

IAU Division C Inter-Commission C1-C2-C3-C4

Working Group for Astronomy in Culture (WGAC)

Annual Report for 2022

Steven Gullberg (Chair, USA)

Javier Mejuto (Co-chair, Honduras)

Organizing Committee

Beatriz Garcia (Argentina), Steven Gullberg (USA), Duane Hamacher (Australia), Jarita Holbrook (UK), Alejandro Martin Lopez (Argentina), Javier Mejuto (Honduras), Rosa M. Ros (Spain)

Membership

The WGAC continues to grow and presently has 113 members - 67 Working Group Members and 46 Working Group Associates. Cultural Astronomy is interdisciplinary and our Associates, frequently with backgrounds in fields such as anthropology and archaeology, make many valuable contributions.

Working Group Members

Danielle Adams (jm; USA), Alan Alves-Brito (Brazil), Elio Antonello (Italy), Megan Argo (UK), G.S.D. Babu (India), Ennio Badolati (Italy), Juan Antonio Belmonte (Spain), Kelly Blumenthal (jm; USA), Kai Cai (USA), John Carlson (USA), Brenda Corbin (USA), Hannah Dalglish (jm; UK), Milan Dimitrijevic (Rep. Serbia), Steve Durst (USA), Marta Folgueira (Spain), Jesus Galindo-Trejo (Mexico), Alejandro Gangui (Argentina), Beatriz García (Argentina), Rita Gautschy (Switzerland), César González-García (Spain), Steven Gullberg (USA), Duane Hamacher (Australia), Saeko Hayashi (Japan), Abraham Hayli (France), Bambang Hidayat (Indonesia), Thomas Hockey (USA), Susanne Hoffmann (Germany), Jarita Holbrook (UK), Andrew Hopkins (Australia), Matthaios Katsanikas (Greece), E. C. Krupp (USA), Mary Beth Laychak (USA), Annette Lee (jm; USA), Ioannis Liritzis (Greece), Alejandro Lopez (Argentina), Claudio Mallamaci (Argentina), J. McKim Malville (USA), Sac Medina (jm; Germany), Javier Mejuto (Honduras), Areg Mickaelian (Armenia), Steve Miller (UK), Eugene Milone (Canada), Simon Mitton (UK), Andrew Munro (USA), Raymond Norris (Australia), Wayne Orchiston (Australia), Robert Preston (USA), Michael Rappenglück (Germany), Rosa Ros (Spain), Clive Ruggles (UK), Sara Schechner (USA), B. S. Shylaja, (India), Irakli Simonia (Rep. Georgia), Timothy Spuck (jm; USA), Magda Stavinschi (Romania), Christiaan Sterken (Belgium), Linda Strubbe (USA), Woodruff Sullivan (USA), Virginia Trimble (USA), Ana Ulla (Spain), Johnson Urama (Nigeria),

David Valls-Gabaud (France), Iryna Vavilova (Ukraine), Tiziana Venturi (Italy), Murli Verma (India), Gudrun Wolfschmidt (Germany), Georg Zotti (Austria).

(jm – junior member)

Working Group Associates

Bryan Bates (USA), David Begay (USA), Suresh Bhattarai (Nepal), Patricio Bustamante (Chile), Nicholas Campion (UK), Walmir Cardoso (Brazil), Barthelemy d'Ans (Peru), Brian Davis (USA), Margaret Davis (USA), Dimitri Douchin (Australia), Eisvandi Parham (Rep. Iran), Sona Farmanyan (Armenia), Roslyn Frank (USA), Robert Fuller (Australia), Cecilia Gomez (Argentina), Akira Goto (Japan), Liz Henty (UK), Gordon Houston (USA), Stanislaw Iwaniszewski (Mexico), Muhammed Khan (Pakistan), Hossein Khezri (Rep. Iran), Olaf Kretzer (Germany), Olanrewaju Lasisi (Nigeria), Trevor Leaman (Australia), Flavia Pedroza Lima (Brazil), Monica Martinez-Borravo (Mexico), Nancy Maryboy (USA), Armando Mudrik (Argentina), Gregory Munson (USA), Cristina Negru (Romania), Daniel Palumbo (USA), David Pankenier (USA), Maryam Papari (Rep. Iran), Fabio Silva (UK), Emilia Pasztor (Hungary), Manuel Pérez-Gutiérrez (Spain), James Ricker (USA), Eduardo Rodas (Honduras), Mahdi Rokni (Rep. Iran), William Romain (USA), John Saul (France), Ivan Šprajc (Rep. Slovenia), Ann Thresher (Australia), Doris Vickers (Austria), Alexander Wolf (Russian Fed.), Mariusz Ziółkowski (Poland).

Objectives

The IAU *Working Group for Astronomy in Culture* (WGAC) is a leading organization for the advancement of all aspects of the growing field of Cultural Astronomy. Cultural Astronomy deals with the astronomy of past cultures, contemporary Indigenous cultures, and other aspects of contemporary Cultural Astronomy as well. The WG is in part a discussion and collaboration group for researchers and others who explore Cultural Astronomy; IAU members with such interests gather here. A fundamental goal is to facilitate interactions between researchers, but the WG also has significant interest in promoting the use of Cultural Astronomy in education. It is the focal point within the IAU for Cultural Astronomy and how it relates to other branches of astronomy, for research in the field, and for educating the public regarding examples of how astronomy is being and has been used in culture throughout world history. The WGAC works to further the following objectives:

- Advance the field of Cultural Astronomy
- Promote research and publication
- Advance awareness of Indigenous concerns at sites where observatory facilities have been built upon culturally sacred grounds; assist future site selections with such insight
- Promote strong initiatives and give support for educators on different levels regarding their use of multiple aspects of cultural astronomy in the classroom

- Pursue exploration of astronomy in contemporary literature, poetry, music, films, etc.
- Promote public outreach to educate regarding Cultural Astronomy
- Use the fascination with astronomy in culture to inspire youth interest in pursuing any aspect of astronomy or other STEM in their futures
- Increase the understanding of how astronomy was used in cultures within developing nations where such has not yet been fully explored
- Facilitate interactions between researchers in the field
- Promote the inclusion of Cultural Astronomy research in research in other fields such as archaeology, anthropology, Indigenous studies, and Native American studies

Activity in 2022

The WGAC is affiliated with all four of the Division C commissions: C1 Astronomy Education and Development, C2 Communicating Astronomy with the Public, C3 History of Astronomy, and C4 World Heritage and Astronomy. Our collaboration with each greatly enhances what the WG is able to contribute. We also enjoy collaboration with other WGs in the Division.

Members contribute toward eight principal activity areas of the WGAC: culturally sensitive sites, education, public outreach, contemporary cultural astronomy, developing nations, interdisciplinary collaboration with relevant fields, indigenous astronomy, and WG publications. The many members of the WGAC also actively perform rigorous research and publication of Cultural Astronomy.

The following selected examples of our work in 2022 will help to illustrate the scope of all that we do and how much the field has grown:

Culturally Sensitive Sites

The Culturally Sensitive Sites committee is a joint initiative led by the IAU WGAC that includes the Royal Astronomical Society and the American Astronomical Society. The joint committee has over 20 members located around the world and meets via Zoom. Our primary mandate is to provide astronomers with insight as to Indigenous concerns regarding observatories that have been or are to be built upon culturally sacred lands. We also endeavor to provide outreach to the public and to establish best practices to be considered when new observatory/facility projects are proposed. In 2022 we were able to share our message in person again: a workshop in June at AAS 240 in Pasadena, California, USA; also in June, another workshop for the European Astronomical Society in Valencia, Spain; in August at the IAU General Assembly in Busan, South Korea, presentations both to Division C and also to the Working Group for Astronomy Equity and Inclusion; in September a presentation to the International Workshop for Astronomy and Relativistic Astrophysics in Antigua Guatemala, Guatemala; and in November as part of a panel discussion at the Oxford Symposium of Cultural Astronomy in La Plata, Argentina. Virtual presentations were also given in January at Nottingham Trent University in Nottingham, UK; in March at the International Indigenous Astronomy Conference at North-West University in Mahikeng, North West

Province, South Africa; in July at the Royal Astronomical Society National Astronomy Meeting in Coventry, UK; and in September to CAP 2022 in Sydney, Australia. WGAC members making presentations in 2022 were **Steven Gullberg, Saeko Hayashi, Jarita Holbrook, Annette Lee, Alejandro Lopez, Javier Mejuto, and Steve Miller**. Other WGAC members of the joint CSS committee are **Danielle Adams, Megan Argo, Hannah Dalglish, Duane Hamacher, Wayne Orchiston, Daniel Palumbo, Rosa Ros, Ann Thresher, and Gudrun Wolfschmidt**.

We are now being contacted for advice by organizations considering sites for future development. We have recently communicated with members of the **Southern Gamma Ray Observatory** team and as well with members of the **Next Generation Event Horizon Telescope** team.

We wrote an article about our Culturally Sensitive Sites activities that was recently published in the RAS's *Astronomy & Geophysics*. It looks great and publications like this do a lot to help spread the word about cultural sensitivities. We've also been approached by CRC Press about writing a book of contributed chapters regarding astronomy and Indigenous concerns.

Education

Educational activity related to Cultural Astronomy is expanding considerably, as given example by the activity of the WGAC members below:

Danielle Adams teaches astronomy that includes cultural constellations in addition to the 88 that are recognized.

Alan Alves-Brito taught teacher training courses regarding such as school education and overcoming structural racism to promote racial equity. He also developed four games to bring the way of being and living of the Morada da Paz Kilombola community to the classroom, and three posters on the Maroon (Quilombola) people to supplement their cosmology. These activities work along with our Culturally Sensitive Sites concerns. He taught undergraduate Astronomy in Cultures and Ethnic-Racial and Gender Relations in Science.

Nicholas Champion continues his graduate program in Cultural Astronomy at the University of Wales Trinity Saint David.

Rita Gautschy taught archaeoastronomy tailored for archaeologists.

Cecilia Gomez teaches a graduate seminar course *Introducción a la Astronomía en la Cultura* (Introduction to Astronomy in Culture) at Facultad de Ciencias Astronómicas y Geofísicas de La Universidad Nacional de La Plata.

Steven Gullberg taught five graduate Cultural Astronomy courses at the University of Oklahoma and supervised graduate students within the Archaeoastronomy and Astronomy in Culture program there.

Duane Hamacher taught Cultural Astronomy at the University of Melbourne and supervised graduate students.

Annette Lee taught Native American astronomy and organized virtual workshops and lectures.

Alejandro Lopez taught postgraduate Cultural Astronomy at Universidad Nacional de Córdoba, Argentina and Universidad Nacional de La Plata, Argentina. He provided technical-pedagogical advice on the teaching of astronomy, with a cultural astronomy perspective and emphasis on naked eye direct observation, for teachers and students in elementary schools of District 11 of the City of Buenos Aires.

Javier Mejuto taught Cultural Astronomy at the Universidad Nacional Autónoma de Honduras where he is the head of the Archaeoastronomy and Cultural Astronomy department.

Areg Mickaelian gave school lectures that included cultural astronomy in Armenia.

Armando Mudrik lectured in a post-graduate course *Introducción a la Astronomía en la Cultura* at Universidad Nacional de La Plata.

Andrew Munro taught two graduate Cultural Astronomy courses at the University of Oklahoma within the Archaeoastronomy and Astronomy in Culture program there.

Ivan Šprajc lectured within Postgraduate study program *Experto en Astronomía: La astronomía en la cultura de los pueblos* at Universidad de Murcia.

Muhammed Rayan Khan presented *Mastruk Jagek* (Observing the Moon), the first astronomical cultural heritage preserving event in Pakistan.

Rosa Ros and **Beatriz Garcia** had another great year with NASE and secondary educators throughout the world. Cultural astronomy has become an integral part of astronomical inspiration and the WGAC supports this outstanding initiative.

Irakli Simonia has a Ph.D. program in Archaeoastronomy at Ilia State University.

Georg Zotti continued his development of significant educational capability in Stellarium that visually demonstrates light and shadow effects of cultural astronomy. He also gave an introductory lecture to archaeoastronomy for the Wiener Arbeitsgemeinschaft für Astronomie, a major amateur astronomer society. He also gave an introductory lecture to Archaeoastronomy at Vienna University's Department of Prehistoric and Historical Archaeology.

Outreach

Members of WGAC strive to share cultural astronomy and do so by speaking to the general public, astronomical groups, and at many schools. The WGAC seeks to excite the public with cultural astronomy in an effort that includes inspiring youth for STEM, both in astronomy and in other fields. Many contributions were made during the year to further this most important endeavor, as illustrated by the examples below:

Danielle Adams gave 10 public talks, International Day of Women in Science, Flagstaff Dark Skies Coalition, Amateur Observers' Society of New York, NPR's ShortWave, Meet a Cultural Astronomer (in-person sky tours at Lowell Observatory), Flagstaff Star Party Opening Presentation, Stars on the Astrolabe, Cromer Elementary School, Flagstaff, West Valley Astronomy Club, and Star Stuff: A Space Poddity (podcast).

Alan Alves-Brito prepared a documentary available on YouTube called Educação Escolar Quilombola – Multiponto. He also prepared digital materials for outreach entitled Relações Étnico-Raciais e Educação Escolar Quilombola, Re-existências Negras, and EMEF Quitéria Pereira do Nascimento / Comunidade Quilombola de Casca. Alan as well gave two interviews broadcast for public outreach.

Nicholas Champion organized a Skyscape Archaeology lecture series in partnership with Sophia Centre Press, Journal of Skyscape Archaeology and Bournemouth University that was available to the public.

Rita Gautschy gave a public talk at the Wilhelm Förster Sternwarte in Berlin on January 12, 2022 with the title "Mechanismus von Antikythera."

Steven Gullberg was the featured speaker for an Online Open Dome Talk at Nottingham Trent University, Nottingham, UK. He also was the featured speaker for an outreach presentation to the Kansas Astronomical Observers, Wichita, Kansas, USA.

Duane Hamacher gave many public talks to organizations such as Rotary Hawthorn, Melbourne (Australia), Sydney City Skywatchers (Australia), AHC (Singapore), Subiaco, Perth (Australia), Coburg Library, Melbourne (Australia), Astronomical Society of Victoria (Australia), Queenscliff Literary Festival (Australia), Townsville Writers Festival (Australia), Canberra Writers Festival (Australia), and Realm Library, Ringwood (Australia).

Susanne Hoffmann prepared an outreach article that was featured in National Geographic, Astrologie – Der Ursprung der Horoskope.

Jarita Holbrook created a YouTube outreach presentation called The Standing Stone Episode of the Science Tourists.

E. C. Krupp gave several public lectures, “Celestial Gods and Sudan Skies” first at Mount Wilson Observatory and later at Cal Poly, Pomona, “How High the Moon” at the Hammer Museum, “Under Chumash Skies” at the San Diego Rock Art Association, and “Night Gallery: The Stars of Spring,” “Night Gallery: The Stars of Summer,” “Night Gallery: The Stars of Autumn”—part of a series of special lectures on traditional constellation lore of multiple cultures in the Samuel Oschin Planetarium at Griffith Observatory.

Annette Lee offers much Cultural Astronomy outreach through her Native Skywatchers and its Design Studio. One of her outstanding projects is Native Skywatchers – We are stardust/Ocean voices – Sea & Stars, She also includes her work with the Women and Girls in Astronomy project, is designing a ceiling projection for the Great River Children’s Museum in St Cloud, Minnesota, USA, and is designing a Visitor Center for the Voyageurs National Park, also in Minnesota. Annette is as well an organizer for Niibin – Bdoketu Summer Camp for high school students to become Native Skywatchers teen ambassadors at Voyageurs National Park.

Alejandro Lopez gave a public talk “Astronomía cultural: El cielo como construcción social”, for the 4th year of secondary school, in the context of the subject “Antropología” of the humanities specialty of the ORT High School, Belgrano, Bs. As., Argentina. He also was interviewed several times, by Matías Bertolotti and José Bianco for the TV show “Fenómenos,” TN channel, on cultural astronomy, archaeoastronomy, and great civilizations of the past, by 7th grade elementary school students, 25 School, Distrito Escolar 7, Bs. As., on cultural astronomy, astronomy in general, and scientific research, about the situation of the indigenous population in Argentina and my ethnoastronomic research in Chaco on the radio show “La tierra es la raíz de nuestras culturas,” and by Lucía Dozo for the Ñ supplement of Clarín newspaper, about the Campo del Cielo meteors and their relationship with the Moqoit.

Nancy Maryboy and **David Begay** have organized great lectures on Indigenous Cultural Astronomy that are available to the public.

Areg Mickaelian contributed to outreach with Astronomical School Lectures in Armenian provinces and Artsakh schools, the 8th Byurakan Science Camp (8BSC), and an Extraordinary Travelers Forum in Armenia, visit to BAO.

Armando Mudrik developed notes about topics related to cultural astronomy for the web site of the Scientific Interpretation Center "Plaza Cielo Tierra" of the Universidad Nacional de Córdoba. Córdoba, Argentina. He also participated as an advisor, scientific editor, and author of the back cover of the Diccionario temático de Adivinanzas. Volumen IV "*Naturaleza y astros*". Compilation and systematization Ivana Alochis and Vanina Rodriguez. *Cuadernos de la Tradición* Collection. El rescoldo Editions. Córdoba, Argentina. July 2022. This was selected by the Programa Estímulo a las Ediciones Literarias Cordobesas, of the Legislature of the province of Córdoba (Law 10.246 de Estímulo a las Ediciones Literarias Cordobesas), to integrate the collection of libraries of the province of Córdoba, Argentina.

Gregory Munson, in concert with the Society for Cultural Astronomy in the American Southwest, sponsors a journal club open for public discussion of cultural astronomy related papers, has helped to create the SCAAS YouTube Channel that is dedicated to bringing top video content on the study of Cultural Astronomy and Traditional Knowledge to a worldwide audience, as well as the SCAAS Facebook page for exchange of cultural astronomy information.

David Pankenier gave three public lectures, "Competing Astral Cultural Traditions in Early China" for the conference History and Philosophy of Cosmology University of Milan, "Ancient Chinese Astronomy and Cosmology: a tour d'horizon" public lecture for the Royal Astronomical Society of Canada, and "Planetary Astrology in Medieval China and the Sassanian Connection" for the conference On the Historical Skies: Harmonies between Heaven and Earth Samarkand, Uzbekistan.

Muhammed Rayan Khan organized the first International Moon Day in Pakistan.

Rosa Ros and **Beatriz Garcia** in their work with NASE offered 16 courses that included workshops on Astro-culture.

B. S. Shylaja prepared six short videos for public outreach.

Ivan Šprajc produced an outreach YouTube video entitled Significado astronómico de los grupos E en la arquitectura Maya: mitos y realidades, Mesa de análisis: Grupos E en la arquitectura Maya.

Georg Zotti gave an introductory lecture to Archaeoastronomy in a lecture cycle for advanced amateur astronomers ("Sternenhimmel-Akademie") of the Wiener Arbeitsgemeinschaft für Astronomie, a major amateur astronomer society. In November he presented Stellarium 1.0 in the society's annual conference.

Contemporary Cultural Astronomy

Contemporary Cultural Astronomy is a new area of emphasis in an exciting part of our field. It encompasses astronomy in culture happening right now that includes areas such as astronomy found in literature, poetry, music, films, and as well cultural practices at sites such as Stonehenge and Machu Picchu. Related research will increase.

Developing Nations and Indigenous Astronomy

The astronomy of living Indigenous cultures often is passed on through oral traditions from one generation to the next. It is critically important to learn all that we can from members of these cultures in our efforts to better understand their astronomy, cosmology, and their ways of knowing. Here are some of the efforts being made:

Walmir Cardoso works with the Tukano people of Brazil to learn more of the astronomy in their culture.

Priscila Faulhaber works with the Tikuna people of Brazil to learn of the astronomy in their culture.

Cecilia Gómez is working with the Toba and Wichi communities of Central Chaco in Argentina where she is doing ethnographical work and research on their Cultural Astronomy. She is also directing a research project: "Cosmovisión y reinterpretaciones del cielo entre los indígenas y criollos chaqueños" (Cosmovision and reinterpretations of the sky among the indigenous and creoles of Chaco) for the Catholic University of Argentina (from 2021 to the present)."

Steven Gullberg is at work on a book that is capturing Inca astronomy and cosmology from the point of view of the Inca oral traditions that have been passed down from one generation to the next to his Quechua co-author.

Duane Hamacher works with Aboriginal Australian elders to learn of the astronomy in their cultures. He involves his graduate students and has co-authored with them and as well has co-authored with elders.

Olanrewaju Lasisi performs research of Cultural Astronomy in Nigeria.

Annette Lee is the Director and founder of the Native Skywatchers research and programming initiative. The organization seeks to remember and revitalize Indigenous star and Earth knowledge. It has organized great virtual presentations and student activities and has received funding from NASA.

Alejandro Lopez works with the Moqoit people of the Chaco region of Argentina to learn of the astronomy in their culture and regularly presents and publishes what he has learned. During 2022 he coordinated the "NAUECQATAXANAQ: Programa de jóvenes guías moqoit para Campo del Cielo", as an expert in cultural astronomy. This is a training program for young people of the Moqoit indigenous people of the Argentine Chaco. The objective is to train them as guides for the Campo del Cielo Meteorite Park, through interaction with elders from different Moqoit communities and courses he taught on didactic tools and cultural astronomy taught. His idea is, on the one hand, to build a way of appropriation by the young Moqoit generations of a space of great importance for this group but to which they have had a very restricted access in recent times; it also seeks to make visible the cultural, political, and historical relations of the Moqoit with the meteorites; it is an opportunity of economic income for these young Moqoit and a way for the Moqoit to receive part of the economic benefits of tourism; it also seeks to intensify the exchange between youth and elders - especially in the context of the growing migration of young people to peri-urban areas. All this is carried out in collaboration with the Dirección de Patrimonio Cultural Chaco and funding obtained from the Consejo Federal de Inversiones in Argentina. Three training camps were held, with the participation of young people, elders, and community leaders (November 12-13, November 19-20 and December 3-4, 2022). Audiovisual recordings

were made and a “Guía de Campo del Cielo” was prepared for use by future Moqoit guides.

Nancy Maryboy and **David Begay** recently organized a focus group called Cosmovisions of the Pacific. Its purpose is to facilitate a research effort where Indigenous researchers and non-Indigenous researchers work together. The intent is to share insight and concerns from their relative perspectives and then to arrive at collaborative research findings. **Steven Gullberg**, **Kelly Blumenthal**, and **Annette Lee** are members of the core group that plans to expand in the future to further this important work in Cultural Astronomy. They also are President and Vice President of the Indigenous Education Institute and they have organized great lectures on Indigenous Cultural Astronomy.

Javier Mejuto works with the Tolupan people of Honduras to learn how they are losing culture by losing dark skies.

Wayne Orchiston has developed an innovative approach to research of Indigenous astronomy. It is called multidisciplinary ethnoastronomy and it synthesizes evidence from fields such as astronomy, genetics (mtDNA), linguistics, prehistory, ethnography, geology, paleoanthropology, and palaeoclimatology.

Interdisciplinary Collaboration

The following are the reported collaborative activities this past year, but there were many others as well. And within the WGAC, WG Associates represent several disciplines other than astronomy.

Rita Gautschy designed and taught an archaeoastronomy course tailored for archaeologists.

Steven Gullberg gave a collaborative presentation at the Eastern States Rock Art Conference in St. Louis, Missouri, USA.

E. C. Krupp was a member of the local organizing committee for the Eleventh Inspiration of Astronomical Phenomena Conference, in Pasadena, California, USA.

Areg Mickaelian organized a collaborative meeting of Space Sciences and Technologies in Byurakan, Armenia.

Armando Mudrik has been working in collaborative research groups with anthropologists.

Andrew Munro works in collaboration with archaeologists to further his research of Puebloan astronomy at Chaco Canyon in New Mexico, USA.

Wayne Orchiston has been developing and promoting a multi-disciplinary approach to ethnoastronomical research.

WG Publications

The work of the WGAC includes material development for both internal and external use. This involves material for WG members and material designed to educate others. One significant goal is to educate the public about cultural astronomy and another from the Culturally Sensitive Sites committee endeavors not only to relate Indigenous insight to astronomers but also to better educate the public as well. Best practices are being identified for future use.

Member Awards

Congratulations to these WGAC members for their 2022 awards!

Alan Alves-Brito received two awards: Prêmio José Reis de Divulgação Científica e Tecnológica - Pesquisador e Escritor, CNPq, Brazil. (<http://www.ufrgs.br/ufrgs/noticias/professor-alan-alves-brito-e-o-ganhador-do-premio-jose-reis-de-divulgacao-cientifica>); and Prêmio Educar 2022 : Educar com Equidade Racial e de Gênero - Projeto Akotirene Kilombo Ciência, CEERT

Nicholas Champion received the Carlos Jaschek Memorial Award, awarded by SEAC (Société Européenne pour l'Astronomie dans la Culture/European society for Astronomy in Culture), for outstanding contribution to the study of Cultural Astronomy

Muhammed Rayan Khan received awards for the International Dark Sky Association's Dark Sky Defender Award, and the Langdon-Malik Foundation Performance Art Prize at the Karachi Biennale 2022.

Conferences

The following WGAC members reported over 100 conference attendance/presentation activities during 2022. Several of them organized such events. Our members continually make a very positive global impact on Cultural Astronomy. The conferences are not listed by name in the interest of space in this report.

Danielle Adams, Alan Alves-Brito, Juan Antonio Belmonte, Kelly Blumenthal, Nicholas Champion, Milan Dimitrijevic, Rita Gautschy, Cesar Gonzalez-Garcia, Steven Gullberg, Duane Hamacher, Saeko Hayashi, Jarita Holbrook, Gordon Houston, Alejandro Lopez, Kim Malville, Javier Mejuto, Areg Mickaelian, Armando Mudrik, Greg Munson, Wayne Orchiston, Muhammad Rayan Khan, Clive Ruggles, B. S. Shylaja, Ivan Sprajc, Gudrun Wolfschmidt

Member Publications Developed in 2022

WGAC members continue to further our cultural astronomy activity areas with research and publication. Many significant publications (as authors/co-authors/editors/co-editors) were reported for 2022 and are listed here; they illustrate our contributions to Cultural Astronomy. The publications of our members are prolific – those below represent the books and papers submitted for this report, yet there are more. Given are author names and titles only for consideration of the length of the report and the titles are good indicators of the work being done. Anyone desiring full reference information on any particular source may contact Steven Gullberg at srgullberg@ou.edu

Juan Belmonte – An Archaeology of the Sky in Gaul in the Augustan Period; Land- and Skyscapes of the Camino de Santiago: An Astronomy and World Heritage Sustainable Approach

Alan Alves-Brito - The history of science and science education from the Amerindian and Amefrican perspectives; Education for ethnic-racial relations: An essay on subalternized alterities in the physical sciences; O ensino de Física e Astronomia pela perspectiva afro-indígena; Astro-Anthropo-Logics: oriki of (in)visible matters; Antônia e os cabelos que carregavam os segredos do Universo; Bará: corpos-territórios em r(existência); Zumbi-Dandara dos Palmares: desafios estruturais e pedagógicos da Educação Escolar Quilombola para a promoção da equidade racial no Brasil do século 21; Cosmopolíticas: educação para as relações étnico-raciais nas ciências exatas; O racismo institucional e a retomada da UFRGS pelos povos originários; Sobre o direito de *(re)existir* e ser Kilombola: o caso do Licenciamento da BR 386 no Rio Grande do Sul; Cosmopoéticas; A ética da diferença: a educação escolar quilombola como direito humano inalienável. Construindo uma educação antirracista: reflexões, afetos e experiências; Cosmologias africanas e afro-brasileiras: reflexões e estratégias didático-pedagógicas para professores e divulgadores de ciências. Sobre mais uma ideia para adiar o fim do mundo: reflexões do curso de aperfeiçoamento Educação das Relações Étnico-raciais na Educação Básica

Nicholas Champion - Exploring Theory in Skyscape Archaeology: Symbols, Materiality, Relationality and Rhizomes; The Planets in Alchemy and Astrology (Medieval and Renaissance); The Planets in Alchemy and Astrology (The Classical World)

Milan Dimitrijević - The bear mythology: An enduring archetypal tale of feminine empowerment, adulthood and motherhood; Anaxagora's views on the origin of universe and nature of celestial bodies; Heraclit's cosmology and modern views on the fate of the universe; Beyond the anthropic principle: Man and the universe; A couple of stećaks from donja zgošća; Delos, the centre of apollo's cult – an archaeoastronomical viewpoint; Portara from naxos – the celestial gate; Fine coins from akragas – a possible astronomical interpretation

Roslyn Frank - Comparing Native American and European Traditional Beliefs and Performance: Ritual Practitioners and Bear Impersonators; Exploring the Indigenous Face of Europe: Rethinking Fairytales, the Pilgrimage to Santiago de Compostela and Glass Mountain before Cinderella; Memoria Social Colectiva. Tomo 1. Análisis de las tecnologías de contabilidad indígena pirenaica constatadas dentro y fuera de Euskal Herria; A Newly Discovered Ethnocultural Substrate Along the Atlantic Façade: Evidence for the Unique Counting System and Mathematical Strategies Shared by the Basque Country (Euskal Herria), Spain, France, Ireland and Scotland

Robert Fuller - The Role of Astronomy in Australian Indigenous Knowledge; The Astronomy of the Aboriginal Peoples of the Sydney Basin

Rita Gautschy - Der Antikythera-Mechanismus

Cecilia Gomez - Zonas cardinales y orientación entre los *qomlé?k* (tobas del oeste de Formosa, Argentina); Cielo y Juegos de hilo. Representación de la temporalidad cíclica entre los Pilagá del Pilcomayo; Asterismos, cielo y ciclos temporales entre los wichí. *Revista del Museo de Antropología*

César Gonzalez-Garcia - An Archaeology of the Sky in Gaul in the Augustan Period; The Guiding Sky: Funerary Orientations and Nomadic Movements in Somaliland during Antiquity; The Winter Solstice as a Roman Cultural Fingerprint from the Mythical Origins of Rome to Augustus; Landscapes of the “Coast of Death”: dolmen topographies of NW Iberia; Land- and Skyscapes of the Camino de Santiago: An Astronomy and World Heritage Sustainable Approach; The Sun and the Moon: Double Alignments in the Iberian Peninsula; Traveling Between Natural and Human Sciences: A Professional Voyage Towards Cultural Astronomy

Steven Gullberg - Painting Babylonian: New Constellations in Stellarium; The Significance of Solstices in the Inca Empire; Our Galaxy in Culture; When Aliens Land; Archaeoastronomy and Ethnoastronomy; Cultural Astronomy and Modern Skywatching; Chankillo Archaeoastronomical Complex: UNESCO World Heritage Site; Inca Cultural Astronomy

Duane Hamacher – The First Astronomers: How Indigenous Elders read the stars; Solar Eclipses in First Nations Traditions; The Art of Star Knowledge; The Role of Astronomy in Australian Indigenous Knowledge; The Astronomy of the Aboriginal Peoples of the Sydney Basin; Using the Significant Horizons Methodology to Determine Potential Astronomical Use of Aboriginal Stone Arrangements; Research Frameworks in Indigenous Astronomy; World Developments: Australasian and Oceanic cultures; Safeguarding Indigenous Sky Rights from Colonial Exploitation; Whitening the Sky: light pollution as a form of cultural genocide; Comparing constellations across cultures; Perceptual grouping explains constellations across cultures

Liz Henty - Exploring Archaeoastronomy: A History of its Relationship with Archaeology and Esotericism; Life in the land of the dead: skyscape archaeology and the ontology of other worlds

Susanne Hoffmann - Astronomy in Culture - Cultures of Astronomy; Painting Babylonian: New Constellations in Stellarium; What astronomy teaches Dante's Divina Comedia?; Intercultural Misunderstandings as possible source of ancient constellations; Ancient Skies and Stellarium – Making cultural information easily accessible; Stellarium Approaching Maturity; Zeit von den Sternen. Die Bedeutung des Himmels vom babylonischen MUL.APIN bis heute, Codices Manuscripti & Impressi; Revisiting Star Names: Stellarium and the Ancient Skies Database

Jarita Holbrook - Cultural Astronomy and Modern Skywatching; When Aliens Land

Gordon Houston - The Potential Horizon Astronomy at Caddo Mounds

E. C. Krupp - Book review of The Measure and Meaning of Time in Mesoamerica and the Andes; Book review of The Human Cosmos: A Secret History of the Stars; "Stellar Acquisition" (article on Dendera Zodiac plate in Description de l'Égypte); Public Astronomy, Los Angeles Style; City of Stars; Public Performane

Trevor Leaman - The Role of Astronomy in Australian Indigenous Knowledge; Using the Significant Horizons Methodology to Determine Potential Astronomical Use of Aboriginal Stone Arrangements

Annette Lee - Anchored to Earth by Starlight – Decolonizing Relationship to Sky; Cosmic Explorations: at the Intersection of Science, Space, Art, and Culture; Cultural Astronomy and Modern Skywatching; When Aliens Land

Alejandro Lopez - El cielo entre nosotros: Patrimonio y dinámicas socioculturales en el Chaco Argentino; "Milky Way Astronomies": Proposing a Framework for Cultural Comparison. Journal of Skyscape Archaeology; Cosmo-Logics in Contemporary Lowland South America; Los hermanitos perdidos: construyendo relatos sobre el cielo entre los moqoit del Chaco; El cielo entre nosotros: Patrimonio y dinámicas socioculturales en el Chaco Argentino; Cultural Astronomy and Modern Skywatching; When Aliens Land

Javier Mejuto - Caribbean astronomy for inclusion (CAI): Transforming "Theory" on inclusion into concrete actions; Improving Resilience in local and Indigenous Communities to face hydrometeorological disasters in Central America through Small Satellites; Ontología de los ajuares funerarios: un estudio multidisciplinario en torno a la relación entre muerte, poder y religion; Patrimonio cultural y natural; Cultural Astronomy and Modern Skywatching; When Aliens Land

Areg Mickaelian - Astronomical Public Activities in Armenia

Steve Miller - When Aliens Land

Armando Mudrik - Encuentro con lo religioso en el campo etnoastronómico entre migrantes europeos y sus descendientes en el norte de Santa Fe, Argentina; Cambios y continuidades en los esquemas de clasificación celestes de migrantes europeos y sus descendientes en el sur de la región chaqueña Argentina; Capítulo 24: “Si vuelca la luna...”: Concepciones astronómicas y meteorológicas entre los colonos del sur de la región chaqueña Argentina

Wayne Orchiston - Mabel Cook Cole’s Philippine Folk Tales: a critical ethnoastronomical analysis; Analysis of the New Moon times on the calendar disk of the astronomical clock in Gdansk; Ethnoastronomy: The Sky in Filipino Civilization, by Dante L. Ambrosio; Review of The First Astronomers: How Indigenous Elders Read the Stars, by Duane Hamacher, Ghillar Michael Anderson, John Barsa, David Bosun, Ron Day, Segar Passi and Alo Tapim

Manuel Perez - Equinoxes and Solstices in Toya's chamber in "The reflection of power in death. La cámara sepulcral de Toya (1918-2018); Actividad de culto y edificación orientalizante en el Cerro de San Vicente (Salamanca, Spain); The Sun God of Puente Tablas (Jaén, Spain)

Michael Rappenglück - Human Beings in Cosmic Lifeworlds: Anthropology, Ecospheres and Cultural Cosmologies

William Romain - Notes on the Accuracy of Google Earth Pro Heading Information for Archaeoastronomy and Landscape Archaeology Studies; Angkor Wat: Lotus Temple at the Intersection of Celestial Azimuths; Observations Concerning the Milky Way, Serpent Mound, Newark and Mound City Earthworks; Tombs of the Tibetan Emperors: Divine Descent and Mortal Remains in the Chongye Valley

B. S. Shylaja - Star names in Indian culture – a search leading to their evolution; Conjunction of planets - procedures and examples from Indian astronomy texts; Investigating the astronomical histories of India and Southeast Asia: the role of stone inscriptions

Ivan Sprajc - El mascarón arquitectónico preclásico de la Estructura 3 de Chacté, Guatemala; Group E of Uaxactún: astronomical hypotheses and archaeological reality

Doris Vickers - Ancient Skies and Stellarium – Making cultural information easily accessible

Alexander Wolf - Stellarium 1.2 User Guide (one of six releases in 2022); Revisiting Star Names: Stellarium and the Ancient Skies Database; Stellarium Approaching Maturity

Gudrun Wolfschmidt - Astronomy in Culture -- Cultures of Astronomy; Carte Stellari dell'Accademia di Berlino / Berlin Academic Star Charts

Georg Zotti - Stellarium 1.2 User Guide (one of six releases in 2022); . Astronomischer Almanach für Österreich 2023; Revisiting Star Names: Stellarium and the Ancient Skies Database; Stellarium Approaching Maturity; Ancient Skies and Stellarium – Making cultural information easily accessible

The journals *Cosmovisiones/Cosmovisões* (**Alejandro Lopez, Walmir Cardoso, and Priscila Faulhaber**, Eds.), *Journal of Astronomical History and Heritage* (**Wayne Orchiston**, Ed.), and *Journal of Skyscape Archaeology* (**Fabio Silva and Liz Henty**, Eds.) focus on or otherwise frequently publish articles of Cultural Astronomy and the editors named above are members of the WGAC. Their efforts contribute greatly to the advancement of the field, and a recent addition to the list is the *Journal of Astronomy in Culture* (**Steven Gullberg**, Ed.).

Future

The WGAC continues a busy and productive triennium. We serve as the IAU's focal point for Cultural Astronomy and as well carry on our efforts to advance the field across the globe. In this endeavor, as illustrated above, we are enjoying considerable success.

We will advance robust efforts to enlighten astronomers throughout the world as to Indigenous sensitivities at astronomical sites built upon sacred grounds. This includes suggestions as to how astronomers can best interact with those expressing these concerns as well as advice for future site selections.

We will continue our efforts in education and outreach and intend to develop closer relationships with the IAU's OAD, OAE, and OAO to explore ways of using Cultural Astronomy to enhance their initiatives wherever possible.

We continue our research of Indigenous astronomy. We also pursue the compilation of materials regarding archaeoastronomy in developing nations.

Our members regularly perform robust research and publication regarding topics in Cultural Astronomy.

A primary goal is to further enhance what is known of world cultures by understanding their cosmologies and how and why they use/used astronomy. We also serve to highlight the role played by Cultural Astronomy with other branches of astronomy.

We look forward to meeting for WGAC business, sharing of research, discussing future collaborations and activities, and general collegial interactions at the General Assembly in Cape Town in 2024. We also will continue to promote Cultural Astronomy at other astronomy, archaeoastronomy, archaeology, anthropology, and Indigenous events during the triennium.

We will work to further enhance the contributions of the WGAC in all ways useful to the IAU. We also look forward to continuing to increase our membership and to the contributions that all of our members will make!