UNESCO’s Astronomy & World Heritage Initiative (AWHI) (URL whc.unesco.org/en/astronomy) has existed since 2004 to identify, promote and protect heritage, and potential World Heritage, connected with astronomy. A Memorandum of Understanding (MoU) between UNESCO and the IAU, under which the IAU undertook to implement the AWHI jointly with UNESCO, was signed in 2008 ahead of the IYA 2009.

The Astronomy & World Heritage Working Group (AWHWG) of Commission 41 (now C3) on the History of Astronomy was formed in 2008 to fulfil the IAU’s commitments under the MoU. In cooperation with ICOMOS, UNESCO’s advisory body on cultural sites, we help to establish both a common global vision on astronomical heritage and robust general principles for assessing the value of different types and categories of scientific and technological heritage relating to astronomy, whether or not they represent potential world heritage under the terms of the World Heritage Convention. In this context, a web-based heritage portal (“Portal to the Heritage of Astronomy”, URL www.astronomicalheritage.net) was developed which not only provides public dissemination but also holds a range of information, case studies and tools vital for State Parties developing nomination dossiers as part of UNESCO’s “upstream processes”. The ICOMOS Thematic Studies (Ruggles & Cotte, 2010, Ruggles, 2017) aim to provide a
By 2015 the IAU had developed a much broader range of commitments relating to astronomical heritage. This resulted in the creation of Commission C4 World Heritage & Astronomy with Clive Ruggles as president, which replaced the earlier AWHWG. C4 continues from the 2015–2018 triennium and is in part a discussion and collaboration group for researchers interested in astronomical heritage. Four WGs were institutionalized.

2. Developments within the past triennium

2.1. Creation of WGs of Division C, Commission C4

Until end of April 2019 the continuation or new creation of the WGs of Commission C4 was discussed. The following WGs were approved: C4 WG1 “Astronomical Heritage in Danger” (Chair: Alejandro López, Argentina), C4 WG2 “Windows to the Universe: Classical and Modern Observatories” (Chair: Matthias Hünsch, Germany), and the Inter-Commission WGs: C4-C4-C1 WG3 “Archaeoastronomy and Astronomy in Culture” (WGAAC) (Chair: Steven Gullberg, USA), and C4-C3-C1 WG4 Ethnoastronomy and Intangible Astronomical Heritage” (Chair: Duane W. Hamacher, Australia). The C4 WG “Heritage of Space Exploration” was not approved by Division C.

The number of members of C4 could be raised from 89 (2018) to 113 (2021). We had useful discussions and collaborations via e-mail or Zoom meetings among several members concerning the cultural heritage of observatories.

2.2. Proposal: FM at the IAU GA, Busan, Korea

In summer 2019, we (Wayne, Gudrun, and C3, C4 organizing committee members) started the discussion about our proposal for a Focus Meeting at the IAU General Assembly, Busan, Korea, August 2021 – Title: “Progressing the UNESCO-IAU History and Heritage Initiative: Emphasis on Asia”, Co-ordinating Division: C, Hosting Commissions: C3 (History of Astronomy) and C4 (World Heritage & Astronomy).

Scientific Organising Committee:

- Professor Dr. Gudrun Wolfschmidt (Germany, C4 President – Co-Chair).
- Professor Dr. Wayne Orchiston (Thailand, C3 President – Co-Chair)

The proposal, delivered on 14 Dec. 2019 with Letters of Intent, was not approved by the IAU.

2.3. IAU List “Outstanding Astronomical Heritage” (OAH)

For the IAU list “Outstanding Astronomical Heritage” (OAH), presented in 2018 in Vienna, IAU-recognised astronomical heritage sites were compiled that are outstanding in science and the history of astronomy, but do not necessarily demonstrate potential Outstanding Universal Value which would be needed for inscription on the World Heritage List. For example, the period from the European Renaissance to the middle of the 20th century was an extremely rich one for the history of astronomy, with many observatories from this period playing a significant role because of the cutting-edge scientific research carried out there – these observatories should get a “gold standard” level of international recognition. However, because the actual building may be damaged or destroyed, and the original instruments may no longer exist in situ or at all, they have no chance for the UNESCO list. During the last triennium, I added a considerable number of observatories, especially sites in Middle and South America (Quito, La Plata), Asia (Byurakan, Bosscha, Nanjing) and Australia, but also in Europe, where you can find by far the
highest number of outstanding observatories, going back to the time around 1500. (URL https://www3.astronomicalheritage.net/index.php/URL heritage/outstanding-astronomical-heritage).

2.4. Astronomical Heritage in Danger List
The C4 WG1 “Astronomical Heritage in Danger” made a list of 15 sites with relevant astronomical value for humanity that are currently at risk. The purpose of this list is to influence governments, nongovernmental organizations, international agencies, local authorities and decision makers to achieve protection and care of these sites.

2.5. Publications

3. Inscriptions on the World Heritage Lists and Nominations
The aim of C4 is to help, influence and encourage State Parties to put forward World Heritage nominations relating to astronomical heritage. In the annual meeting celebrated in Baku (Azerbaijan) in July 2019, the World Heritage Convention (WHC) of UNESCO declared two sites as World Heritage:
- United Kingdom: Jodrell Bank Observatory
In that same meeting, UNESCO also declared the Observatory of Jodrell Bank as a World Heritage site. Again Prof. Dr. Clive Ruggles was a key member of the team behind the proposal. Jodrell Bank is a very impressive site with the Lovell and Mark II Telescopes as landmarks; it is the earliest radio astronomy observatory in the world that is still in existence. (URL https://whc.unesco.org/en/list/1594).
- Spain: Risco Caído and the Sacred Mountains of Gran Canaria Cultural Landscape
The land- and skiescape interaction in the different components of the property was a must for the success of the candidacy. C.C4 past President, Clive Ruggles, and present Vice-President Juan Antonio Belmonte were deeply involved in the whole process as main scientific advisors of the proposal and co-authors of the corresponding proceedings. This is,
a great success of the IAU-UNESCO Astronomy & World Heritage Initiative, which was at the basis of the creation of C.C4. (URL https://whc.unesco.org/en/list/1578).

The 44th session of the UNESCO World Heritage Committee in Fuzhou, China, initially scheduled for 29 June – 9 July 2020, is postponed to June/July 2021. Due to this, there were no nominations in 2020; this concerns Spain’s application on the El Retiro Cultural Landscape in Madrid, including the 18th century National Astronomical Observatory, and Peru’s application on Chankillo archaeological site. Besides, Spain has selected Talayotic Menorca, a cyclopean island Odyssey as the Spanish candidate for UNESCO-ICOMOS evaluation in 2021. This includes the cultural astronomy aspects of talayotic culture.

- Peru: Chankillo pre-Classic archaeological astronomical complex
The impressive pre-Classic archaeological site of Chankillo, in Peru, on occasions referred as the first observatory of the Americas (submitted in 2013), has been proposed in 2019 as a candidate to be declared as a World Heritage site. Profs. Ivan Ghezzi and Clive Ruggles were the key factors in the process. In September 2019, the proposed property was evaluated on site by an ICOMOS specialist and it is currently in the process of final evaluation by UNESCO advisory boards. Unfortunately, the WHC meeting to be held in China has been postponed “sine die” due to the Covid-19 crisis. (URL https://whc.unesco.org/en/tentativelists/5792/).

- Spain: Talayotic Culture of Minorca – Spanish candidate for WHC in 2021
Spanish authorities have decided that Talayotic Minorca Serial Proposal as a WH site will be the candidate of Spain for the World Heritage Convention in 2021. C.C4 Vice-President Juan Antonio Belmonte is in charge of the coordination of the cultural astronomy aspects of the proposal based, among other, on the pioneering work of Prof. Michael Hoskin in the 1980s and 1990s. Currently the white book of the proposal is being documented and written. (URL https://whc.unesco.org/en/tentativelists/3433/).

4. Presentations, Cooperations, and Conferences
- In 2019 I organised in Hamburg Observatory eight events in the context with the jubilee of the IAU 100 years (URL https://www.fhsev.de/fhs-v19.php).
- During the flagship event “International Astronomical Union (IAU) 1919–2019: 100 Years Under One Sky”, April 10–16, 2019, in Bruxelles, Belgium, I could visit the very interesting old Royal Observatory of Belgium building (1826–1891) and the Uccle Observatory (1883–1890) in Bruxelles.
- During the XXXVII Scientific Instrument Symposium (SIC), Sept. 23–27, 2019, with the topic “Instruments at crossroads” I could study the observatories and instruments in Havana, Cuba: the Jesuit geomagnetic, meteorological and astronomical observatory in Belém college (1857, now museum), the National Observatory, (1908, since 1965 Cuban Institute of Meteorology), and the Astronomical Observatory of the University of Havana (1914). These will be included in the OAH List.
- A considerable number of C4 members participated, also with presentations, in the online conference IAU367 Education and Heritage in the Era of Big Data in Astronomy – The first steps on the IAU 2020–2030 Strategic Plan, December 8–12 December 2020 – a very impressive and perfectly organized event.
- Astronomical Observatories and Chronometry: Time, Science and Instruments (18th–
During 2020/21, due to the Coronavirus problems, most conferences were shifted to later dates; there were only several online meetings between members of C4 and the WGs, e.g. a Zoom meeting of G. Wolfschmidt with Lydia Cidale, La Plata, Argentina, April 2021.


In December 1–6, 2019, two C4 organizing committee members were invited by Kazan Federal University and the Academy of Sciences of the Republic of Tatarstan, Russia. My lecture had the topic: Heritage of Astronomical Observatories in the context of the Thematic Initiative on Heritage of “Astronomy, Science and Technology” and Areg Mickaelian’s lecture: Byurakan Astrophysical Observatory as the centre of Scientific and Cultural Heritage; in addition I was asked to participate in the Round Table discussion during the International Scientific and Practical Conference: “Historical, Cultural and Scientific Heritage of Astronomical Observatories: Formation of the World Universal Value of Sites” (URL https://forumrt.ru/en/).

Concerning the two Kazan observatories (old observatory, 1837, and new Engelhardt Astronomical Observatory (EAO), 1901), I had to give advice to Kazan authorities how to prepare an application for the Unesco World Heritage List. The proceedings of the conference were published online in 2020.

After the Kazan meeting, a delegation of Kazan University, led by Dr Rafael Valeev, Vice President of the Russian National Committee of the International Council on Monuments and Sites (ICOMOS), visited Hamburg, on February 17th, 2020, Hamburg Observatory. The university in the capital of the autonomous Republic of Tatarstan in the Russian Federation has an observatory (Engelhardt Astrophysical Observatory, EAO), which, like the Hamburg observatory, was built in an astronomy park at the beginning of the 20th century and is largely equipped with German-made instruments. As in Hamburg, the historical buildings and instruments are well preserved and accessible to the public through guided tours and events; at the same time, top astronomical research is being carried out at the University of Kazan. By signing a bilateral letter of intent (MoU), the two research institutions sealed their interest in exploring both the possibilities of scientific cooperation and a joint transnational serial UNESCO nomination of the two historical observatories.

Another online meeting of Kazan is planned for April 2021: Astronomical observatories of Kazan University in culture and science of the World.

Several discussions with Hamburg politicians were made, concerning the intended (serial transnational) application of Hamburg Observatory (with La Plata and/or Kazan) for the German National UNESCO list, to be submitted in Oct. 2021.

4.2. Bosscha Observatory, Indonesia, and Hamburg Observatory, March 2021

Online Zoom meeting of Premani Premadi, director of Bosscha Observatory, Lembang, Java, Indonesia, and Gudrun Wolfschmidt, GNT, Hamburg Observatory, March 24, 2021 concerning cultural heritage and a possible Unesco application, as well as discussion about a Digital Heritage Project by Perry Lange, Hamburg, with the aim to create (3D) reconstructions of historical buildings with the help of existing, terrestrial, historical photos and current satellite images in order to document and interpret changes of the building structure or losses of cultural property.
4.3. *Astronomy in Culture – Cultures of Astronomy (2021)*


4.4. “Astronomies, Cultures and Societies”, La Plata, Argentina, 2020/21

For the Oxford XII and SIAC VIII Conference “Astronomies, Cultures and Societies” (URL http://dawson.fcaglp.unlp.edu.ar/) in La Plata, Argentina, April 16–25, 2020, some C4 members are also members of the SOC (Juan, Wayne, Clive, Alejandro, Duane, Siramas and Gudrun), and we had to evaluate the abstract applications. The title of my lecture is “Cultural Heritage of Observatories – Changing Structures over Time”. But due to the Corona Virus situation the conference was shifted to March 2021, and now to Nov. 13–14, 2021.

5. Conclusion and Future Plans

In the coming triennium, a key activity will be to progress the IAU’s List of Outstanding Astronomical Heritage sites, more recent observatories should be added, and also architectural sites. The Commission C4 and its members, as well as WG *Windows to the Universe: Classical and Modern Observatories*, will also continue to work directly with State Parties to help progress particular nomination projects. We hope to get more nominations and inscriptions on the World Heritage List.


Unesco renamed the *World Heritage & Astronomy* initiative during the World Heritage Committee at its 42nd session (Manama, 2018) to *Heritage of Astronomy, Science and Technology* (HAST). Concerning this new initiative, we have to think, which sites can be proposed in the next triennium, for example science parks or science campus, e.g. Wissenschaftspark Albert Einstein on Telegrafenberg Potsdam with astronomy, solar physics, and Helmholtz Centre Potsdam – GFZ German Research Centre for Geosciences or Baroque Jesuit or Benedictine observatories with astronomy, time keeping, meteorology, geomagnetism, seismology, and natural science (like Havana, Cuba, or Mathematical Tower, Kremsmünster, Austria), or Space Technological Heritage.

Also early important public observatories, planetariums, and museums for astronomy, science, and technology – like the *Deutsches Museum* in Munich with the first Zeiss planetarium in the world and two domes with a public observatory – should be included in the “Portal to the Heritage of Astronomy” in the next triennium. We – with all WGs of C4 – also want to achieve greater visibility within the community of professional and amateur astronomers and the public – in cooperation with Commission C1 “Astronomy Education and Development”.

Gudrun Wolfschmidt

*President of Commission C.C4*

March 2021