begin{figure}[htb!]` tells
 112 LaTeX to try the current location first, then the top of the page and finally the bottom of the page without regard to
 113 what it thinks the proper position should be. Many of the tables and figures in this article use a placement specifier
 114 to set their positions.

115 Note that the LaTeX `tabular` environment is not a float. Only when a `tabular` is surrounded by `\begin{table}`
 116 ... `\end{table}` is it a true float and the rules and suggestions above apply.

117 In AASTeX all deluxetables are float tables and thus if they are longer than a page will spill off the bottom. Long
 118 deluxetables should begin with the `\startlongtable` command. This initiates a longtable environment. Authors
 119 might have to use `\clearpage` to isolate a long table or optimally place it within the surrounding text.

120 3.1. Tables

121 Tables can be constructed with LaTeX’s standard table environment or the AASTeX’s deluxetable environment.
 122 The deluxetable construct handles long tables better but has a larger overhead due to the greater amount of defined
 123 mark up used to set up and manipulate the table structure. The choice of which to use is up to the author. Examples
 124 of both environments are used in this manuscript.

125 Tables longer than 200 data lines and complex tables should only have a short example table with the full data set
 126 available in the machine readable format. The machine readable table will be available in the HTML version of the
 127 article with just a short example in the PDF. Authors are required to indicate in the table comments that the data
 128 is in machine readable format in the full article. Authors are encouraged to create their own machine readable tables
 129 using the online tool at <http://authortools.aas.org/MRT/upload.html>.

130 AASTeX v6 introduced five new table features that were designed to make table construction easier and the resulting
 131 display better for PASP authors. The items are:

- 132 1. Declaring math mode in specific columns,
- 133 2. Column decimal alignment,
- 134 3. Automatic column header numbering,

135 4. Hiding columns, and

136 5. Splitting wide tables into two or three parts.

137 Full details on how to create each of these special table types are given in the guidelines at <http://journals.aas.org/authors/aastex.html>.

139 3.1.1. *Extremely wide tables*

140 Since PASP is now all electronic with no print version there is no reason why tables can not be as wide as authors
141 need them to be. For wide tables, the full table will almost always be available in machine readable format with just
142 an example in the article but how is an example created for a wide table?

143 There are two ways to create examples for wide tabular data sets. The first is to to break a table into two or three
144 components so that it flows down a page by invoking a new table type, `splittabular` or `splitdeluxetable`. Within these
145 tables a new “B” column separator is introduced. Much like the vertical bar option, “|”, that produces a vertical table
146 lines the new “B” separator indicates where to `Break` a table. Up to two “B”s may be included.

147 Table 1 shows how to split a wide `deluxetable` into three parts with the `\splitdeluxetable` command. The
148 `\colnumbers` option is on to show how the automatic column numbering carries through the second table component.

149 The second way is to create a “descriptive” table instead. This type of table only provides information about the
150 columns rather than the data itself. Table 2 shows an example of this type of table using the same columns as in
151 Table 1. Since these types of tables always have a machine readable component, this table uses the `\digitalasset`
152 command to highlight this fact.

153 3.2. *Figures*

154 Authors can include a wide number of different graphics with their articles. These range from general figures all
155 authors are familiar with to new enhanced graphics that can only be fully experienced in HTML. The later include
156 figure sets, animations and interactive figures. All enhanced graphics require a static two dimensional representation
157 in the manuscript to serve as the example for the reader. All figures should include detailed and descriptive captions.
158 These captions are absolutely critical for readers for whom the enhanced figure is inaccessible either due to a disability
159 or offline access. This portion of the article provides examples for setting up all these types in with the latest version
160 of AAST_EX.

161 3.3. *General figures*

162 AAST_EX has a `\plotone` command to display a figure consisting of one figure file. Figure 1 is an example. For a
163 general figure consisting of two figure files the `\plottwo` command can be used to position the two image files side by
164 side.

165 Both `\plotone` and `\plottwo` take a `\caption` and an optional `\figurenum` command to specify the figure
166 number⁸. Each is based on the `graphicx` package command, `\includegraphics`. Authors are welcome to use
167 `\includegraphics` along with its optional arguments that control the height, width, scale, and position an-
168 gle of a file within the figure. More information on the full usage of `\includegraphics` can be found at
169 https://en.wikibooks.org/wiki/LaTeX/Importing_Graphics#Including_graphics.

170 3.4. *Enhanced graphics*

171 Enhanced graphics have an example figure to serve as an example for the reader and the full graphical item available
172 in the published HTML article. This includes Figure sets, animations, and interactive figures. The Astronomy Image
173 Explorer (<http://www.astroexplorer.org/>) provides access to all the figures published in the AAS Journals since they
174 offered an electronic version which was in the mid 1990s. You can filter image searches by specific terms, year, journal,
175 or type. The type filter is particularly useful for finding all published enhanced graphics. As of August 2024 there are
176 over 5600 videos, 2200 figure sets, and 200 interactive figures. The next sections describe how to include these types
177 of graphics in your own manuscripts.

⁸ It is better to not use `\figurenum` and let LaTeX auto-increment all the figures. If you do use this command you need to mark all of them accordingly.

Table 1. Measurements of Emission Lines: two breaks

| Model | Component | Shift (km s ⁻¹) | FWHM (km s ⁻¹) | Flux (10 ⁻¹⁷ erg s ⁻¹ cm ⁻²) |
|---------|-----------|--------------------------------|-------------------------------|---|
| (1) | (2) | (3) | (4) | (5) |
| Model 1 | BELs | -97.13 | 9117±38 | 1033±33 |
| | IELs | -4049.123 | 1974±22 | 2495±30 |
| | NELs | ... | 641±4 | 449±23 |
| Model 2 | BELs | -85 | 8991±41 | 988±29 |
| | IELs | -51000 | 2025±26 | 2494±32 |
| | NELs | 52 | 637±10 | 477±17 |

| N V | Si IV | C IV | Mg II | H γ |
|------|-------|----------|---------|------------|
| (6) | (7) | (8) | (9) | (10) |
| < 35 | < 166 | 637±31 | 1951±26 | 991±30 |
| < 42 | < 109 | 995±186 | 83±30 | 75±23 |
| < 6 | < 9 | - | 275±18 | 150±11 |
| < 24 | < 173 | 623±28 | 1945±29 | 989±27 |
| < 37 | < 124 | 1005±190 | 72±28 | 72±21 |
| < 4 | < 8 | - | 278±17 | 153±10 |

| H β | H α | He I | Pa γ |
|-----------|------------|----------|-------------|
| (11) | (12) | (13) | (14) |
| 3502±42 | 20285±80 | 2025±116 | 1289±107 |
| 130±25 | 357±94 | 194±64 | 36±23 |
| 313±12 | 958±43 | 318±34 | 151±17 |
| 3498±37 | 20288±73 | 2047±143 | 1376±167 |
| 113±18 | 271±85 | 205±72 | 34±21 |
| 317±15 | 969±40 | 325±37 | 147±22 |

NOTE—This is an example of how to split a deluxetable. You can split any table with this command into two or three parts. The location of the split is given by the author based on the placement of the “B” indicators in the column identifier preamble. For more information please look at the new AAST_EX instructions.

4. REVISION TRACKING AND COLOR HIGHLIGHTING

The `\added{<text>}` command should be used to highlight new text in bold for revised manuscripts. To activate this command, the `trackchanges` option must be used in the `\documentclass` call. When compiled this will produce the marked text in bold font. Take out the `trackchanges` option if you want the bold to disappear.

This text was specifically added to feature this reborn functionality. Notice how the bold goes away when you remove the 'trackfeatures' option.

5. SOFTWARE AND THIRD PARTY DATA REPOSITORY CITATIONS

PASP would like to encourage authors to change software and third party data repository references from the current standard of a footnote to a first class citation in the bibliography. As a bibliographic citation these important references will be more easily captured and credit will be given to the appropriate people.

The first step to making this happen is to have the data or software in a long term repository that has made these items available via a persistent identifier like a Digital Object Identifier (DOI). A list of repositories that satisfy this criteria plus each one’s pros and cons are given at <https://github.com/AASJournals/Tutorials/tree/master/Repositories>.

Table 2. Descriptive version of the "Measurements of Emission Lines" table

| Number | Units | Label | Explanation |
|--------|--|-------------|---------------------------------|
| 1 | — | Model | Model identifier |
| 2 | — | Component | Component identifier |
| 3 | km s ⁻¹ | Shift | Line shift |
| 4 | km s ⁻¹ | FWHM | Line Full-Width at Half-Maximum |
| 5 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | Ly α | Ly α line flux |
| 6 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | N V | N V line flux |
| 7 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | Si IV | Si IV line flux |
| 8 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | C IV | C IV line flux |
| 9 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | Mg II | Mg II line flux |
| 10 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | H γ | H γ line flux |
| 11 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | H β | H β line flux |
| 12 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | H α | H α line flux |
| 13 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | He I | He I line flux |
| 14 | 10 ⁻¹⁷ erg s ⁻¹ cm ⁻² | Pa γ | Pa γ line flux |

NOTE—Table 2 is published in its entirety in the electronic edition of the *Astrophysical Journal*. A portion is shown here for guidance regarding its form and content. The `\digitalasset` command highlights the Table title to visually indicate to the reader that there is data associated with this table.

In the bibliography the format for data or code follows this format:

author year, title, version, publisher, prefix:identifier

L. Corrales (2015) provides a example of how the citation in the article references the external code at <https://doi.org/10.5281/zenodo.15991>. Unfortunately, bibtex does not have specific bibtex entries for these types of references so the "@misc" type should be used. The Repository tutorial explains how to code the "@misc" type correctly. The most recent .bst file, aasjournalv7.bst, will output bibtex "@misc" type properly.

Authors can also use the website <https://www.doi2bib.org/> to create a BIBTeX entry for any DOI. Please check the output from this site carefully as its output is only as good as the DOI metadata. Some DOI creators do not provide enough metadata to construct an adequate citation.

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AUTHOR CONTRIBUTIONS

All editors contribute equally to the operation of PASP.

Facilities: HST(STIS), Swift(XRT and UVOT), AAVSO, CTIO:1.3m, CTIO:1.5m, CXO

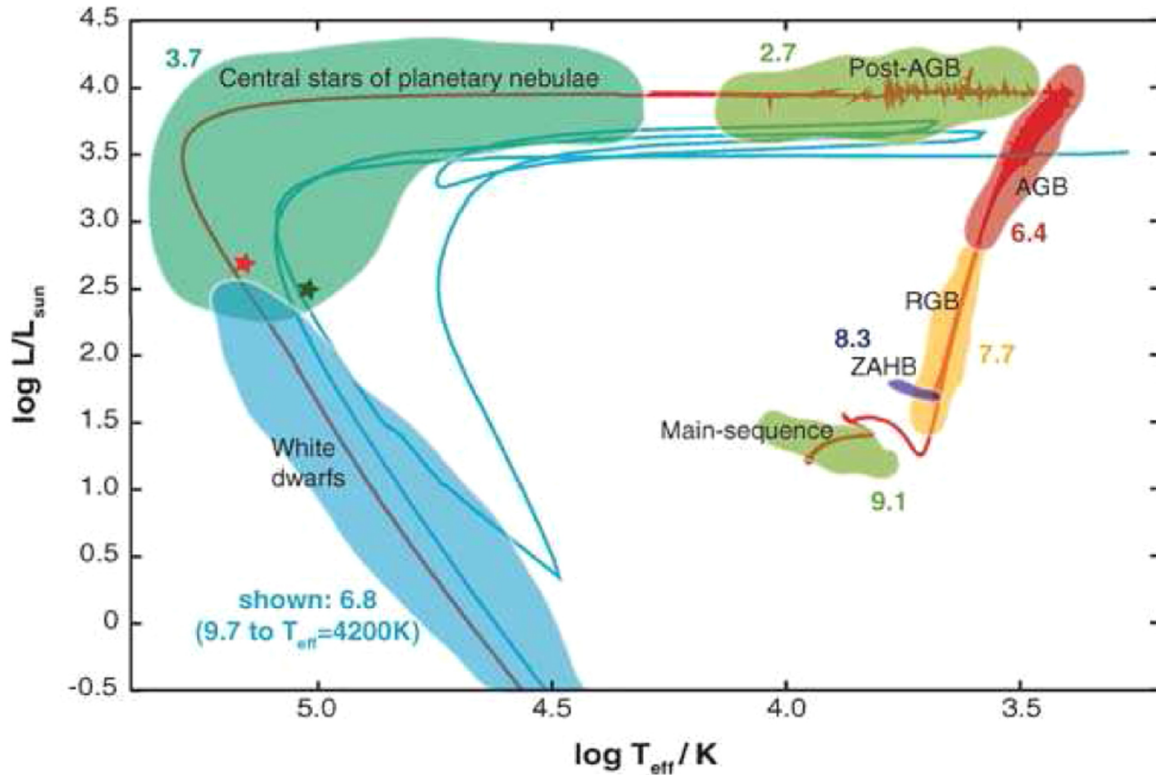


Figure 1. Hertzsprung–Russell diagram of a complete evolutionary track for a $2 M_{\odot}$ solar-metallicity star from the main sequence to the white dwarf phase. From K. B. Kwitner & R. B. C. Henry (2022).

213 *Software:* astropy (Astropy Collaboration et al. 2013, 2018, 2022), Cloudy (G. J. Ferland et al. 2013), Source
 214 Extractor (E. Bertin & S. Arnouts 1996)

APPENDIX

A. APPENDIX INFORMATION

216
 217 Appendices can be broken into separate sections just like in the main text. The only difference is that each appendix
 218 section is indexed by a letter (A, B, C, etc.) instead of a number. Likewise numbered equations have the section letter
 219 appended. Here is an equation as an example.

$$I = \frac{1}{1 + d_1^{P(1+d_2)}} \quad (\text{A1})$$

221 Appendix tables and figures should not be numbered like equations. Instead they should continue the sequence from
 222 the main article body.

B. AUTHOR PUBLICATION CHARGES

224 PASP is a hybrid open access journal. Authors have the option to pay article publication charge (APC) to publish
 225 their article on an open access basis under a Creative Commons Attribution (CC BY) license. Additionally, PASP is
 226 supported in part by page charges. The current cost for publication charges is available at <https://iopscience.iop.org/journal/1538-3873/page/publication-charges>.
 227

C. ROTATING TABLES

228
 229 To place a single page table in a landscape mode start the table portion with `\begin{rotatetable}` and end with
 230 `\end{rotatetable}`.

231 Tables that exceed a print page take a slightly different environment since both rotation and long table print-
 232 ing are required. In these cases start with `\begin{longrotatetable}` and end with `\end{longrotatetable}`.
 233 The `\movetabledown` command can be used to help center extremely wide, landscape tables. The command
 234 `\movetabledown=1in` will move any rotated table down 1 inch.

235 A handy "cheat sheet" that provides the necessary LaTeX to produce 17 different types of tables is available at
 236 http://journals.aas.org/authors/aastex/aasguide.html#table_cheat_sheet.

237 D. USING CHINESE, JAPANESE, AND KOREAN CHARACTERS

238 Authors have the option to include names in Chinese, Japanese, or Korean (CJK) characters in addition to the
 239 English name. The names will be displayed in parentheses after the English name. The way to do this in AASTeX
 240 is to use the CJK package available at <https://ctan.org/pkg/cjk?lang=en>. Further details on how to implement this
 241 and solutions for common problems, please go to <https://journals.aas.org/nonroman/>.

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