

# Public Naming of Exoplanets and Their Stars: Implementation and Outcomes of the IAU100 NameExoWorlds Global Project

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The IAU100 NameExoWorlds public naming campaign was a core project during the International Astronomical Union's 100th anniversary (IAU100) in 2019, giving the opportunity to everyone, everywhere, to propose official names for exoplanets and their host stars. With IAU100 NameExoWorlds the IAU encouraged all peoples of Earth to consider themselves as "Citizens of the Universe", united "under one sky". The 113 national campaigns involved hundreds of thousands of people in a global effort to bring the public closer to science by allowing them to participate in the process of naming stars and planets, and learning more about astronomy in the process. The campaign resulted in nearly 425 000 votes, and 113 new IAU-recognised proper names for exoplanets and 113 new names for their stars. The IAU now officially recognises the chosen proper names in addition to their previous scientific designations, and they appear in popular databases.

## Introduction

Over the past three decades, astronomers have discovered thousands of planets orbiting other stars, which are known as exoplanets. The results from the NASA Kepler mission<sup>1</sup> suggest that most stars must have exoplanets. The ubiquity of planets orbiting other stars, and the commonality of chemical species which are the building blocks of life, suggest that extraterrestrial life may be likely. These discoveries open an enormous perspective of humanity's place in the cosmos.

Within the NameExoWorlds programme, the IAU encourages all peoples of Earth to consider themselves as "citizens of the Universe", and set aside borders, wars, and religious and cultural differences for a universal, peaceful view of humanity as one.

While celebrating its first 100 years (IAU100) of fostering international collaboration, the International Astronomical Union (IAU)

wished to contribute to the fraternity of all people with a significant token of global identity.

As part of the IAU's mission to promote and safeguard the science of astronomy

through international cooperation, the IAU is the authority responsible for assigning official names to celestial bodies. With the IAU100 NameExoWorlds Global Project, the IAU aimed to offer all countries and as many people as possible the opportunity



Figure 1. IAU100 NameExoWorlds website. Credit: IAU

to participate in the official naming process of exoplanets and their stars.

The IAU Office for Astronomy Outreach (OAO) invited all IAU National Outreach Coordinators (NOCs) and countries without a NOC to compose a National Committee in their country responsible for holding the national contest.

The project was officially launched on 6 June 2019<sup>2</sup> (Figure 1) and came to an end on 17 December 2019 when the results from 112 national campaigns were publicised. Results from an additional campaign in Mongolia took several weeks of additional deliberation and were decided in early 2020.

The national campaigns involved hundreds of thousands of people as a global effort to bring the public closer to science — learning more about astronomy and other planets — and by allowing them to participate in the process of naming stars and planets (Penteado *et al.*, 2019). The names for the planets and stars in these 113 systems reflect the rich culture of human practices and natural wonders, all now immortalised in the sky (Figure 2).

## Early Planning

In 2019, the IAU completed 100 years since its foundation. As decided in the XXXth General Assembly in Vienna, Austria in 2018, a year-long celebration was organised to promote and support outreach and educational events taking place worldwide, as an effort to foster astronomy as a tool for development and diplomacy. One of the global projects proposed in the framework of IAU100 was the NameExoWorlds programme as a suitable way to pursue the central theme of IAU100, “Under One Sky”.

The 2019 edition of NameExoWorlds built upon the experience acquired in the previous edition of 2015, but now offered the opportunity for all countries and territories of the world to run their own national contests to choose names of an assigned exoplanet and its host star. This new format proposed by Piero Benvenuti, IAU General Secretary from 2015 to 2018, aimed at directly involving the population within each country. The experience of NameExoWorlds in 2015 had indeed

shown that all over the world the population is truly involved in the process, especially when local people interested in astronomy organise outreach activities related to the contest. Moreover, the involvement is further increased when the population is given the opportunity to draw a link between the names given to the extrasolar systems and its own culture.

## IAU100 NameExoWorlds Steering Committee

To coordinate the IAU100 NameExoWorlds project, the IAU100 Secretariat set up a

Steering Committee with members from all around the globe. The Steering Committee selected and assigned planetary systems to each participating country, and developed naming guidelines to be followed by the National Committees. The IAU president Ewine van Dischoeck invited Eric Mamajek and Alain Lecavelier des Etangs to co-chair the IAU100 NameExoWorlds Steering Committee and Eduardo Monfardini Penteado to be the project manager. Additional Steering Committee members included IAU President-Elect Debra Elmegreen, former IAU General Secretary Piero Benvenuti, IAU OAO



**Figure 2.** Example graphic for the Trinidad & Tobago IAU100 NameExoWorlds campaign, showing the winning selections for the exoplanet HD 96063b/Ramajay and its star HD 96063/Dingolay. Credit: IAU100 / Aneta Magraf-Druc

International Outreach Coordinator (IOC) Lina Canas, former OAO IOC Sze-leung Cheung, IAU Press Officer Lars Lindberg Christensen, IAU100 Coordinator Jorge Rivero González, and researchers Guillem Anglada-Escudé, Gareth Williams, Hitoshi Yamaoka, and John Brown Paul Strachan.

### Exoplanetary Systems: Vetting and Assignment

Mamajek, Lecavelier des Etangs, and Anglada-Escudé vetted exoplanetary systems in early 2019, producing a list of systems for naming. The vetting process involved searching the Washington Double Star Catalogue<sup>3</sup>, the Gaia Data Release 2 Catalogue<sup>4</sup> and published journal papers. To level the naming opportunities among the national campaigns, each campaign would yield a pair of names (an exoplanet and host star) for a system currently thought to have a single exoplanet and no other known stellar or substellar companions.

The selected exoplanets are mostly thought to be giant planets with masses between 0.1 and 5 Jupiter masses and mostly discovered before 2013. All had been detected via either the radial velocity or ground-based transit method. The host stars are all fainter than the naked eye with magnitudes between 6 and 13. The selected range was chosen for educational and practical purposes. Stars in this range require binoculars or small telescopes for observation, which encourages their use. Additionally, there were too few naked-eye host stars for all the countries, and the committee wanted to avoid any controversy over whether or not a given country had a star visible to the naked eye or create a hierarchy among countries with the brightest naked-eye star. An initial attempt was made to sort the candidates by declination and assign them to countries based on the latitude of the country's capital. However, in several instances stars were assigned where there was an obvious connection between the exoplanet and the nationality of the discoverers or the location of the observatories used to discover the planet. For example, HD 109246 (dec +74°) was assigned to the northernmost country (Iceland, lat. +64°) and HD 137388 (dec -80°) was assigned to the southernmost (New Zealand, lat. -41°). All the systems assigned have declinations within 52° of the latitude of the capital of the country that conducted the naming campaign, and

hence are locally visible at least partially during the year. In many instances the stars are circumpolar.

The Steering Committee gave the National Committees the opportunity to request changes to their assigned systems as long as a reasonable reason was provided and the requested planetary system followed the rules of assignment, such as the star magnitude and planet mass constraints. Reassignment requests taking into consideration the nationality of a member of the discovery team, thus increasing local engagement and publicity for the campaign, were considered reasonable<sup>5</sup>.

### Establishment of the National Committees

The 2019 NameExoWorlds campaign intended to broaden the participation of the public, which was possible through individual national campaigns. This was the first time that such a project was proposed to the IAU National Outreach Coordinators (NOCs) networks, and for most, this was also the first opportunity to lead an international project at a national level. The participation of NOCs was crucial for the success of this latest edition. The Steering Committee also accepted proposals to run campaigns from autonomous territories (e.g. Aruba) and other regions (e.g. China Nanjing, China Taipei) in which the local community displayed a high level of excitement and engagement with astronomy.

Most of the national campaigns had committees chaired by the corresponding NOC. In the cases where the NOCs could not take the lead, another person was appointed by them. NOCs were responsible for appointing other members to join the National Committees, which was recommended to be diverse in terms of backgrounds and experience, and taking gender balance into account. In total, nearly one thousand people supported the 113 National Committees.

In the absence of a NOC to lead the national campaigns, a form was made available through the official NameExoWorlds website<sup>6</sup> for people and organisations interested in running the contest in their national communities as an effort to offer the opportunity to include and represent as many peoples as possible in the campaign.

As a result, a total of eight countries or territories joined the project following the acceptance by the Steering Committee: China Taipei, the Cook Islands, Costa Rica, Madagascar, the Pitcairn Islands, Singapore, Paraguay, and Haiti. In some of these geographical areas, the proposer later became a NOC.

A total of 113 national campaigns successfully carried out public naming campaigns from the initial proposal to the acceptance of selected names (Figure 3). Three countries were unable to complete their contests. The main reasons were a lack of resources to promote the project on a national scale, which resulted in no direct participation of the public, and difficulties recruiting members to form a National Committee. Social and political disturbances, and security and safety concerns also played an important role in deterring the successful conclusion of the contest, in at least one case.

### Naming Guidelines

The first IAU NameExoWorlds campaign in 2015 kept very general naming guidelines based on those used for minor planets (*Montmerle et al., 2016*). For the 2019 campaign, additional guidelines (Box 1) to improve the quality and diversity of the winning entries, to create long-standing value to the IAU and the rest of the astronomical community, and to inform future naming guidelines<sup>7</sup>. The NameExoWorlds campaign was seen as a celebration of world culture and people's connection to the sky.

One of the challenges was to inform the public of which names the IAU already recognised as "official". In 2015 several top vote-getters duplicated existing minor planet names, and the committee spent large amounts of time identifying and handling these duplicates. Therefore, as a lesson learnt from the 2015 campaign, a single IAU database of such names was created for the 2019 edition making it easier to avoid conflicts with the roughly 22 600 IAU-recognised names for exoplanets, solar system planets, planetary satellites, minor planets, constellations, and stars. An electronic version of the file is being prepared for long term curation and future use on the IAU website.

The Steering Committee allowed additional direct queries by all National Committees regarding guidelines and naming rules, and in an effort to answer any further questions from the public a Frequently Asked Questions was made available online<sup>8</sup>.

## National Campaigns

The NameExoWorlds National Committees had approximately six months to run their campaigns, with an additional three months of earlier preparation.

The exact time a country could join the project was quite flexible, as it depended on their availability. Most countries started their national contests on the official launch date, while others joined later on.

Most national campaigns were composed of three main steps: (1) advertising the contest, (2) collecting and down-selecting name proposals, and (3) voting on the finalists. National Committees were in charge of the whole process, and free to develop a timeline that best suited their local needs, as long as all results were delivered on the date established by the Steering Committee.

## Advertising the Contest

The first step was performed in a very broad manner. Social media, altogether with a visually appealing artwork and design (including an official NameExoWorlds logo) was the most used method to advertise the project, while other traditional media, such as TV and radio, were also used on a smaller scale. Many countries created websites to advertise their campaigns. One of the most critical characteristics of NameExoWorlds was involving the general public as much as possible in the naming process. Therefore, it was mandatory that all names were proposed exclusively by the public.

## Selection and Voting

For the voting phase, in case the National Committee lacked the time or resources to organise a secured vote open to the public, guidelines allowed a voting system where the final decision was made solely by the National Committee or by a hybrid system

with input from the public and the National Committee.

## Results and Global Announcement

The voting results submitted by each National Committee were composed of the highest-ranked name of the country's

exoplanet and star, plus two backup names for each.

The Steering Committee then performed a validation process. When the highest-ranked names followed the naming rules, they were recognised as the official names of the respective "exoworlds"; otherwise, backups were identified and chosen.

After the vetting process was concluded and the Steering Committee had reached

### Box 1. Additional Naming Guidelines

- The proposed names should be of things, people, or places of long-standing cultural, historical, or geographical significance, worthy of being assigned to a celestial object.
- Although not necessary, the names may be drawn from themes related to the sky and astronomy, or related in some way to the constellation or a cultural asterism in which the exoplanetary system lies.
- In recognition of the UN 2019 International Year of Indigenous Languages (IYIL2019)<sup>21</sup>, speakers of Indigenous languages are encouraged to propose names drawn from those languages.
- Two (2) names should be proposed — one (1) for the exoplanet and one (1) for the star it orbits.
- The two names should follow a common naming theme. The naming theme describing how the names are related in some logical way should be summarised in a sentence or two, and be broad enough that additional names could be drawn from the literature to name additional objects in that exoplanetary system in the future (e.g. additional planets which might be discovered, additional stellar companions). Example: Rivers of country XYZ. Fictional lands in 19th-century stories from country XYZ, etc.
- Proposed names, after translation, should be:
  - Between 4 and 16 characters in length in Latin alphabet (including spaces or punctuation),
  - Preferably one word,
  - Pronounceable (in some language),
  - Non-offensive,
  - Not identical to, or too similar to, an existing name of an astronomical object. Names already assigned to astronomical objects can be checked using these links.
    - IAU names for minor planets in the Minor Planet Centre (MPC) database<sup>22</sup>,
    - Names of galactic and extragalactic objects in the Sesame name resolver<sup>23</sup>,
    - IAU names for planets, dwarf planets, and satellites<sup>24</sup>,
    - IAU names for stars<sup>25</sup>,
    - IAU names for exoplanets<sup>26</sup>.
  - In addition, proposed names may not be:
    - Names of a purely or principally commercial nature,
    - Names of individuals, places or events principally known for political, military or religious activities,
    - Names of individuals that died less than a century ago (1919),
    - Names of living individuals,
    - Names of organisations related to the selection,
    - Names of pet animals,
    - Contrived names (i.e. new, invented),
    - Acronyms,
    - Names that include numbers or punctuation marks (diacritics are acceptable),
    - Names that are principally known as trademarks or protected by intellectual property claims.



Figure 3. Worldwide distribution of the IAU100 NameExoWorlds campaigns. Credit: IAU100 / Aneta Magraf-Druc

a final decision, the first draft of the names and themes descriptions were sent to each National Committee, giving them the opportunity to address any questions or concerns. Nearly 355 000 proposals were received (79.2% in Africa, 2.4% in Americas, 10.5% in Asia, 7.7% in Europe, and 0.2% in Oceania). For the total number of votes, which was nearly 425 000, 3.6% were in Africa, 9.3% in Americas, 34.6% in Asia, 51.5% in Europe, and 1.0% in Oceania.

The results show an enormous diversity of meanings, ranging from names associated with indigenous culture to wonders of nature, mythology, literature, history and more<sup>9</sup>. This is expected due to the broad public participation and reflecting the fact that the NameExoWorlds project was truly a global event with the direct participation

of hundreds of thousands of people who played a key role in proposing and voting for their preferred choices of names that represent their countries in the sky.

The IAU now officially recognises the chosen proper names in addition to their previous scientific designations, and they appear in popular databases like SIMBAD<sup>10</sup> and the NASA Exoplanet Archive<sup>11</sup>, and night sky programs like Stellarium<sup>12</sup>.

The official press release was shared with the National Committees beforehand for national translation and tailored dissemination in each country.

The project was advertised in widely viewed channels, such as the New York Times<sup>13</sup> in the US and Le Parisien<sup>14</sup> in France. Results were also covered worldwide by different

media, such as a podcast in Argentina<sup>15</sup>, a TV show in Dominican Republic<sup>16</sup>, a report by CNN<sup>17</sup>, and a video on Twitter of the moment when schoolchildren learnt their name proposal was chosen by the UK campaign<sup>18</sup>. The Wide Angle Search for Planets (WASP) project also advertised NameExoWorlds and posted the final results on their website<sup>19</sup> for the assigned WASP planets.

### Lessons Learnt to Inform Future Campaigns

#### Considerations on “Contrived” Names

Future public naming campaigns should consider relaxing the guidelines with respect to “contrived” names. The exact meaning of “contrived” was sometimes

misunderstood or contentious. It was decided to encourage names “of things, people, or places of long-standing cultural, historical, or geographical significance” — and discourage new, invented names (e.g. names based on acronyms, portmanteaus, or completely new words with no etymology). However, what could be considered as “contrived” in a given culture may not be in another. For instance, it was decided that names which were pure invention were considered “contrived”; this rule led to rejecting some names built by composition of existing names that might have been acceptable with more relaxed guidelines. For future campaigns, the issue of acceptable names, with a good balance between quality and originality, will need to be reassessed.

### Considerations on “Names of organisations related to the selection”

The guideline prohibiting “Names of organisations related to the selection” needed to be more specific, modifying it to “Names of organisations, institutions and countries related to the selection”. For “non-commercial” and “non-political” names, the guidelines must be clearer, for example by giving some examples illustrating the rule. The proposed names which required the most deliberation and follow-up research bordered on the commercial, political, and military - future naming campaigns will benefit from further clarification on these guidelines for the proposers.

### Clarification of “proper names” and “alphanumeric designations”

Members of the public and press were also sometimes confused assuming that the new IAU proper names “replace” the alphanumeric designations, which is not the case. Alphanumeric designations continue to be officially regarded, and exoplanets often have multiple designations — a fact of life for astronomers that may catalogue the same object multiple times over the years for different reasons.

### Time Allocation for the Vetting Process

Future public campaigns should incorporate more time allocation for the vetting processes, since it proved to be a difficult, time consuming task, requiring long hours of focus and attention.

Vetting proposals before they are submitted to public voting may also help to ease the process, but then more human resources are necessary to manage such a high workload.

### Final Remarks

The IAU100 NameExoWorlds Global Project, organised in the framework of the celebrations of the 100th anniversary of the IAU, was carried out from June to December 2019. It was designed to offer the opportunity to all countries and territories of the world to name an exoplanet and its host star, to raise awareness of the vastness of the Universe and recognising Earth as just one planet amongst many others. Ultimately, NameExoWorlds invites people to consider themselves as “citizens of the Universe”, sharing a fragile planet that must be preserved.

The project was developed in collaboration with the NOCs, as nominated by the OAO, who created National Committees to carry out the project at a national level. The participation of the NOC network proved to be essential for the success of the project. As a direct result of NameExoWorlds, some committee members proceeded to become part of the NOCs network following their successful participation and wish to continue to be actively engaged with the IAU outreach initiatives and global network. The NameExoWorlds project contributed to increasing even more this community, bringing together different science outreach groups worldwide, strengthening their actions and experiences.

The campaign was considered the “project with the greatest worldwide impact” in the IAU100 Final Report<sup>20</sup>, and was successful in engaging people across the globe to help contribute diverse names to exoplanetary systems. The results now appear in a popular planetarium software, which can be used as one of a vast range of other possibilities for outreach and educational purposes enhancing the results to a wider audience, increasing awareness about the culture behind each chosen name now immortalised in the sky. It is hoped that the international astronomical community will continue to encourage future public naming campaigns that build off of the success of IAU100 NameExoWorlds.

### Notes

- <sup>1</sup> NASA Kepler Mission: [https://www.nasa.gov/mission\\_pages/kepler/overview/index.html](https://www.nasa.gov/mission_pages/kepler/overview/index.html)
- <sup>2</sup> Name an Exoplanet Press Release: <https://www.iau.org/news/pressreleases/detail/iau1908/>
- <sup>3</sup> Washington Double Star Catalogue: <http://www.astro.gsu.edu/wds/>
- <sup>4</sup> Gaia Data Release 2 Catalogue: <https://www.cosmos.esa.int/web/gaia/dr2> and Gaia Archive: <https://gea.esac.esa.int/archive/>
- <sup>5</sup> The exception was WASP-161, whose discovery paper was in 2019. The Morocco National Committee requested WASP-161 as it was the first exoplanet whose discovery paper was led by authors from Morocco (Barkaoui et al. 2019). Assessment of the published paper led to the conclusion that the planet is firmly detected.
- <sup>6</sup> Official NameExoWorlds Website: <http://www.nameexoworlds.iau.org>
- <sup>7</sup> Naming rules for exo-systems: <http://www.nameexoworlds.iau.org/naming-rules>
- <sup>8</sup> NameExoWorlds FAQs: <http://www.nameexoworlds.iau.org/faqs>
- <sup>9</sup> IAU100 NameExoWorlds Results Press Release: <https://www.iau.org/news/pressreleases/detail/iau1912/>
- <sup>10</sup> SIMBAD Astronomical Database: <http://simbad.u-strasbg.fr/simbad/>
- <sup>11</sup> NASA Exoplanet Archive: <https://exoplanetarchive.ipac.caltech.edu/>
- <sup>12</sup> Stellarium Astronomy Software: <http://stellarium.org/>
- <sup>13</sup> “So Long, Exoplanet HD 17156b. Hello Sauron...?” by Dennis Overbye: <https://www.nytimes.com/2019/06/14/science/exoplanets-astronomy-space.html>
- <sup>14</sup> “Les Français sont invités à trouver un petit nom à l'exoplanète HD 8574 b” by Vincent Gautier: <http://www.leparisien.fr/sciences/les-francais-sont-invites-a-trouver-un-petit-nom-a-l-exoplanete-hd-8574-b-08-06-2019-8089272.php>
- <sup>15</sup> Malos Días programme on FM UTN Mendoza 94.5: [https://radiocut.fm/radiostation/utnmendoza/listen/2019/12/19/10/48/53/?created\\_cut\\_id=927957](https://radiocut.fm/radiostation/utnmendoza/listen/2019/12/19/10/48/53/?created_cut_id=927957)
- <sup>16</sup> “Hoy conocemos el resultado del concurso busca nombre para un exoplaneta” from Esta Noche Mariasela: <https://www.youtube.com/watch?v=5wQQR-Auwbw&feature=youtu.be>
- <sup>17</sup> “Nachtwacht? Mulchatna? 112 exoplanets and stars get new names from countries around the Earth” by Katie Hunt: <https://edition.cnn.com/2019/12/17/world/exoplanets-new-names-scn/index.html>

<sup>18</sup> Video of the students celebrating on Twitter (via user Claire C Smith): <https://twitter.com/ClaireCSmith/status/1207379385646551040>

<sup>19</sup> WASP Planets press release: <https://wasp-planets.net/2020/01/05/the-iau-announces-names-for-wasp-exoplanets/>

<sup>20</sup> IAU 100th Anniversary Celebrations: Final Report: <https://www.iau.org/static/archives/announcements/pdf/iau100-final-report-ann20019.pdf>

<sup>21</sup> International Year of Indigenous Languages: <https://en.iyil2019.org/>

<sup>22</sup> Minor Planet Center (MPC) database: <https://www.minorplanetcenter.net/iau/lists/MPNames.html>

<sup>23</sup> Sesame name resolver: <http://cds.u-strasbg.fr/cgi-bin/Sesame>

<sup>24</sup> Gazetteer of Planetary Nomenclature: <https://planetarynames.wr.usgs.gov/Page/Planets>

<sup>25</sup> IAU "Naming Stars" theme: [https://www.iau.org/public/themes/naming\\_stars/](https://www.iau.org/public/themes/naming_stars/)

<sup>26</sup> IAU "Naming Exoplanets" theme: [https://www.iau.org/public/themes/naming\\_exoplanets/](https://www.iau.org/public/themes/naming_exoplanets/)

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## Biographies

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**Lars Lindberg Christensen** is an astronomer and science communicator. He has authored a dozen popular science books translated into more than ten languages, and has directed more than 10 documentaries and planetarium movies that have received critical acclaim around the world. He is responsible for the communication, education and community engagement for NOIRLab consisting of Cerro Tololo, CSDC, Gemini, Kitt Peak and Rubin Observatory operations.

**Hitoshi Yamaoka** is an astronomer and press and information officer. He is working as the IAU National Outreach Coordinator of Japan and is a committee member of IAU WG Star Names.

**Debra Meloy Elmegreen** is President-elect of the IAU and Professor of Astronomy on the Maria Mitchell Chair at Vassar College. Her research is on the structure and evolution of galaxies through multiwavelength observations.

**Eduardo Monfardini Penteado** is an astronomer and specialist in science communication and outreach. He was project manager of IAU100 NameExoWorlds and is currently working as IAU National Outreach Coordinator of Brazil.

**Gareth Williams** worked at the IAU Minor Planet Centre for thirty years, before semi-retiring in early 2020. He still serves on the IAU Working Group on Small Body Nomenclature and the IAU Working Group on Planetary System Nomenclature.

**Guillem Anglada-Escudé** is an exoplanet researcher specialised in searches for nearby possibly terrestrial planets. His interest is also in communicating space sciences with the public, and led the Pale Red Dot campaign & Red Dots follow-up programmes (scientific and outreach) that reported the discovery of Proxima b, the nearest exoplanet to the Solar System.

**Alain Lecavelier des Etangs** was co-chair of IAU100 NameExoWorlds and chair of IAU Commission n°53 "extrasolar planets" (2012-2015) and Commission F2 "Exoplanets and the Solar system" (2015-2018). His research activity is on atmospheres of exoplanets and exocomets.