

15th International Conference on Geoinformation and Cartography

Zagreb, Vodnjan/Dignano, Pula/Pola, Brijuni Islands, Croatia
 Venice, Italy, September 26–29, 2019

The 15th International Conference on Geoinformation and Cartography (15th ICGC) was organized by the Croatian Cartographic Society and the University of Zagreb, Faculty of Geodesy. It was organized under the auspices of the International Cartographic Association, the Croatian Academy of Engineering, the University of Zagreb, the University of Zadar and the Juraj Dobrila University of Pula.

El Magazèin Gallery from Vodnjan / Dignano, Pučko otvoreno učilište – Università popolare aperta "Vodnjan-Dignano", Tourist Board Zagreb, Tourist Board Pula / Pola and Tourist Board Vodnjan / Dignano were partners in conference organization.

APIS IT d.o.o. was the Main Sponsor of the conference. We are also grateful to Geomatika-Smolčak d.o.o. for supporting the conference.

By organizing this conference, the Croatian Cartographic Society and the Faculty of Geodesy of the University of Zagreb wanted to contribute to the development of geoinformatics, cartography, geodesy, geography and related fields, with a special emphasis on new achievements. A wide range of themes and renowned invited lecturers guaranteed interesting lectures and a contemporary approach.

Keynote Speakers



Prof. Dr. E. Lynn Usery is a Senior Scientist of the U.S. Geological Survey (USGS) and Director of the Center of

Excellence for Geospatial Information Science (CEGIS). He has worked as a cartographer and geographer for the USGS for 30 years and a professor of geography for 17 years with the University of Wisconsin-Madison and the University of Georgia. He served as President of the University Consortium for Geographic Information Science (UCGIS), the Cartography and Geographic Information Society (CaGIS), and the American Society for Photogrammetry and Remote Sensing (ASPRS). He is a Fellow of CaGIS, UCGIS, and ASPRS, and received the CaGIS Distinguished Career Award in 2012. He served as Vice-President of the International Cartographic Association from 2015–2019. His primary research areas are in theoretical cartography and geographic information science, map projections, geospatial semantics and ontology, high-performance computing and CyberGIS, spatial data models, and data integration. He has published more than 120 articles in these areas and continues theoretical research in cartography.



Prof. Dr. Adrijana Car is currently a Professor in Geoinformatics at the Carinthia University of Applied Sciences (FH Kärnten), Villach, Austria, an elected member of the Commission for Geographic Information Science at the Austrian Academy of Sciences, Program Committee Chair of the GI_Forum conference and one of the founding editors-in-chief of the GI-Forum Journal. She holds a PhD

in Geoinformation from the University of Technology in Vienna and is a graduate of the Faculty of Geodesy at the University of Zagreb. She has been teaching GIS-related courses at the undergraduate, graduate and post-graduate level since 1992. Through academic positions in geographical locations like Austria, UK, USA, and Oman, she gained experience in different academic environments and scientific communities, and in various cultural surroundings. Her professional-scientific interests focus on conceptualization and formalization of space and time, project-based learning and curriculum design in Geographic Information Science & Technology, as well as quality assurance aspects in higher education.



Dr. Hernik István Hargitai is a planetary geomorphologist and media historian. He is an affiliate researcher of the Search for Extraterrestrial Intelligence (SETI) Institute and was a postdoctoral fellow at the NASA Ames Research Center until 2017. He has taught planetary geomorphology, planetary cartography, typography, and media history as a senior lecturer at Eötvös Loránd University, Budapest, Hungary since 2002. He has a PhD in Earth Sciences and Philosophy (Aesthetics). His study fields include planetary cartography, fluvial geomorphology and the history and localization of planetary nomenclature. He participated in two Mars Desert Research Station simulations. Dr. Hargitai is the co-chair of the ICA

15. međunarodna konferencija o geoinformacijama i kartografiji

Zagreb, Vodnjan/Dignano, Pula/Pola, Brijuni, Venecija
26–29. rujna 2019.

Petnaestu međunarodnu konferenciju o geoinformacijama i kartografiji (15th ICGC) organizirali su Hrvatsko kartografsko društvo i Geodetski fakultet Sveučilišta u Zagrebu. Konferencija je organizirana pod pokroviteljstvom Međunarodnoga kartografskog društva (International Cartographic Association – ICA), Akademije tehničkih znanosti Hrvatske, Sveučilišta u Zagrebu, Sveučilišta u Zadru i Sveučilišta Juraj Dobrila u Puli.

Partneri u organizaciji konferencije bili su galerija El Magazèn u Vodnjanu / Dignano, Pučko otvoreno učilište – Università popolare aperta "Vodnjan-Dignano", Turistički ured Zagreb, Turistički ured Pula / Pola i Turistički ured Vodnjan / Dignano.

Glavni sponzor konferencije bila je tvrtka APIS IT d.o.o. Konferenciju je podržala i Geomatika-Smolčak d.o.o.

Organizirajući ovu konferenciju Hrvatsko kartografsko društvo i Geodetski fakultet Sveučilišta u Zagrebu željeli su pridonijeti razvoju geoinformatike, kartografije, geodezije, geografije i srodnih područja, s posebnim naglaskom na nova dostignuća. Široki raspon tema i poznati pozvani predavači garantirali su zanimljiva predavanja i suvremeni pristup.

Pozvani predavači

E. Lynn Usery je stariji znanstvenik (Senior Scientist) u U.S. Geological Surveyu (USGS) i direktor u Center of Excellence for Geospatial Information Science (CEGIS). Trideset godina radi kao kartograf i geograf za USGS, a 17 godina bio je profesor na University of Wisconsin-Madison i University of Georgia. Bio

je predsjednik u University Consortium for Geographic Information Science (UCGIS), Cartography and Geographic Information Society

15th International conference

GEOINFORMATION and CARTOGRAPHY

**ZAGREB | VODNJAN | PULA
BRIJUNI ISLANDS | VENICE**

26 - 29 September, 2019

Organizers

hrvatsko kartografsko društvo
croatian cartographic society

Faculty of Geodesy
University of Zagreb

Under the Auspices of

ICA
AGI
International Cartographic Association

Croatian Academy of Engineering

University of Zagreb

University of Zadar

University of Pula

By organizing this conference the Croatian Cartographic Society and the Faculty of Geodesy of the University of Zagreb wish to contribute to the development of geoinformatics, cartography, geodesy, geography and associated fields with special emphasis on new achievements. A wide range of themes offered and renowned invited lecturers guarantee interesting lectures and a contemporary approach.

Conference themes include Geoheritage and cartoheritage, Big data, Maps & AI, Internet of Things, Croatian Qualifications Framework, Map projections, UAV, LBS, Satellite technologies in cartography, and many more.

hrvatsko kartografsko društvo
croatian cartographic society

www.kartografija.hr



Venice, 2019 / Venecija, 2019.



(CaGIS) i American Society for Photogrammetry and Remote Sensing (ASPRS). Počasni je član društava CaGIS, UCGIS i ASPRS, a nagradu CaGIS-a Distinguished Career Award dobio je 2012. Bio je dopredsjednik International Cartographic Association 2015–2019. Njegova područja istraživanja su teorijska kartografija i znanost o geoinformacijama, kartografske projekcije, geoprostorna semantika i ontologija, računarstvo visokih performansi i CyberGIS, modeli prostornih podataka i integracija podataka. Objavio je više od 120 članaka iz tih područja i najstavlja teorijska istraživanja u kartografiji.



Adrijana Car je profesorica geoinformatike na Fachhochschule Kärnten u Villachu u Austriji. Izabrana je u Povjerenstvo za znanost o geografskim informacijama pri Austrijskoj akademiji znanosti, predsjedavajuća je Programskim odborom konferencije GI_Forum i jedna od osnivača glavnih urednika časopisa GI-Forum Journal. Diplomirala je na Geodetskom fakultetu Sveučilišta u Zagrebu, a doktorirala iz geoinformatike na Tehničkom sveučilištu u Beču. Predaje predmete koji se odnose na GIS na preddiplomskim, diplomskim i poslijediplomskim studijima od 1992. Osim u Austriji, predavala je i u Ujedinjenom Kraljevstvu, SAD-u i Omanu, gdje je stekla iskustvo u različitim akademskim okolinama i znanstvenim zajednicama, i u različitim kulturnim sredinama. Njezino stručno-znanstveno zanimanje usmjereno je na konceptualizaciju i formalizaciju prostora i vremena, učenje utemeljeno na projektima i oblikovanje nastavnih planova i programa za znanost i tehnologiju o geografskim informacijama, kao i na aspekte osiguranja kvalitete u visokom obrazovanju.



Hernik István Hargitai je geomorfologičar planeta i povjesničar medija. Pridruženi je istraživač instituta SETI (Search for Extraterrestrial Intelligence Institute), a bio je postdoktorand u NASA Ames Research Center do 2017. Predaje geomorfologiju planeta, kartografiju planeta, tipografiju i povijest medija na Eötvös Loránd University u Budimpešti u Mađarskoj od 2002. Doktorirao je u području znanosti o Zemlji i filozofiji (estetika). Njegova područja proučavanja su kartografija planeta, geomorfologija rijeka te povijest i lokalizacija nomenklature planeta. Sudjelovao je na dvije simulacije Mars Desert Research Station. Supredsjedavajući je Povjerenstva o kartografiji planeta ICA-e. Autor je mnogih javnih programa o zanosti o planetima za radio. Član je projekta HiRISE Beautiful Mars. Urednik je Digitalnog muzeja o kartiranju planeta i web-tranice Karte planeta za djecu.

Program prvoga dana konferencije

Prvi dan konferencije bio je organiziran na Geodetskom fakultetu Sveučilišta u Zagrebu. Godine 2019. Geodetski fakultet obilježava 100. godišnjicu Kraljevske visoke tehničke škole osnovane 1919.

Nakon svečnog otvaranja slijedila su dva pozvana predavanja E. Lynna Useryja i Adrijane Car. Prije ručka održana je Svečana sjednica Fakultetskog, jer je 26. rujna Dan Geodetskog fakulteta. Geodetski fakultetu osnovan je kao nezavisna institucija na taj dan 1962. godine. Nakon ručka konferencija je nastavljena sjednicom Povjerenstva za kartografske projekcije ICA-e. Time je bio završen prvi dan konferencije.

Program drugoga dana

Sljedeći dan preselili smo se u Vodnjan/Dignano, gdje je konferencija nastavljena u galeriji El Magazèin. *Vodnjan* (hrvatski) ili *Dignano*

(talijanski) je grad i općina u Istarskoj županiji u Hrvatskoj, smješten oko 10 kilometara sjeverno od najvećeg grada u Istri, Pule. U povijesnoj jezgri grad je sačuvao karakterističan srednjovjekovni izgled atrija i uskih ulica koje nepravilno vrludaju među kućama, sa starim fasadama i ulicama u kojima se još uvijek mogu prepoznati stilovi gotike, venecijanske renesanse i baroka te mnogo crkava s bogatom poviješću i umjetnošću.

Galerija *El Magazèin*, mjesto održavanja drugoga dana konferencije, nalazi se u vrlo staroj zgradi, a promovira različitost u kulturi i umjetnosti ovog područja. Zidovi su ožbukani na starinski način mješavinom vapna, lapora, pepela, istarske kamene prašine i crvene glina što im daje boju, no povrh svega čini dobru zvučnu izolaciju sa svojih 25 niša, vratiju i prozora.

Drugi dan konferencije započeo je razgledavanjem Vodnjana. Naš vodič je Germano Fioranti, vlasnik galerije u kojoj je nastavljen program konferencije. Nakon pozdravnih riječi gradonačelnika Vodnjana pozvano predavanje održao je Henrik Hargitai, a zatim je slijedio niz prezentacija.

Ručak je bio poslužen u neposrednoj blizini u Pučkom otvorenom učilištu – Università popolare aperta "Vodnjan-Dignano", a večera u restoranu u okolici Vodnjana.

Prije večere uživali smo u klasičnoj glazbi koju su izvele vrlo mlade glazbenice Ana Kanižaj na violini i Erin Bracovich na klaviru. Program se sastojao od ovih djela: J. S. Bach: Violin Concerto in A-minor 1st part, Ch. Beriot: Concerto in A-minor nr. 9, 1st part, H. Wieniawski: Chanson polonaise, Ch. Dancla: Air varié nr. 5 i L. M. Čuperjani: Tonina.

Program trećega dana

Treći dan konferencije bio je cjelodnevni stručni obilazak Pule i Brijuna. Pula je najveći grad u Istarskoj županiji, smješten na južnom vrhu Istarskog poluotoka. Poznat je po mnoštvu starih rimskih građevina od kojih je najpoznatija pulska Arena, jedan od najsčačuvanijih rimskih

Commission on Planetary Cartography. He is the producer of numerous public outreach programs in planetary science for the radio and a member of the HiRISE Beautiful Mars project. Dr. Hargitai is also the editor of the Digital Museum of Planetary Mapping, as well as of the web-site Planetary Maps for Children.

First day program

First day of the conference was organized at the Faculty of Geodesy, University of Zagreb. In 2019, the Faculty of Geodesy celebrates the 100th anniversary of the establishment of the Royal High Technical School in 1919.

The Opening Ceremony was followed by two keynote lectures given by E. Lynn Usery and Adrijana Car. Before the lunch, the Solemn Session of the Faculty of Geodesy Council took place, because September 26 is the Day of the Faculty of Geodesy. The Faculty of Geodesy was established as an independent institution on that day in 1962. After the lunch, the conference continued with the International Cartographic Association Commission on Map Projections meeting and that was the end of the first day of the conference.

Second day program

Next day, we moved to Vodnjan/Dignano, where the conference continued in the El Magazèin Gallery. *Vodnjan* (Croatian) or *Dignano* (Italian) is a town and municipality in Istria County, Croatia, located about 10 kilometres north of the largest city in Istria, Pula. Within the historic core, the town preserved its characteristic medieval look with atria and narrow streets irregularly winding among houses, with cobble roads and façades, old streets still impressively recognizable by their Gothic, Venetian Renaissance and Baroque style and many churches rich with memories and art.

The *El Magazèin* Gallery, where the second conference day took place, is in a very old building and promotes diversity in culture and arts within this area. The walls are covered the old-fashioned way with a mixture of lime, marl, ashes, Istrian stone dust and red clay that gives it colour, but above all it makes a good sound insulation together with 25 niches, doors and windows.

The second conference day started with guided sightseeing of Vodnjan. Our guide was Germano Fioranti, owner of the Gallery, where the conference program continued. Greetings by Vodnjan mayor were followed by a keynote lecture given by Henrik Hargitai, as well as several presentations.

A lunch was served just across the street at the Pučko otvoreno učilište – Università popolare aperta "Vodnjan-Dignano", while a dinner was served at a restaurant in the vicinity of Vodnjan.

Before the dinner, we enjoyed a classical music performed by very young musicians Ana Kanižaj, violin and Erin Bracovich, piano. They played J. S. Bach: Violin Concerto in A-minor 1st part, Ch. Beriot: Concerto in A-minor nr. 9, 1st part, H. Wieniawski: Chanson polonaise, Ch. Dancla: Air varié nr. 5 and L. M. Čuperjani: Tonina.

Third day program

The third conference day was a whole-day guided tour of Pula and Brijuni Islands. Pula is the largest city in the Istria County, situated at the southern tip of the Istrian peninsula. It is known for its multitude of ancient Roman buildings, the most famous of which is the Pula Arena, one of the best-preserved Roman amphitheatres, as well as the beautiful sea. The city has a long tradition of wine making, fishing, shipbuilding, and tourism.

The Brijuni Islands are a group of fourteen small islands in the Croatian part of the northern Adriatic Sea separated from the west coast

of the Istrian peninsula by the narrow Fažana Strait. Famous for their scenic beauty, the islands are a holiday resort and a Croatian National Park.

Fourth day program

A whole-day guided tour in Venice was organized on the fourth conference day. Venice is a city in north-eastern Italy and the capital of the Veneto region. It is situated on 118 small islands separated by canals and linked with over 400 bridges. Venice is referred to as "La Dominante", "La Serenissima", "Queen of the Adriatic", "City of Water", "City of Masks", "City of Bridges", "The Floating City", and "City of Canals". The lagoon and a part of the city are listed as a UNESCO World Heritage Site.

Venice is renowned for its beauty, architecture and artwork. It is also known for several important artistic movements, especially during the Renaissance period. It played an important role in the history of symphonic and operatic music and is the birthplace of Antonio Vivaldi. Although the city is facing some major challenges (including financial difficulties, pollution, an excessive number of tourists and problems caused by cruise ships sailing close to the buildings), Venice remains a very popular tourist destination, an iconic Italian city, and has been ranked the most beautiful city in the world.

Conference program and lecture abstracts were published in a printed publication, and all presentations, as well as many photos were published on the Croatian Cartographic Society website, www.kartografija.hr.

Seventy participants attended the 15th International Conference on Geoinformation and Cartography. We were happy to demonstrate Croatian hospitality to our guests from USA, Russia, China, Japan, Hungary, Czech Republic and Austria. We hope they will come to Croatia again next year to attend the 16th International Conference on Geoinformation and Cartography.

Miljenko Lapaine ■

Pokrovitelji
Under the Auspices of



Međunarodno kartografsko društvo
International Cartographic Association



Akademija tehničkih znanosti Hrvatske
Croatian Academy of Engineering



Sveučilište u Zagrebu
University of Zagreb



Sveučilište u Zadru
University of Zadar



Sveučilište Juraj Dobrila u Puli
Juraj Dobrila University of Pula

amfiteatara, kao i po lijepom moru. Grad ima dugu tradiciju vinarstva, ribarstva, brodogradnje i turizma.

Brijunsko otočje je skupina od 14 malih otoka u hrvatskom dijelu sjevernog Jadranskog mora. Smješteno je blizu zapadne obale Istarskog poluotoka uz uski morski prolaz blizu Fažane. Poznati po svojoj ljepoti, otoci su mjesto za odmor i hrvatski nacionalni park.

Partneri
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Galerija El Magazèin u Vodnjanu /
Dignano
**El Magazèin Gallery from Vodnjan /
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Pučko otvoreno učilište – Università popolare aperta "Vodnjan-Dignano"
Pučko otvoreno učilište – Università popolare aperta "Vodnjan-Dignano"



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Turistički ured Pula / Pola
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Turistički ured Vodnjan / Dignano
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Program četvrtoga dana

Cjelodnevni stručni obilazak Venecije organiziran je četvrtoga dana konferencije. Venecija je grad na sjeveroistoku Italije i glavni grad regije Veneto. Smješten je na 118 malih otoka odvojenih kanalima i povezan s više od 400 mostova. Veneciju nazivaju "La Dominante", "La Sere-nissima", "Kraljicom Jadrana", "Gradom vode", "Gradom maski",

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"Gradom mostova", "Plutajućim gradom" i "Gradom kanala". Laguna i dio grada upisani su u UNESCO-v popis mjesta svjetske baštine.

Venecija je poznata po svojoj ljepoti, arhitekturi i umjetnosti. Poznata je i po nekoliko važnih umjetničkih pokreta, posebno u doba renesanse. Igrala je važnu ulogu u povijesti simfonijske i operne glazbe, tamo se rodio Antonio Vivaldi. Iako se grad susreće s nekoliko velikih izazova (uključujući financijske teškoće, poluciju, prevelik broj turista i probleme prouzročene brodovima kruzerima koji ploje blizu zgrada), Venecija ostaje vrlo popularno turističko odredište, ikonički talijanski grad koji je rangiran među najljepše gradove na svijetu.

Program konferencije i sažetci objavljeni su u tiskanoj publikaciji, a sve prezentacije, kao i mnogo fotografija objavljeno je na web-stranici Hrvatskoga kartografskog društva, www.kartografija.hr.

Na 15. međunarodnoj konferenciji o geoinformacijama i kartografiji sudjelovalo je 70 sudionika. Zadovoljni smo što smo mogli pokazati hrvatsko gostoprimstvo našim gostima iz SAD-a, Rusije, Kine, Japana, Mađarske, Češke i Austrije. Nadamo se da će oni ponovno doći u Hrvatsku i sudjelovati na 16. međunarodnoj konferenciji o geoinformacijama i kartografiji.

Miljenko Lapaine ■