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Foreign Member, Academia Europaea
AAAS Fellow, IEEE Fellow, AAG Fellow, ASPRS Fellow, AAIA Fellow

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CAREER NARRATIVE

Dr. Qihao Weng is a Chair Professor at the Hong Kong Polytechnic University since July 2021. He worked as the Director of the Center for Urban and Environmental Change (July 2004-2021) and a Professor at Indiana State University, 2001-2021, and was a Senior Fellow at the NASA Marshall Space Flight Center from Dec. 2008 to Dec. 2009. He received his Ph.D. degree in geography (concentrations: remote sensing, GIS, and environment) from the University of Georgia in 1999. Weng is currently the Lead of the Group on Earth Observation's (GEO) Global Urban Observation and Information Initiative and serves as an Editor-in-Chief of the *ISPRS Journal of Photogrammetry and Remote Sensing*. Additionally, he works as the Series Editor of *Taylor & Francis Series in Remote Sensing Applications*, *Taylor & Francis Series in Imaging Science*, and *Taylor & Francis Series in the Urban-Environment-Sustainability-Technology Nexus*. Weng has been the Organizer and Program Committee Chair of the biennial IEEE International Workshop on Earth Observation and Remote Sensing Applications conference series since 2008, a National Director of the American Society for Photogrammetry and Remote Sensing (ASPRS) from 2007 to 2010, a Trustee of the ISPRS Foundation since 2021, and a panelist of U.S. DOE's Cool Roofs Roadmap and Strategy committee in 2010.

In 2008, Weng received a prestigious NASA senior fellowship. He received the Outstanding Contributions Award in Remote Sensing in 2011, the AAG E. Willard and Ruby S. Miller Award in 2015, the 2020 AAG Distinguished Scholarship Honors Award, the AAG Wilbanks Prize for Transformational Research in Geography and RSSG (Remote Sensing Specialty Group) Lifetime Achievement Honor Award, all from the American Association of Geographers (AAG). Furthermore, in 2019, he was given a Taylor & Francis Lifetime Achievements Award, and a fellowship from Japan Society for the Promotion of Science under the "JSPS Invitational Fellowships for Research in Japan" (Short-term S [E], formerly known as "JSPS Award for Eminent Scientists"). In 2021, Weng was awarded a Global STEM Professorship by the government of the Hong Kong Special Administrative Region. At Indiana State University, he was selected as a Lilly Foundation Faculty Fellow in 2005. In the following year, he also received the Theodore Dreiser Distinguished Research Award. Additionally, Weng was the recipient of 2010 Erdas Award for Best Scientific Paper in Remote Sensing (1st place) and the 1999 Robert E. Altenhofen Memorial Scholarship Award, which were both awarded by the ASPRS. He was also awarded the Best Student-Authored Paper Award by the International Geographic Information Foundation in 1998. Weng has been invited to give more than 130 talks by worldwide organizations and conferences and is honored with a visiting professorship in a dozen of universities in Japan, France, and China. Weng was elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) in 2018, the American Association for the Advancement of Science (AAAS) in 2019, the ASPRS in 2020, the AAG and the Asia-Pacific Artificial Intelligence Association (AAIA) in 2021. He is an elected Foreign Member of Academia Europaea (The Academy of Europe) in 2021.

Weng's research focuses on remote sensing applications to urban environmental and ecological systems, land-use and land-cover changes, urbanization impacts, urban sustainability, environmental modeling, and

human-environment interactions. Through the serial invention of innovative techniques, methods, and theories, Weng's research efforts have fostered growth in the geographical and environmental applications of the science and technology of remote sensing. Moreover, his research has bridged methodological gaps between geography, landscape ecology, and environmental science, uniting these related fields to design holistic solutions to many environmental, ecological, and climatic issues. Throughout his research career, Weng has authored more than 280 articles (journal articles, chapters, etc.) and 15 books. Per Google Scholar, as of April 14, 2024, his works have been cited more than 33,300 times (H-index of 81), and 70 of his publications have more than 100 citations each. Weng's research has been supported by funding agencies including the NSF, NASA, USAID, National Geographic, Microsoft, Hong Kong Research Grant Council and Hong Kong Jockey Club Charities Trust.

EDUCATION

- University of Georgia, Geography, Ph.D., 1999.
- University of Arizona, Geography, M.A., 1996.
- South China Normal University, Geography, M.S., 1990.
- Minjiang University, China, Geography, A.S. (equivalent), 1984.

EXPERIENCE

- Chair Professor of Geomatics and Artificial Intelligence, The Hong Kong Polytechnic University, July 19, 2021 - present, Dept. of Land Surveying and Geo-Informatics, Hung Hom, Kowloon, Hong Kong.
- Director, Research Centre for Artificial Intelligence in Geomatics, The Hong Kong Polytechnic University, July 15, 2023 - present.
- Director, JC STEM Lab of Earth Observations, The Hong Kong Polytechnic University, July 21, 2022 - present.
- Associate Director, Research Institute of Land and Space, The Hong Kong Polytechnic University, October 11, 2021-present.
- Professor (2009-present), Department of Earth & Environmental Systems, Indiana State University; Associate Prof., 2005-2009; Assistant Prof., 2001-2005.
- Director (2004-present), Center for Urban and Environmental Change, Indiana State University.
- Editor-in-Chief, *ISPRS Journal of Photogrammetry and Remote Sensing*, 2015-present.
- JSPS Fellow, School of Life and Environmental Sciences, University of Tsukuba, Japan, Dec 2019-Jan 2020.
- Senior Fellow, NASA Marshall Space Flight Center, Dec 2008-Dec 2009.
- Assistant Professor of Geography, University of Alabama, August 1999-May 2001.

HONORS/AWARDS

- 2024. AAG Wilbanks Prize for Transformational Research in Geography, American Association of Geographers.
- 2024. Lifetime Achievement in Remote Sensing Award, AAG Remote Sensing Specialty Group.
- 2021. Foreign Member of Academia Europaea (The Academy of Europe).
- 2021. Fellow, American Association of Geographers (AAG).
- 2021. Fellow, Asia-Pacific Artificial Intelligence Association (AAIA).
- 2021. Distinguished Lecturer, IEEE Geoscience and Remote Sensing Society, 2021-2022.
- 2021. The John R. Jensen Distinguished Lecturer, AAG Remote Sensing Specialty Group.
- 2020. Distinguished Scholarship Honors, American Association of Geographers (AAG).
- 2020. Fellow, American Society for Photogrammetry and Remote Sensing (ASPRS).
- 2019. Invitational Fellowships for Research in Japan (Short-term S[E], formerly known as "JSPS Award for Eminent Scientists"), Japan Society for the Promotion of Science.
- 2019. Taylor & Francis Lifetime Achievement Award.

- 2019. Fellow, American Association for the Advancement of Science (AAAS).
- 2018. Fellow, Institute of Electrical and Electronics Engineers (IEEE).
- 2015. AAG E. Willard and Ruby S. Miller Award, American Association of Geographers.
- 2011. Outstanding Contributions Award in Remote Sensing, AAG.
- 2008. Senior Fellowship Award, the National Aeronautics and Space Administration.

RESEARCH AREAS

(Extracted from <http://qihaoweng.net>)

I characterize myself as an environmental geographer who uses remote sensing, GIS, and spatial modeling methods and techniques to study urban environmental issues and ecosystems. The goals of my research include improving our understanding of urban structures, environments, and ecosystems through remote sensing and GIScience; linking urban climate (heat islands) with urban ecology (landscape patterns and processes) across various spatial scales; and exploring human-environment interactions during the urbanization process in different geographical settings and stages from a local to a global scope. The ultimate goal is to obtain better knowledge about urban environments and global urbanization processes through remote sensing and GIScience for sustainable development. My main research areas involve three broad themes: (1) urban remote sensing; (2) urban climatology and ecology; and (3) environmental sustainability.

Urban Remote Sensing:

- Invention of new algorithms and techniques: Urban landscape continuum model; sub-pixel analysis; fractals and scaling; data mining; and time series image analysis.
- Areas of application: Urban heat island modelling; estimation and mapping of urban impervious surfaces; urban sprawl mapping; land surface temperature analysis; urban classification and land characterization; population estimation; public health; and urban sustainability.
- Theory: Linkage between geography and landscape ecology; and understanding of geographical issues through remote sensing data and methods.
- GEO Global Urban Observation and Information Initiative, 2012-2022: This international initiative involves collaborators from all major countries, has conducted activities on global megacities analysis; defining requirements for global urban monitoring; improving global coverage of urban observation; and developing innovative techniques and indicators to support sustainable cities. Dr. Weng has led this initiative GUOI by bringing together numerous global stakeholders from policy, education, research and the private sector and has generated global impact on the Urban SDG.

Urban Climatology and Ecology:

- Urban heat island (UHI) modeling using remote sensing data and field measurements: Fractal analysis of UHI patterns; estimating UHI parameters using kernel convolution; data mining of UHIs; sub-pixel vegetation fraction-LST relationship in UHI; scaling effect of LST-vegetation abundance relationship; and relationship among air pollution, land use density and UHI.
- Land surface temperature (LST) estimation, generation, and analysis: LST scaling; development of data fusion algorithms; time-series analysis; spatio-temporal patterns; annual and diurnal temperature cycles modeling; generation of consistent LST data sets; use of LST data for urban, environment, and public health studies.
- Estimation and mapping of urban extents and impervious surfaces: Systematic analysis of different algorithms for estimation but focusing on sub-pixel, ANN, fuzzy set, and object based; effects of spectral and spatial resolutions; seasonality; relationship of impervious surface pattern with socioeconomic and demographic data; and time series nighttime light analysis.

- Urban sprawl mapping and environmental impact analysis: Urban growth detection and monitoring; dynamic relationship between urban growth and environmental change; urbanization effects; integration of remote sensing and GIS; land use change analysis; and time series image analysis.
- Cities at night: Settlements; population; energy use; urbanization processes; lighting sources; and light emission heterogeneity.

Environmental Sustainability:

- Population estimation: First use of impervious surface, LST, and vegetation fraction images in population estimation; land use based model; and spectral based model.
- Urban energy consumption: High-resolution building energy data; GIS based building energy modeling; climate change impacts; anthropogenic heat discharge estimation; nighttime urban energy consumption; and light pollution.
- Human and environmental health, environmental quality, and quality of life: Developing new indicators for urban physical environmental quality; scale effect of census-based urban environmental quality; environmental public health using remote sensing and GIS; West Nile Virus spread in urban settings; and effects of landscape pattern on disease spread.
- Urban ecosystems sustainability analysis: Use of fuzzy set in assessing urban ecosystem sustainability and temporal change.
- Human-environment interactions in coastal China: Agricultural land use and sustainability in the Pearl River Delta; land use and water conservancy techniques; Mangrove and inundation dynamics.

MAJOR ACHIEVEMENTS

(Extracted largely from the citation described Dr. Qihao Weng for receiving the 2020 AAG Distinguished Scholarship Award. <http://news.aag.org/2019/12/aag-is-proud-to-announce-the-2020-aag-honors/>)

Weng is a pioneer and leader in urban remote sensing. During his distinguished career, he has significantly advanced our theoretical understanding and empirical knowledge of urban heat islands, urban sprawl, and environmental sustainability. His outstanding contributions include methodological innovations of novel algorithms and analysis methods and theoretical advances on urban environments and urbanization processes. Taken together, his empirical and theoretical contributions have yielded significant new insights on some of the most critically important phenomenon influencing contemporary urban environments.

Weng's seminal research opened a critical new frontier towards understanding and measuring novel urban environmental risks. He developed a methodology for estimating land surface temperature with satellite-derived measures of vegetation that has become a core technique in urban climate studies. His research has also demonstrated that urban sprawl and warming are coupled with such risks as infectious disease. His scholarship has not only transformed the science of remote sensing, but has bridged gaps between geography, landscape ecology, and environmental science.

Beyond the considerable impact in research, Weng's production of educational materials and resources have played an important role in training future generations of scholars. An Introduction to Contemporary Remote Sensing is the standard textbook adopted by numerous universities worldwide.

Weng serves the scientific community through leadership and services. As Editor of ISPRS J. P&RS, he has shown vision, sound judgement and discretion, and has noticeably increased the quality of the journal. As GEO Urban Lead, he has spearheaded the development of this innovative initiative, and has generated a global impact on SDGs.

SELECTED PUBLICATIONS

- 1) Jia, S., **Weng, Q.***, Yoo, C. *et al.* 2024. Building energy savings by green roofs and cool

- roofs in current and future climates. *npj Urban Sustainability*, 4, 23 (2024). DOI: <https://doi.org/10.1038/s42949-024-00159-8>
- 2) Yoo, C., Im, J.*, **Weng, Q.***, Cho, D., Kang, E. and Y. Shin. 2023. Diurnal urban heat risk assessment: using extreme air temperatures and real-time population data in Seoul, *iScience*, 26(11), 108123. DOI: <https://doi.org/10.1016/j.isci.2023.108123>
 - 3) Zheng, Q., Seto, K.C., Zhou, Y., You, S. and **Q. Weng***. 2023. Nighttime light remote sensing for urban applications: progress, challenges, and prospects, *ISPRS Journal of Photogrammetry and Remote Sensing*, 202(8), 125-141. DOI: <https://doi.org/10.1016/j.isprsjprs.2023.05.028>
 - 4) Chen, Y., **Weng, Q.***, Tang, T.*, Wang, L., Xing, H. and Q. Liu. 2023. Developing an intelligent cloud attention network to support global urban green spaces mapping, *ISPRS Journal of Photogrammetry and Remote Sensing*, 198(4), 197-209. DOI: <https://doi.org/10.1016/j.isprsjprs.2023.03.005>
 - 5) Jiang, H., Sun, Z., Guo, H.*, **Weng, Q.***, Du, W., Xing, Q., and G. Cai. 2021. An assessment of urbanization sustainability in China between 1990 and 2015 using land use efficiency indicators. *npj Urban Sustainability*, 1, 34 (2021). DOI: <https://doi.org/10.1038/s42949-021-00032-y>
 - 6) Firozjaei, M.K., **Weng, Q.***, Zhao, C., Kiavarz, M., Lu, L. and S.K. Alavipanah. 2020. Surface anthropogenic heat islands in six megacities: an assessment based on a triple-source surface energy balance model, *Remote Sensing of Environment*, 242(6), 111751. DOI: <https://doi.org/10.1016/j.rse.2020.111751>
 - 7) Zheng, Y. and **Q. Weng.*** 2019. Modeling the effect of climate change on building energy demand in Los Angeles County by using a GIS-based high spatial- and temporal-resolution approach, *Energy*, 176, 641-655. DOI: <https://doi.org/10.1016/j.energy.2019.04.052>
 - 8) Xie, Y., **Weng, Q.** and P. Fu. 2019. Temporal variations of artificial nighttime lights and their implications for urbanization in the conterminous United States, 2013-2017, *Remote Sensing of Environment*, 225, 160-174. DOI: <https://doi.org/10.1016/j.rse.2019.03.008>
 - 9) Chen, G., **Weng, Q.**, Hay, G.J. and Y. He. 2018. Geographic Object-based Image Analysis (GEOBIA): Emerging trends and future opportunities, *GIScience & Remote Sensing*, 55(2), 159-182. DOI: <https://doi.org/10.1080/15481603.2018.1426092>
 - 10) Fu, P. and **Q. Weng***. 2016. A time series analysis of urbanization induced land use and land cover change and its impact on land surface temperature with Landsat imagery, *Remote Sensing of Environment*, 175(4), 205-214. DOI: <https://doi.org/10.1016/j.rse.2015.12.040>
 - 11) **Weng, Q.***, Fu, P. and F. Gao. 2014. Generating daily land surface temperature at Landsat resolution by fusing Landsat and MODIS data. *Remote Sensing of Environment*, 145, 55-67. DOI: <https://doi.org/10.1016/j.rse.2014.02.003>
 - 12) **Weng, Q.** 2012. Remote sensing of impervious surfaces in the urban areas: requirements, methods, and trends. *Remote Sensing of Environment*, 117(2), 34-49. DOI: <https://doi.org/10.1016/j.rse.2011.02.030>
 - 13) **Weng, Q.** 2009. Thermal infrared remote sensing for urban climate and environmental studies: methods, applications, and trends. *ISPRS Journal of Photogrammetry and Remote Sensing*, 64(4), 335-344. DOI: <https://doi.org/10.1016/j.isprsjprs.2009.03.007>
 - 14) Lu, D. and **Q. Weng.** 2007. A survey of image classification methods and techniques for improving classification performance. *International Journal of Remote Sensing*, 28(5), 823-870. DOI: <https://doi.org/10.1080/01431160600746456>
 - 15) **Weng, Q.***, Lu, D. and J. Schubring. 2004. Estimation of land surface temperature-vegetation abundance relationship for urban heat island studies. *Remote Sensing of Environment*, 89(4), 467-483. DOI: <https://doi.org/10.1016/j.rse.2003.11.005>
 - 16) **Weng, Q.** 2002. Land use change analysis in the Zhujiang Delta of China using satellite remote sensing, GIS, and stochastic modeling. *Journal of Environmental Management*, 64(3), 273-284. DOI: <https://doi.org/10.1006/jema.2001.0509>
 - 17) **Weng, Q.** 2001. A remote sensing-GIS evaluation of urban expansion and its impact on surface temperature in the Zhujiang Delta, China. *International Journal of Remote Sensing*, 22(10), 1999-2014. DOI: <https://doi.org/10.1080/713860788>