THE IAU WORKING GROUP ON STAR NAMES (WGSN): A REVIEW OF RECENT ACTIVITIES

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1 INTRODUCTION

The International Astronomical Union (IAU) established its Working Group on Star Names (WGSN) in May 2016, following the 2015 NameExoWorlds campaign that exposed the lack of formal star-naming policies (Montmerle et al., 2016). The main goal then became the compilation of a new catalog of star names that is supposed to reduce confusion about the spellings and namings of stars in research papers. Under Eric Mamajek's initial leadership and supported by IAU General Secretary Thierry Montmerle, the WGSN was created to establish comprehensive guidelines for proposing and adopting star names. The group's primary mission include:

(1) Searching international astronomical history and cultural literature for traditional star names;
(2) Adopting unique names for stars of scientific and historical importance, based on agreed-upon guidelines;
(3) Creating standardized nomenclature (which had been lacking for over a century); and
(4) Expanding beyond conventional Greco-Roman and Arabic naming traditions.

1.1 The IAU Catalogue of Star Names

The WGSN systematically assembles, maintains, publishes, and disseminates an official IAU-Catalogue of Star Names (CSN) for both stars and exoplanets. Through careful documentation of historical and cultural stellar nomenclature, this comprehensive approach preserves astronomical heritage while informing and standardizing future naming initiatives, including public campaigns for exoplanets and their host stars.

While this catalogue will serve as the standard scientific reference for astronomical publications, it maintains an inclusive approach rather than imposing restrictions on naming conventions. The CSN's core mission is to establish standardized nomenclature that minimizes ambiguity in research papers, while simultaneously documenting alternate names used across different cultures. These cultural variants will be systematically mapped and accessible through an IAU-portal dedicated to preserving astronomical heritage, ensuring both scientific clarity and cultural recognition.

1.2 Etymologies

The WGSN's 2018–2021 Triennial Report (Mamajek et al., 2021) comprehensively analyzed star name origins. The data revealed a significant dominance of Arabic names (see Figure 1). Based on these findings, the WGSN made a strategic decision to diversify the IAU-CSN by actively incorporating names from cultures beyond the traditional Arabic and Greco-Latin astronomical traditions.

1.3 Strategy

In 2021, the IAU established that historical and Indigenous cultural names would be reserved for bright stars (those with a visual magnitude brighter than 6.5). Stars fainter than this threshold were designated for the NameExoWorlds Campaigns (NEWC). The IAU Office for Astronomy Outreach managed the 2022 NEWC with a Steering Committee that included members of WGSN and the IAU Executive Committee, and the Working Group on Star Names expanded its scope to systematically document cultural star names across civilizations.

1.4 Further Collections

The WGSN has embarked on an ambitious project to create a comprehensive encyclopedia documenting the proper names of stars and constellations across historical and indigenous

cultures worldwide. Initially, the group considered building upon existing platforms, such as the Stellarium software's 'sky cultures' repository on GitHub or the ancient-skies.org database (cf. Vickers et al., 2022). However, after a thorough evaluation at a 2023 scientific meeting in Jena, these existing systems were found to be inadequate for the project's scope and requirements.

Following a detailed analysis of data management needs and extensive collaborative discussions, the WGSN has developed its own custom solution for the IAU encyclopedia. This new platform has been specifically designed to meet the unique requirements of preserving and presenting astronomical naming traditions from diverse cultures.

The new IAU encyclopedia employs a carefully controlled editorial process, with contributions limited to vetted scholars. This specialized database is designed to capture comprehensive information about stellar nomenclature. Each entry documents the etymological histories and origins of star names, along with their cultural and mythological significance across different societies. The encyclopedia draws from a wide range of historical documentation, including ancient texts and books, historical star charts and celestial globes, oral histories, and traditional knowledge. Recorded interviews with community Elders and cultural knowledge keepers could be particularly valuable sources, complementing contemporary astronomical literature. This curated approach ensures the encyclopedia maintains high academic standards while preserving diverse astronomical heritage from around the world.

2 CURRENT STATE OF THE ART

The WGSN experienced varying levels of activity in its star-naming efforts across recent years. In 2022, the group approved just two new star names, while subsequent work in 2023 focused heavily on technical development and organizational restructuring. After this period of internal development, the WGSN established a more systematic approach to evaluating bright star names in 2024 by implementing regular monthly meetings to discuss and review naming proposals.

2.1 Launching Etymologies Studies

In 2021, the WGSN Subgroup on Star Names etymologies led by Doris Vickers, undertook a systematic effort to catalogue etymological information for star names in a detailed spreadsheet, following statistical analyses of IAU-approved star names, examining their etymological origins and historical context in a study that covered 449 star names, with the exception of 127 names from the 2015 and 2019 IAU NameExoWorlds campaigns. The linguistic analysis revealed Arabic as the predominant source at 44.3%, followed by Latin at 6.5%, Greek at 4.9%, and Chinese at 2.4%. For 2.2% of names, the linguistic origin remains unclear, while the remaining 41.9% represents contributions from at least 22 different languages, each contributing less than 2% of the total.

The historical timeline analysis, completed for 375 stars (83.5% of the sample), revealed that 37.7% originated from recent NameExoWorlds campaigns, while 3.3% were Indigenous in origin. Among names with determinable historical epochs, 7.1% dated from after 1800 CE, 35% from between 1500–1800 CE, 11% from 500–1500 CE, and 14.8% from 500 BCE–500 CE. A small fraction dated to earlier periods, with 0.3% from the early first millennium BCE and 2.1% from the second millennium BCE, while 16.5% of the names still await historical dating. These findings, documented in the 2020 WGSN annual report, provide valuable insights into the cultural and temporal diversity of astronomical nomenclature.

The Etymology Task Group developed a comprehensive table documenting the origins of WGSN-approved star names. The online table, accessible at http://exopla.net/star-names/modern-iau-star-names/, is a living document. It provides detailed etymological information for each star name, including its cultural roots, linguistic origin, earliest recorded usage, and WGSN approval details. Working closely with colleagues including Clive Ruggles, Danielle Adams, Duane Hamacher, and Susanne M. Hoffmann, the content of the etymology table was systematically expanded. The findings were presented at the annual meeting in January 2023, after which the spreadsheet was made publicly available on the WGSN website. By late 2023, the team had completed 59% of the etymological entries. Among the remaining entries, particularly those referenced in Kunitzsch and Smart's (2006) comprehensive work, are slated for future documentation by Adams and Vickers. Ridpath and Hoffmann added the rest of roughly seventy entries. By the end of 2024, the document was complete except three entries whose origin remained unknown. This living document undergoes regular updates as new information becomes available and additional star names are included in the IAU-CSN.

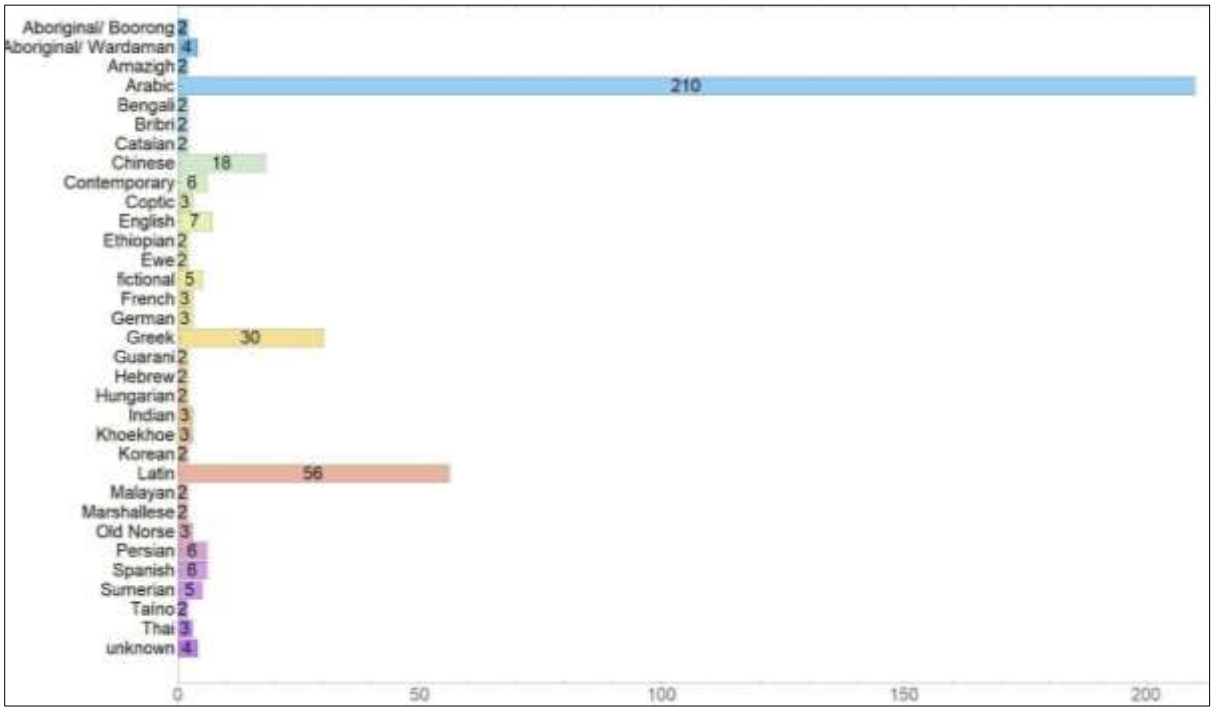

Figure 1: Statistics of languages that occur more than one time and are not from one of the exoworld naming campaigns.

2.2 Re-Analysis of the IAU Catalogue of Star Names (2023/2024)

After the 2022 public naming campaign and some additions in 2024 from WGSN's own research, the IAU Catalogue of 491 Star Names reflects a rich linguistic diversity, drawing from over 105 different languages, including various dialects and derivative forms that are counted with their parent languages. Many languages are represented by just a single entry, often introduced through NameExoWorlds Campaigns (NEWCs). For statistical analysis, the name catalogue tracks the frequency of language appearances, excluding single occurrences and NEWC contributions (Figure 1). The name catalogue includes a special 'Contemporary' category for modern naming sources, encompassing names derived from scientific discoveries like 'Barnard's Star' and astrophysical phenomena such as 'Geminga'. This category also includes names drawn from fiction, such as 'Absolutno' from Czech literature and 'Solaris' from Polish science fiction. These contemporary names represent a distinct cultural layer in astronomical nomenclature, bridging historical traditions with modern scientific and cultural contributions.

The statistical analysis of star names plotted in Figure 1 remains mostly the same compared to the 2020 statistics of linguistic origins. Arabic names still dominate the catalogue, comprising 42.7% (–1.6%) of entries, followed by Latin names at 11.4% (+4.9%). The next tier includes Ancient Greek (6.1%; +1.2%), Chinese (3.7%; +1.3%), and Contemporary and fictional names (2.2%). Among modern languages, English and Spanish contribute 1.4% and 1.2% of names, setting them apart from other current languages that appear less frequently in the catalogue. This distribution reflects both historical astronomical traditions and the enduring influence of early star-naming practices.

The spatial distribution of named stars (Figure 2) across the celestial sphere shows notable concentrations in certain constellations. Ursa Major (the Great Bear) leads with 4.9% of named stars, followed by Eridanus (the River) with 4.1%, and Scorpius (the Scorpion) with 3.7%. Despite these concentrations, named stars appear well distributed across the entire celestial sphere, representing both the Northern and Southern Hemispheres (see Figure 3).

In the annual report for 2023, the WGSN identified a notable gap in stellar nomenclature regarding bright stars that serve as primary references in official IAU constellations, e.g. for stick figures. There are 471 stars with m_V >3.9 i.e. visible even under urban light pollution, and about half of them are unnamed. Several main stars in fainter constellations even remain without standardised names. Specifically, 36 main stars (brightest) of IAU constellations still await official designations (see Table 1). This situation has highlighted the need for systematic attention to these significant celestial markers.

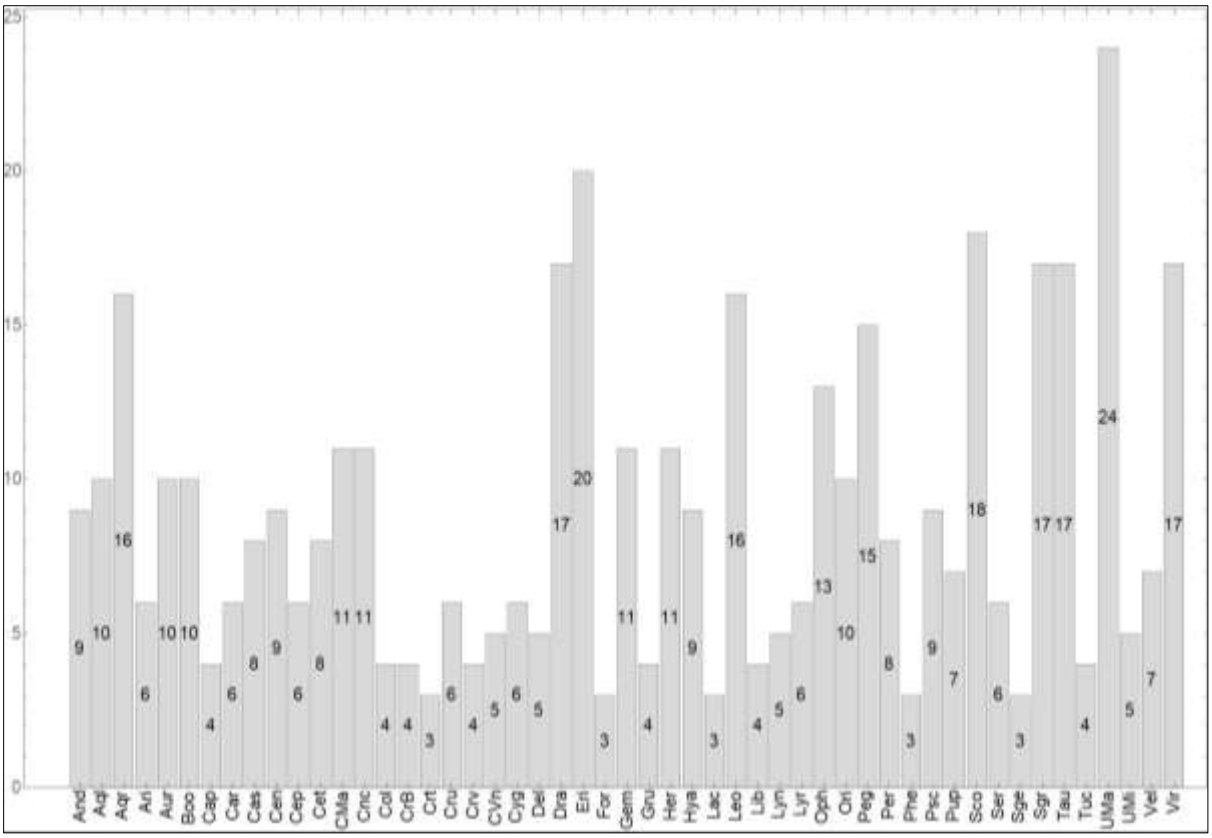

Figure 2: Distribution of all named stars among the constellations (displayed only those with more than two stars named).

Table 1: Main stars in IAU constellations unnamed as at the end of 2023.

Star				Constellation Name
No.	Designation	Name	Magnitude (m_v)	
1	HIP 39953	γ2 Vel	1.83	Vela
2	HIP 71860	α Lup	2.29	Lupus
3	HIP 2081	α Phe	2.38	Phoenix
4	HIP 61585	α Mus	2.69	Musca
5	HIP 85792	α Ara	2.84	Ara
6	HIP 9236	α Hyi	2.86	Hydra
7	HIP 110130	α Tuc	2.87	Tucana
8	HIP 101772	α Ind	3.11	Indus
9	HIP 45860	α Lyn	3.14	Lynx
10	HIP 71906	α Cir	3.19	Circinus
11	HIP 32607	α Pic	3.3	Pictor
12	HIP 21281	α Dor	3.30	Dorado
13	HIP 17440	α Ret	3.33	Reticulum
14	HIP 90442	α Tel	3.46	Telescopium
15	HIP 98337	γ Sge	3.51	Sagitta
16	HIP 40526	β Cnc	3.52	Cancer
17	HIP 55282	δ Crt	3.56	Crater
18	HIP 42828	α Pyx	3.68	Pyxis
19	HIP 107089	ν Oct	3.7	Octans
20	HIP 34481	γ2 Vol	3.72	Volans
21	HIP 111169	α Lac	3.76	Lacerta
22	HIP 72370	α Aps	3.83	Apus
23	HIP 91117	α Sct	3.83	Scutum
24	HIP 19747	α Hor	3.85	Horologium
25	HIP 37447	α Mon	3.93	Monoceros
26	HIP 40702	α Cha	4.05	Chamaeleon
27	HIP 51172	α Ant	4.25	Antlia
28	HIP 4577	α Scl	4.27	Scutum

29	HIP 22783	α Cam	4.29	Camelopardalis
30	HIP 21770	α Cae	4.45	Caelum
31	HIP 49641	α Sex	4.49	Sextans
32	HIP 102831	α Mic	4.89	Microscopium
33	HIP 79790	γ Nor	5.01	Norma
34	HIP 29271	α Men	5.07	Mensa

In 2024, the WGSN agreed upon names for some of them (see below), specifically using historical name alternatives of the constellation. By the end of 2024, still 51.5% of the stars brighter than 3.9 mag were unnamed, and WGSN targets to research more Indigenous and historical names to apply to them. Hence, all experts are invited to contribute their ideas on how to name these crucial stars.

2.3 Star Catalog and Star Name Catalog

Beyond the unnamed main stars of modern constellations, the WGSN created a comprehensive naked-eye star catalogue to track both named and unnamed stars better. This new catalogue is based on the ESA Hipparcos (HIP) catalogue: the result is a catalog of 8547 star brighter than 6.5 mag, among which 471 are brighter than 3.9 mag. This catalog focuses specifically on stars visible to the naked eye (those brighter than visual magnitude 6.5) mapping them to their respective IAU constellations. While still in development and pending publication, this catalogue will be a foundational resource for the WGSN's future naming efforts. The ongoing verification process has already revealed the need for careful review, as some entries originally classified as stars have been identified as other celestial objects—for example, omega Centauri, which is a globular star cluster rather than a single star.

In 2023 and 2024, the group members also collated name suggestions. We created a collection where our group members contributed names of asterisms of all types (constellations, super-constellations, parts of constellations, individual stars) from the cultures they study: for instance, there are 283 Chinese constellation names (among them, some single star-asterisms) and for most of them, we could name the principle star of the historical constellation pars-pro-toto to preserve the heritage in a name. However, this won't work for some of these names because the Chinese principal star already has a name. It will not make sense for Chinese readers to apply the name to any other star in the traditional constellation (e.g. Regulus as the principal star of the Chinese constellation Xuanyuan, so WGSN cannot use the name Xuanyuan). We collated a total of 269 names from twentieth-century astronomy literature, ancient Egyptian, Inka, Indian Sanskrit, Coptic, Latin, Babylonian, Greek, Oceanic, Coptic, Japanese, Locono tradition and from the Stellarium sky cultures, 180 names from the Northern Dene peoples in Alaska and Northern Canada (based on Chris Cannon's work), and 712 Arabic terms (based on Roland Laffitte's work). This list of roughly 1450 name suggestions from currently ongoing research in history, philology and ethnology needs to be sorted, checked for duplicates, and mapped to the catalog of about 8000 unnamed stars brighter than 6.5 mag.

2.4 New Encyclopaedia Project

The WGSN is developing a sophisticated scoring system to evaluate potential star names for official inclusion in the catalogue. This initiative reflects the complex balance between two key objectives: preserving historically established names while promoting cultural diversity and inclusion in astronomical nomenclature. In its earlier phase, before 2021, the WGSN primarily focused on standardizing spellings of well-known star names—for instance, determining whether 'Altair' should include the 'L'. However, the current scope has expanded significantly, requiring a more nuanced approach. The working group now faces the challenging task of developing robust criteria for choosing between competing cultural names for the same star. This decision-making framework must carefully weigh the preservation of long-standing astronomical traditions against the IAU's commitment to cultural diversification and inclusivity.

The WGSN has consistently stressed, in various forums, that excluding a name from the IAU catalogue does not diminish its cultural value or significance. Technical constraints, such as the 16-character length limit or restrictions on diacritical marks, may prevent a name from being officially adopted for practical astronomical use. These limitations reflect purely practical considerations for both professional and amateur astronomers.

To address this challenge, the WGSN has created a comprehensive digital encyclopedia project to document and preserve star names from all cultures, regardless of their official status. This knowledge base is built on MediaWiki technology but has been customised to meet specific project requirements. A key feature is its restricted editing access, allowing contributions only from authorised scholars and project partners.

Table 2: New officially recognised star names designed to fill gaps in the nomenclature.

No.	Original Name			New Name	
	Designation	Name	m_V	Name	Origin
2	HIP 71860	α Lup	2.29	Uridim	Babylonian term
7	HIP 110130	α Tuc	2.87	Lang-Exster	Early modern Malayan-Dutch term
10	HIP 71906	α Cir	3.19	Xami	|Xam-dialect of the Khoe language
13	HIP 17440	α Ret	3.33	Rhombus	Latin term, original constellation name
21	HIP 111169	α Lac	3.76	Stellio	Latin term, original constellation name
34	HIP 29271	α Men	5.07	Hoerikwaggo	Khoekhoe / San language

The encyclopedia maintains academic rigour through careful documentation. Each entry is fully citable, with clear attribution of authors and timestamps for the most recent updates. This information is readily available both at the bottom of each page and in the page history. All content, including both text and images, is shared under a Creative Commons (CC) license that requires attribution to the original authors. This ensures proper recognition of scholarly contributions while promoting open access to astronomical cultural heritage.

2.5 First Success

The WGSN has enhanced its operational efficiency by implementing regular monthly meetings for focused discussions and launching the All Skies Encyclopedia (ASE) project. This new approach has facilitated more effective collection and organisation of cultural information about star names in 2024. The Working Group has also expanded its expertise by adding new members and creating specialised subgroups focused on specific cultural traditions: Arabic, Babylonian, Greco–Latin, and Chinese astronomical heritage. These subgroups help ensure thorough evaluation of star names from these historical traditions.

The Working Group continues to make progress in naming previously undesignated principal stars, recently adding 20 new officially recognised names to the IAU Catalogue of Star Names. Those additions that specifically target filling gaps in the nomenclature of significant stars that previously lacked standardised designations are listed in Table 2.

The distribution of all star names applied as of December 2024 is displayed in Figure 3.

3 CALL FOR CONTRIBUTIONS

In 2022, the IAU launched another public naming campaign for stars, with the IAU Office for Astronomy Outreach (OAO) managing the NameExoWorlds Campaign independently from cultural naming initiatives. While WGSN Secretary Eric Mamajek provided consultation to OAO, the broader Working Group on Star Names remained uninvolved. The WGSN's cultural astronomy experts, whose work traditionally focuses on naked-eye visible stars (those brighter than magnitude 6.5), typically concentrate on preserving and documenting historical and Indigenous stellar names. Looking ahead, the WGSN cultural astronomy experts aim to

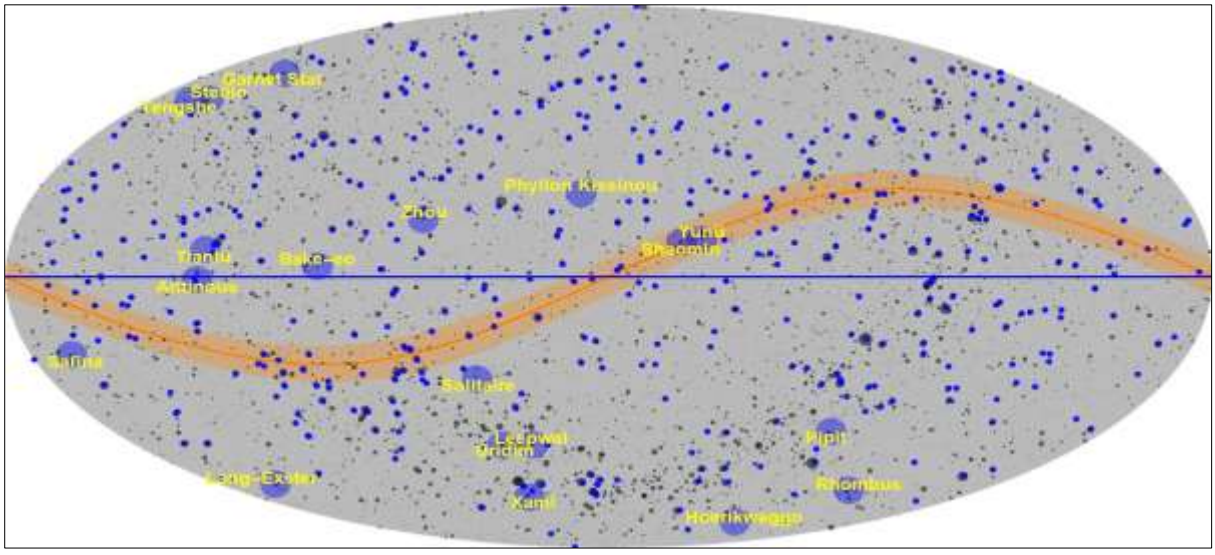

Figure 3: This is an all-sky map of the Yale Bright Star Catalog (black) in equatorial coordinates. The Equator is indicated in blue, and the ecliptic and the path of the Moon and planets are indicated in orange because this area had cultural significance. All stars named in the IAU Catalog of Star Names (CSN) are coloured in blue; the large blue discs indicate the new adoptions in 2024.

participate actively in future naming campaigns, broadening their scope beyond bright stars to ensure cultural and historical perspectives inform the naming process across all stellar magnitudes.

The Working Group Star Names (WGSN) is a key strategic initiative in the IAU's 2020–2030 Strategic Plan. It focuses on expanding cultural representation in astronomical nomenclature. The group seeks to address a significant gap in stellar naming traditions, particularly regarding Indigenous and pre-ancient astronomical heritage, which remains notably underrepresented in current catalogues.

The WGSN actively seeks contributions from cultural experts of all backgrounds—those with direct cultural knowledge and academic scholars—mainly to help name the above-mentioned significant stars in IAU constellations that currently lack standardised names. While the IAU operates as a volunteer organisation without monetary compensation, it offers participants a valuable opportunity to join a global network of experts dedicated to preserving immaterial astronomical heritage.

The group especially welcomes experts who can contribute to its broader mission of cultural diversification in astronomical naming traditions. This collaboration aims to ensure that star names reflect the rich astronomical heritage of cultures worldwide, moving beyond traditionally documented sources to include previously underrepresented cultural perspectives.

4 ACKNOWLEDGEMENTS

WGSN warmly thanks Rob van Gent (The Netherlands) for his advice and comments.

5 REFERENCES

Cannon, C.M., 2021. Northern Dene Astronomical and Sky-related Knowledge: A Comparative Anthropological Study. PhD Thesis, Department of Anthropology[?], University of Alaska, Fairbanks, Alaska, USA (https://scholarworks.alaska.edu/handle/11122/12991).

Kunitzsch, P., and Smart, T., 2006. *A Dictionary of Modern Star Names: A Short Guide to 254 Star Names and Their Derivations, 2nd Revised Edition*. Cambridge (MA), Sky Publishing Corporation.

Laffitte, R., 2012. *Le Ciel des Arabes: Apport de l'Uranographie Arabe*. Paris, Geuthner (in French).

Mamajek, E.R., Belmonte Aviles, J.A., Cheung, S-L., Garcia, B.E., Gullberg, S., plus 14 further authors, 2021. Division C / Working Group Star Names. In Lago, M.T. (ed.), *Reports on Astronomy, 2018-2021, Transactions of the IAU, Volume XXXA*. Cambridge, Cambridge University Press (https://exopla.net/wp-content/uploads/2025/04/wg-starnames-triennial-report-2018-2021.pdf).

Montmerle, T., Benvenuti, P., Cheung, S.-L., Christensen, L.L., Lecavelier Des Etangs, A., plus 7 further authors, 2016. Executive Committee Working Group Report: Public naming of planets and planetary satellites. In Montmerle, T. (ed.), *Transactions of the IAU, Volume XXIXA*. Cambridge, Cambridge University Press. Pp. 539–548.

Vickers, D. Zotti, G., Schultz, R. and Hoffmann, S.M., 2022. Ancient skies and Stellarium – making cultural information easily accessible. In Hoffmann, S.M., and Wolfschmidt, G. (eds.). *Astronomy in Culture: Cultures of Astronomy*. Hamburg, Tredition. Pp. 562–580.