

DIVISION C / WORKING GROUP STAR NAMES

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1. Motivation and Creation of the Working Group

1.1. *Summary of Terms of Reference*

The WGSN consists of an international group of astronomers with expertise in stellar astronomy, astronomical history, and cultural astronomy, with the aim to catalogue cultural star names and catalogue unique proper names for stars. The WGSN terms of reference contains the concise goals to:

- establish IAU guidelines for the proposal and adoption of names for stars,
- search the international astronomical history and astronomical culture literature for star names,
- drawing upon this literature, adopt unique names for stars of scientific and historical value for community use following agreed upon guidelines,
- assemble, maintain, publish, and disseminate an official IAU star name catalogue of names for stars and exoplanets.

The terms of reference for the Division C WG Star Names (WGSN)[†] were approved by the IAU Executive Committee in May 2016.

1.2. *Motivation*

The birth of WGSN stemmed from discussions within the IAU Executive Committee Working Group on the Public Naming of Planets and Planetary Satellites (Montmerle et al. 2016), when during the 2015 NameExoWorlds[‡] initiative it became obvious that there were unresolved issues with IAU policy with regard to proper names for stars. A few practical questions were unanswerable at the time: *Are there official IAU-recognized proper names for stars? Is “Fomalhaut” an IAU-recognized proper name? Should an obscure traditional name for a star (e.g., “Ain” for ϵ Tauri) or a cultural name be recognized as an official IAU-adopted name or allow it to be named/re-named via the NameExoWorlds public naming campaign? Should proper names be applied to individual stars or multiples? If individual exoplanets are to receive proper names, shouldn't also the individual stellar components in multiple systems?*

IAU guidelines for alphanumerical *designations* for stars (and other radiation sources outside the solar system) had crystallized a few decades ago, but stellar *proper names* were largely an afterthought. Through the 1980s and up until a decade ago, the IAU

[†] https://www.iau.org/science/scientific_bodies/working_groups/280/

[‡] <http://nameexoworlds.iau.org/>

Commission 5 Working Group on Designations was active, and led to recommendations on nomenclature, e.g., IAU Resolutions 1985 C3¶ and 1988 A3|| (via The IAU Style Manual; Wilkins 1989)††. While “dictionaries” of celestial nomenclature were published (Fernandez et al. 1983; Lortet & Spite 1986), these were mainly to clarify alphanumeric designations. The tables of proper names in Fernandez et al. (1983) were stated to *not* be meant to be complete, contained multiple names for some stars (e.g., *Aluccabah*, *Cynosura*, and *Polaris* for α UMi), and contained spellings found nowhere else (e.g., *Alderamin* for α Cep). Despite these activities, there has been no IAU body responsible for tracking or maintaining a database of unique *proper names* for stars. The IAU body which had the closest purview, responsible for guidelines for alphanumeric designations, not only avoided proper names (Schmitz et al. 2007), but no longer existed at the time of NameExoWorlds in 2015.

An illustration of the lack of guidance on proper names can be found in The IAU Style Manual (Wilkins 1989, approved by the XXth IAU General Assembly under 1988 IAU Resolution A3). The IAU Style Manual states “*simple names are usually only appropriate for a very limited number of the brightest stars...*” and “*[A]bout 1000 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 value for particular purposes (such as astronavigation).*” Multiple references for proper names for stars are mentioned in the IAU Style Manual, however *none* was considered authoritative: *The First Dictionary of the Nomenclature of Celestial Objects (Solar System Excluded)* (Fernandez et al. 1983), *First Supplement to the First Dictionary of the Nomenclature of Celestial Objects - Solar System Excluded* (Lortet & Spite 1986), the SIMBAD database at the Strasbourg Data Centre (CDS) (all in Sec. 7.12), and the Bright Star Catalogue (Hoffleit & Jaschek 1982). These references sometimes have multiple names for the same stars and occasionally differences in spellings. For a typical example, the bright star with Bayer designation α Cephei is called *Alderamin* in Fernandez et al. (1983), *Alderamin* in SIMBAD, and *Alderamin* in Hoffleit & Jaschek (1982) with alias *Alderamin*. While *Alderamin* is by far the most common name and spelling in modern literature, one also finds *Aderamin* (Bayer 1603) and *Alderamin* (Alfonso X 1492) (see also Kunitzsch 1986) in classic astronomical literature, and even *Al'deramin* (Kostjuk 2004). There are countless other cases, often with numerous names and spelling variations. A bright star like *Fomalhaut*, for example, has no fewer than three dozen names and spelling variations, and likely countless more exist (*Fomalhaut* is only the most common name and spelling over the past couple centuries). SIMBAD is a living database maintained at CDS which maintains a Dictionary of Nomenclature for Celestial Objects†, however at least as of 2016 whether a proper name for a star was included or excluded from SIMBAD appeared to be independent of whether a name was included in any of the previously named references, and names were sometimes included without any IAU oversight. For example, SIMBAD currently lists proper names for α UMi of *Polaris*, *North Star*, and *Lodestar*.

At the time of NameExoWorlds in 2015, it was clear that the IAU did not have, nor maintain, a catalogue of formally adopted unique proper names for stars, and no IAU

¶ https://www.iau.org/static/resolutions/IAU1985_French.pdf

|| https://www.iau.org/static/resolutions/IAU1988_French.pdf

†† <https://www.iau.org/static/publications/stylemanual1989.pdf>

† <http://simbad.u-strasbg.fr/simbad/>, <http://cds.u-strasbg.fr/cgi-bin/Dic-Simbad>

body had the proper names of stars within its purview. This was very different from the IAU's treatment over the past century of (solar system) planets, planetary satellites, asteroids, planetary surface features, and the constellations - all of which have official, unique, alphabetical IAU proper names whose names were either adopted or approved through the actions of previous or current IAU bodies or resolutions. The IAU Style Manual pointed to multiple name compilations, sometimes with mutually inconsistent spellings, and sometimes multiple aliases. With the IAU's new policy of adopting proper names for some exoplanets and their host stars (Montmerle et al. 2016), it became clear that an official list of IAU star names had finally become a practical necessity and that some new IAU body should be created to build the list and maintain it. The situation mirrored earlier IAU nomenclature quandaries which were resolved by creating new working groups and charging them the task of sorting through disjointed past nomenclature by previous astronomers, and synthesizing a standardized nomenclature for international use. Illustrative examples include the standardization of the names and boundaries of the constellations (1920s), lunar feature nomenclature (1920s-1930s), Martian feature nomenclature (1950s), and the names of the outer satellites of Jupiter (1970s).

The need for a new IAU compilation of star names presented a unique opportunity to start to formally recognize some of the wide variety of celestial nomenclature from cultures around the world which had previously been largely ignored or simply excluded from previous star name catalogues in common use. This new IAU working group could *help to preserve intangible astronomical heritage (cultural celestial names) for modern and future use by the international astronomical community in the era of exoplanetary systems*. It was envisioned that a new "Working Group on Star Names" (WGSN) could marshal the expertise of Division C Education, Outreach & Heritage to accomplish several goals: help fill a century-long IAU nomenclature gap relevant to both Division G Stars and Division F Planetary Systems and Bioastronomy, provide a means of clarifying IAU nomenclature policy and handle public queries on stellar nomenclature for the IAU Executive Committee, all while helping support one of the high level goals of the IAU-UNESCO Initiative: helping to preserve intangible astronomical heritage.

2. Guidelines

Early discussion within the WGSN in 2016 converged on some guidelines. These were listed verbatim in Bulletin #1 of the WGSN (July 2016), and posted on the IAU website[†]. Many of the guidelines will seem familiar as they purposefully built on the lessons learned from decades of IAU naming of asteroids.

- Names that preserve world heritage (astronomical heritage, cultural heritage, and natural heritage) are strongly encouraged. Common and cultural star names are to be preferred over new names to preserve continuity and recognize astronomical heritage.
- Names should preferably be between 4 and 16 characters in length. Variances may be granted for multi-word names or short names demonstrated to be in common historical use. Two and three-word names could be too easily confused with designations, acronyms, and abbreviations.
- Short names are preferred over long names.
- Where feasible, multiple word names may be concatenated into single word names,

[†] https://www.iau.org/static/science/scientific_bodies/working_groups/280/WGSN_bulletin1.pdf

and long cultural names may be shortened in order to satisfy length requirements (which preserve the essence of the original cultural/historical name).

- Names should be pronounceable in some language.
- Names should be non-offensive.
- Names should not be too similar to an existing name of a star, planet, planetary satellite, or minor planet.
- Names of all individuals are prohibited for bright stars, except for rare cases with demonstrated historical precedence and widespread international diffusion.
- Contrived names are discouraged, except for rare cases with demonstrated historical precedence and widespread international diffusion.
- Names of events principally known for political or military activities are prohibited.
- Names of a purely or principally commercial nature are prohibited.
- Names of pet animals are prohibited.
- Acronyms, or names based on acronyms, are prohibited for proper names (acronyms could be confused with designations).
- Adopted names will follow The IAU Style Manual (Wilkins 1989). Proper names are transliterated to Latin alphabet, have an initial capitalized letter, and never contain numbers. Punctuation marks are discouraged. The names will be reported in Latin alphabet, but names may be quoted with original accents and diacritic marks where appropriate.
- The WGSN explicitly recognizes the names of exoplanets and their host stars approved by the EC WG Public Naming of Planets and Planetary Satellites (Montmerle et al. 2016).

Most of the WGSN's effort in standardizing names over the past triennium has thus far been on names for bright stars, with a few famous exceptions of faint stars. As mentioned in WGSN Bulletin #1: “[F]or the purposes of discussion and prioritization, “bright stars” refers to those with designations in the *Bright Star Catalogue* (HR #s) and any physical companions. “Faint stars” will refer to any other Galactic stars, substellar objects, and stellar remnants not in the “bright star category.”

The WGSN continues longstanding IAU policy of not recognizing the validity of names that are bought or sold†. While the focus of WGSN has been on common and/or cultural star names, in practice this has meant names that were either in use in astronomical literature up through roughly the year 2000, but could include compilations of ancient cultural names which appeared in literature post-2000. Care has been taken to avoid diffusion of dozens of names which were essentially ‘graffiti’ in Wikipedia articles in the late 2000s. Some graffiti names made their way into poorly researched books in the 2010s which appear to have made the cardinal sin of using Wikipedia as a primary uncited reference. Input to the WGSN from astronomers and the public is welcomed via email at IAUWGSN@gmail.com, and input related to published sources of cultural star names from around the world is especially welcomed.

2.1. Authoritative References

The primary references for traditional names (and most common spellings) in common use in the international astronomical literature are Allen (1899), Kunitzsch (1959), Hoffleit & Jaschek (1982), Hoffleit & Jaschek (1991), and Kunitzsch & Smart (2006). Kunitzsch & Smart (2006) present useful brief etymologies for the most common couple hundred star names, with more detailed etymologies (in German) of the Arabic star

† https://www.iau.org/public/themes/buying_star_names/

names appearing in Kunitzsch (1959). Many of the compilations in recent decades (e.g., Rhoads 1971; Hoffleit & Jaschek 1982) draw heavily from the popular English-language work by Allen (1899), however as pointed out by Kunitzsch (1979), much of the scholarship on the etymologies of the Arabic names presented by Allen is questionable.

After surveying the literature on cultural star names, several publications are now considered authoritative in terms of names and spellings. These include Saha & Lahiri (1955) for Hindu names, Kawena Johnson, Kaipo Mahelona & Ruggles (2015) for Polynesian names, and Cairns & Harney (2004) for Wardaman Aboriginal names. Chinese star names presented some challenges. Most Chinese star names that have appeared in western literature are actually names of asterisms, and many of these are duplicative and/or have uncertain cross-identifications. After consulting with the leadership of the Chinese Astronomical Society, we added associate member Yunli Shi as a recommended expert on the subject of Chinese names of stars and asterisms. After some discussions, some general guidelines for the Chinese star names were adopted during 2017: 1) “*The Chinese Sky During the Han: Constellating Stars and Society*” (Sun & Kistemaker 1997) is considered authoritative with early Chinese name-star identifications and spellings. 2) In general, the adopting of Chinese *asterism* names for *individual stars* should be avoided as it would cause confusion, so the Chinese names adopted for IAU CSN were usually attributed to individual stars. 3) Pinyin spelling is preferred, following Sun & Kistemaker (1997); however if the name appeared in older western literature with previous transliterations, those should probably be mentioned in notes. Eleven Chinese names were adopted by WGSN in 2017 for the IAU Catalogue of Star Names (CSN): *Fang*, *Fulu*, *Fuyue*, *Jishui*, *Kang*, *Taiyangshou*, *Taiyi*, *Tianguan*, *Tianyi*, *Xuange* and *Zhang*. While most of these were cases of Chinese names for individual stars, there are two exceptions: *Fang* and *Kang* were used for the determinative star in lunar asterisms.

For cross-identifications to designations (HR, HD, Bayer), those from the Bright Star Catalogue (Hoffleit & Jaschek 1982) are considered authoritative following the IAU Style Manual. In a small number of instances in the IAU CSN, stars with un-superscripted Bayer designations with component letters were used in favor of superscripted Bayer designations (e.g., Baily 1845, which are rarely used in the astronomical literature). For example, the designation α *Cen A* is listed as the designation for the star named *Rigil Kentaurus* instead of the rarer designation α^1 *Cen* listed in Bright Star Catalogue.

2.2. Multiple Stars

Following the precedence of the Executive Committee WG Public Naming of Planets and Planetary Satellites during the previous triennium (Montmerle et al. 2016), it was decided to attribute proper names to *individual stars* rather than entire multiple systems. For example, the name *Fomalhaut* specifically refers to the bright A component of a 3-star system. The informal names often attributed to other components in a physical multiple (e.g., “*Fomalhaut B*”) are treated as unofficial, and not included in the IAU Catalogue of Star Names†. In the IAU CSN, the components are clearly identified via their WDS identifiers, and have been double checked with Brian Mason (Comm. G1 Binary and Multiple Star Systems, and maintainer of the Washington Double Star Catalog‡).

† As these useful nicknames with the form [*proper name*] [*letter component*] often appear in the literature, many appear in the SIMBAD database.

‡ <http://ad.usno.navy.mil/wds/>

3. Products and External Coverage

Updates on WGSN's activities were presented in two IAU press releases:

IAU Formally Approves 227 Star Names (24 Nov 2016):
<https://www.iau.org/news/pressreleases/detail/iau1603/>

IAU Approves 86 New Star Names From Around the World (11 Dec 2017):
<https://www.iau.org/news/pressreleases/detail/iau1707/>

The IAU Catalogue of Star Names (CSN) maintained by the WGSN is posted at:
https://www.iau.org/public/themes/naming_stars/.

Two bulletins summarizing the early activities of the WGSN and the first batches of adopted names were posted to the IAU WGSN website:

https://www.iau.org/static/science/scientific_bodies/working_groups/280/WGSN_bulletin1.pdf

https://www.iau.org/static/science/scientific_bodies/working_groups/280/WGSN_bulletin2.pdf

WGSN member Duane Hamacher wrote an article for *The Conversation*:

“The stories behind Aboriginal star names now recognised by the worlds astronomical body”

<http://theconversation.com/the-stories-behind-aboriginal-star-names-now-recognised-by-the-worlds-astronomical-body-87617>.

Here are some examples of media coverage for WGSN activities:

“International Astronomical Union formally approves 227 star names” - Astronomy Now (Nov. 24, 2016)

<https://astronomynow.com/2016/11/24/international-astronomical-union-formally-approves-227-star-names/>

“227 Stars Given Names By International Astronomical Union” - Universe Today (Nov. 26, 2016)

<https://www.universetoday.com/132127/227-stars-given-names-international-astronomical-union/>

“Twinkle, Twinkle Little [Insert Name Here]” - New York Times (Dec. 2, 2016)

<https://www.nytimes.com/2016/12/02/science/naming-stars.html>

“Meer helderheid aan de sterrenhemel” - De Standaard (Dec. 1, 2016)

<http://www.cielen.eu/astrologie-meer-helderheid-aan-de-sterrenhemel-DS.pdf>

“Les cartes du ciel ont été dépoussiérées” - Le Monde (Jan. 4, 2017)

http://www.lemonde.fr/journalectronique/donnees/libre/20170104/index.html?article_id=1263836

“Official Names Approved for 86 More Stars” - Sky & Telescope (Dec. 14, 2017)

<http://www.skyandtelescope.com/astronomy-news/official-names-approved-for-86-more-star/>

“Cultures Lend Titles to 86 Suns” - Space.com (Dec. 18, 2017)

<https://www.space.com/39127-iau-unveils-86-new-star-names.html>

“86 stars get official names: Choices reflect international community” - Science News (Jan. 2, 2018)

<https://www.sciencenews.org/article/86-stars-get-official-names>

4. Star Names

Most of the traditional star names in common use compiled by Kunitzsch & Smart (2006) were approved by WGSN during 2016 and 2017. In some cases, choices were made with regards to which name and spelling was deemed most common, and in some cases some duplications were broken up. For example, both the stars designated ϵ Cygni and γ Corvi have been known as *Gienah* in some astronomical literature over at least the past two centuries. The name appears to have a stronger etymology with γ Corvi, and so the name *Gienah* was adopted for that star, however a name closely tied to the original Arabic etymology was adopted for ϵ Cygni - *Aljanah* (following the example in Rhoads 1971). Some star names from Bečvář (1951) for which Kunitzsch & Smart (2006) has been unable to trace an etymology, were adopted by WGSN, as they have diffused through the international astronomy literature over the past half century (and adopting other names might cause unneeded confusion). These include names like *Achird* for η Cas A, *Hatysa* for ι Ori Aa, and *Segin* for ϵ Cas. As of early 2018, a total of 313 star names were adopted for the IAU Catalogue of Star Names.

In Table 1, we list some examples of star names adopted by the WGSN for the IAU Catalogue of Star Names from cultures around the world (and notably outside the stream of “traditional” Arabic/Greek/Latin names).

Table 1. Examples of Cultural Star Names Approved for IAU Catalogue of Star Names

Name	Designation	Culture	Reference
Bharani	41 Ari Aa	Hindu	Saha & Lahiri (1955)
Chamukuy	θ^2 Tau Aa	Yucatec Maya	Milbrath (2010)
Fang	π Sco Aa	Chinese	Sun & Kistemaker (1997)
Fulu	ζ Cas	Chinese	Sun & Kistemaker (1997)
Fuyue	HR 6630	Chinese	Sun & Kistemaker (1997)
Ginan	ϵ Cru	Wardaman	Cairns & Harney (2004)
Jishui	o Gem	Chinese	Sun & Kistemaker (1997)
Kang	κ Vir	Chinese	Sun & Kistemaker (1997)
Khambalia	λ Vir A	Coptic	Greswell (1852)
Larawag	ϵ Sco	Wardaman	Cairns & Harney (2004)
Lilii Borea	39 Ari	French(Latin)	La Caille (1757)
Pipirima	μ^2 Sco A	Tahitian	Calderon (1922)
Polis	μ Sgr Aa	Coptic	Greswell (1852)
Revati	ζ Psc A	Hindu	Saha & Lahiri (1955)
Taiyangshou	χ UMa	Chinese	Sun & Kistemaker (1997)
Taiyi	8 Dra	Chinese	Sun & Kistemaker (1997)
Tiaki	β Gru	Tuamotuan	Kawena Johnson, Kaipō Mahelona & Ruggles (2015)
Tianguan	ζ Tau A	Chinese	Sun & Kistemaker (1997)
Tianyi	7 Dra	Chinese	Sun & Kistemaker (1997)
Unurgunite	σ CMa	Boorong	Stanbridge (1861)
Wurren	ζ Phe Aa	Wardaman	Cairns & Harney (2004)
Xamidimura	μ^1 Sco Aa	Khoikhoi	Hahn (1881)
Xuange	λ Boo	Chinese	Sun & Kistemaker (1997)
Zhang	v^1 Hya A	Chinese	Sun & Kistemaker (1997)

5. Future

The WGSN had a very successful first couple years of activity, and plans to repropose to the EC and Division C for activation during the next triennium. The WGSN serves an important role in filling in a long-standing IAU nomenclature gap (proper names of stars), both with respect to recognizing “past” names and setting the stage for enabling the inclusion of “new” names for astrophysically interesting stars and exoplanet hosts in the future. The WGSN is planning to write an article for the IAU Communicating Astronomy with the Public (CAP) journal about the WG’s activities and present the IAU Catalogue of Star Names along with summaries of the etymologies.

The WGSN maintains a large internal database of proper names of stars found in the historical astronomy and cultural astronomy literature. It is this large internal database that provides the working list of names from which unique names are proposed, voted upon, and adopted for the IAU Catalogue of Star Names. The database is enormous and growing, but not in a sufficiently polished form for external use. One idea is that the WGSN works to ultimately publish/post this internal database (perhaps an “IAU Dictionary of Cultural Star Names”?), which would require an enormous amount of work, and potentially including names in their original languages via unicode (which may require more expertise in languages that the WG currently has), and with information on the origin, etymology, and references.

The WGSN would like to increase and diversify the expertise of the WG, and would like to add new interested members, especially from regions with cultures with astronomical traditions currently underrepresented among the etymologies of the entries in the IAU Catalogue of Stars Names (e.g. especially those with knowledge of indigenous names from e.g., Africa, the Americas, and regions of Asia outside of China and Japan). It is hoped that the National Outreach Contacts engaged with the Office of Astronomy Outreach (OAO) could help provide more information on cultural star names to assist with the WGSN’s efforts and to diversify the pool of names incorporated into the CSN. Further work is needed reviewing eponymous names and deciding which may be worth including in the IAU CSN. One has been adopted thus far (Barnard’s Star); however there are numerous others, and some fell into disuse soon after their naming.

There are some open questions for which external input from other astronomers would be welcome going into WGSN’s 2nd triennium: *Can cultural names/aliases for bright stars be used as IAU adopted names for companions that already have IAU names? Can astronomers propose new proper names for stars† of astrophysical interest? (and by what criteria would these stars be worth naming?) Can the public (around the world) be engaged in a campaign similar to NameExoWorlds to name bright stars currently lacking proper names? (and by what criteria would these stars be worth naming?)*

† The same question can be posed for exoplanets. However, after the completion of Name-ExoWorlds in 2015 and dissolution of the IAU Executive Committee Working Group: Public Naming of Planets and Planetary Satellites, no WG exists to address this at present (2018).

6. Clarification on Stellar Nomenclature

Here are answers to some common questions on celestial nomenclature which were asked of WGSN:

Are transliterated Bayer designations considered “proper names”? No. Bayer designations are considered a special historical case of alphanumeric designations. While these transliterated names are in common use (e.g. Tau Ceti), they are treated as designations and not catalogued in the IAU Catalogue of Star Names.

Are transliterated Bayer designations capitalized? Yes. Even though Bayer’s (1603) *Uranometria* used lower case Greek letters, and a transliterated lower case letter (α) would not normally be capitalized (e.g. *alpha*), the fact that Bayer designations are representing *individual astronomical objects* (Sec. 6.13 of IAU Style Manual; Wilkins 1989) means that initial capitals should be used. So when transliterated to Latin alphabet, τ Ceti would appear in text as *Tau Ceti*. This is consistent with use in the majority of IAU publications over the past century.

Do proper names “replace” alphanumeric (e.g. Bayer) designations? Did Rigil Kentaurus “replace” the name for α Centauri? No & no. Stars may have several *designations* as they appear in various astronomical catalogues representing varieties of different observations (e.g. astrometry catalogues, bright star catalogues, infrared catalogues, etc.). A star can easily have dozens of designations, but they do not “replace” each other. So the star with proper name *Sirius* is associated with the star with Bayer designation α CMa (Alpha Canis Majoris), and designated HR 2491, HD 48915, etc. When the WGSN adopted the old traditional name *Sirius*, the other designations obviously do not “disappear” or become any less valid. One can think of the α Cen multiple system now having three stellar components: A has the proper name *Rigil Kentaurus*, C has proper name *Proxima Centauri*, and B thus far does not have a proper name. Alphanumeric designations for those stars can be found in SIMBAD.

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