Solstice: An Electronic Journal of Geography and Mathematics
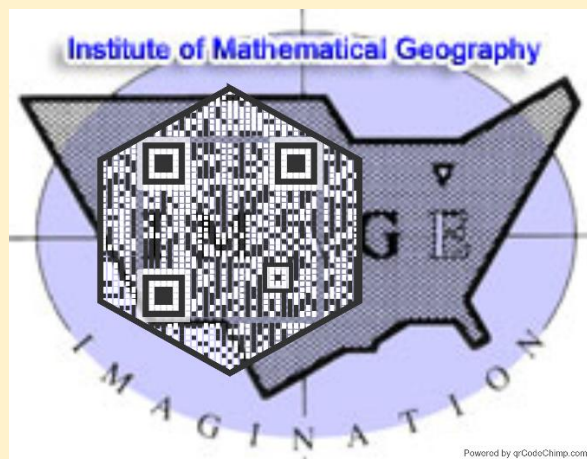
Volume XXXIII Number 2

December 21, 2022

University Record article

Scan to: *Money Magazine* article

CONGRATULATIONS TO **THE UNIVERSITY OF MICHIGAN!**

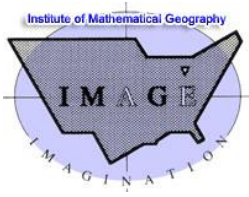RANKED NUMBER 1 COLLEGE, FOR VALUE, IN AMERICA

MONEY MAGAZINE, 2022.

Institute of Mathematical Geography

IMAGINATION

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SOLSTICE:

An Electronic Journal of Geography and Mathematics

33 YEARS OF PUBLICATION!

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Cite articles as: Author name(s), Year. Title of article, *Solstice: An Electronic Journal of Geography and Mathematics*, Vol. YY, No. ZZ. Ann Arbor: Institute of Mathematical Geography.

Virtual reality of The University of Michigan "Diag", below. Note the observatory dome atop Angell Hall, in the foreground.
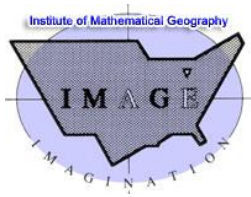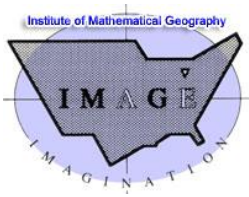
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Frontmatter

Solstice was born digital in 1990, before the advent of the Internet. Early volumes were typeset using the digital typesetting language, TeX. The digital files were sent to subscribers via email and the receiver printed out the TeX code, if desired, to produce a typeset-quality journal, on-demand. Selected monographs in the IMaGe Monograph series contain typeset versions of *Solstice*, printed from the code transmitted as the original version of that issue of *Solstice*. Later, when the Internet became available, *Solstice* switched to the Internet as the platform for transmission, writing documents in html rather than TeX.

Early in *Solstice's* production history, some authors worried that their electronic files could be maliciously altered by random readers and uploaded to replace their own writings. Of course, that could not have happened (because everything was passworded). However, as reassurance to prospective authors not yet familiar with the mechanics of servers and such, early documents were edited to introduce deliberate errors in spacing, inserted by hand, that a random word-processed document would fail to automatically duplicate. Hence, a bogus copy could be detected simply by overlaying a 'new' printout on the 'old' printout on a light table. The hand-insertion of erroneous spaces motivated the oriental rug motif, photographed from a Bokhara rug from the 1964 New York City World's Fair; that symbol is carried forward (although the practice itself is not) in *Solstice* today, as a subtle reminder of one element of the journal's history.

Over the years, *Solstice* has gained media attention from a variety of sectors: from *Science* (AAAS) and *Science News* early on. A bit later with interaction with a museum, the Exploratorium (San Francisco), and the TV show, *Nova*. For all these notices, as well as for those in more conventional academic arenas, our primary thanks go to our contributors, volunteers, and readers who have been with us for so many years. Best wishes to all!
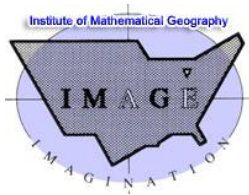
Founder and Editor-in-Chief: Sandra Lach Arlinghaus. Contact for article, note, or comment submission information: sarhaus@umich.edu

Persistent URL, University of Michigan Deep Blue Archive (housed under 'Communities & Collections', 'Mathematical Geography (Institute of)': **http://deepblue.lib.umich.edu/handle/2027.42/58219**

AUTHORS OF ORIGINAL MATERIALS APPEARING IN SOLSTICE, 1990-present:
Ainslie, V. | Albert, D. | Ard, K. | Arlinghaus, D. E. | Arlinghaus, S. L. | Arlinghaus, W. C. | Arlinghaus, W. E. | Austin, R. F. | Baird, N. D. | Bandyopadhyay, G. | Barmore, F. E. | Barr, D. | Batty, M. | Beal, F. J. | Beier, K.-P. | Bhatia, S. S. | Blake, B. | Borgers, A. W. J. | Burkhalter, B. R. | Chattopadhyay, S. | Chaudhuri, S. | Childers, P. E. | Chirapiwat, T. | Crane, J. | Crawford, T. C. | De la Sierra, R. | Derudder, B. | Dison, A. C. | Drake, W. D. | Eagle, K. A. | Earl, E. | Emas, T. | Favro, R. | Frank, A. I. | Gober, C. | Glunz, B. | Goodman, F. L. | Gorstein, J. | Griffith, D. A. | Haidar, S. | Hall, B. | Hall, D.| Hamilton, R. C. | Han, S.-H. | Harary, F. | Haug, R. | Haynes, D. | Hoffman, L. L. | Hogh, G. | Iyer, S. D. | Jacobs, D. A. | Johnson, S. S. | Kaur, K. | Kelbaugh, D. S. | Kerski, J. | Kim, E-Y. | Koenig, R. | Kos, S. | Kwon, T. | Lach, A. | Lane, J. D. | Larimore, A. E. | Laug, A. | Lazzaro, A. A. | Lee, H. | Licate, J. A. | Lindemann, W. | Maeda, J. | Martin, P. | Mayer, J. D. | McCloskey, J. C. | Metzler, D. | Mokray, G. | Moore, K. | Muhilal | Naud, M. | Noguchi, M. | Nystuen, J. A. | Nystuen, J. D. | Onstott, B. | Oppenheim, P. J. | Oswalt, K. S. | Pak, S. | Phillips, L. R. | Pogany, T. | Ponce de Leon, J. S. | Pothukuchi, K. | Purvis, E. M. | Ram, B. | Rayle, R. | Robinson, Craig | Rosenblum, A. | Ross, S. | Rushing, D. | Ryznar, R. | Sammataro, D. | Schlossberg, M. | Schumann, L. | Stern, H. L. | Stuckman, P. | Tarwotjo, I. | Tilden, R. | Timmermans, H. J. P. | Tobler, W. R. | Van Acker, V. | Wagner, T. | Wallace, R. | Walton, A. | Ward, M. | Wilson, M. L. | Wilson, S. | Witlox, F. J. A. | Woldenberg, M. J. | Zander, R. H.
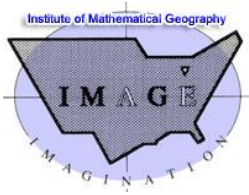
In Memoriam, 2022

In 2022, *Solstice* lost two of its original board members; first John Nystuen, followed shortly thereafter by Bob Austin. It was a sad summer for *Solstice* as two of its dearest friends and supporters passed on. Their extensive contributions, memories, and friendships remain treasured memories; their lasting professional imprint remains in the persistent archive of the Institute of Mathematical Geography housed in Deep Blue at The University of Michigan Library (and elsewhere), and their lasting personal imprint remains in the minds and hearts of their extensive networks of colleagues and friends.

In the memorials that follow, the family has submitted memorial materials; there is some work also contributed by the Editor. Greatest thanks to Gwen L. Nystuen and Leslie Nystuen (wife and daughter, respectively of John) for their extensive efforts during their ongoing difficult period during the latter times in John's life. And heartfelt thanks to Michelle Austin (Bob's wife) for her sympathetic picture of the sudden end to Bob's life. May peace be with you all, now and in the future.

Sandra L. Arlinghaus
Meridian, MS
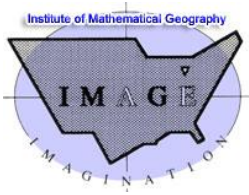
John David Nystuen

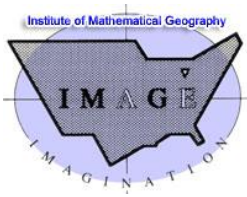Professor John D. Nystuen, Ph.D., 91, of Ann Arbor Michigan, passed away on July 2, 2022 at his long-time home on Olivia Avenue in Ann Arbor. The family wants you to know that John enjoyed seeing family and friends despite short-term memory loss and the chronic heart failure that caused his death. John was born on January 7, 1931, in Northfield Minnesota to Mary Elizabeth (Cooey) Nystuen and Oscar Nystuen. The family moved to Oroville, California when he was 11. After graduating from Oroville High School in 1948 he moved to Berkeley and the University of California, completing a Bachelor of Arts degree in Geography in 1953. Immediately after graduating, he finished ROTC training as a Second Lieutenant in the Army Artillery, serving two years at Misawa Airbase in Northern Japan. In 1955 he earned a Master's degree and Doctorate in Geography from the University of Washington in Seattle.

John's professional career began in 1959 at the University of Michigan in Ann Arbor in the Department of Geography, and later he worked in the Taubman College of Architecture and Urban Planning. John educated a world of doctoral students. He was the chair for more than 70 PhD students from around the globe. Many of his students comment on how much they learned from him and how supportive and caring they found him to be in their intellectual development. Indeed, Gwen notes how John often said that he had learned a lot from his students, as well. He was a master of the one-on-one educational experience. He implemented his belief in interactive educational interchange long before it became fashionable.

John was a leader not only in the mentoring arena but also in the research arena. As one of the first 'space cadets' in the quantitative revolution in geography, originated at the University of Washington in Seattle, John retained a lifelong curiosity not only about traditional geographic inquiry but also about the role of the geographer in studying evolving dynamical systems as applied both on the Earth and in the heavens above. How remarkable it was for Gwen to find, shortly after her 'space cadet' husband's death, that the latest issue of Scientific America was open on his desk to a beautiful photograph of the latest information on the universe.

He published numerous books and articles with citations available in major citation indexing services. Many of his publications are archived in Deep Blue, the online persistent digital repository of The
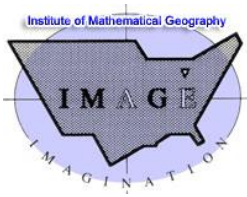
University of Michigan. He served in advisory capacities on academic boards specific to mathematical geography (first on that of the Michigan Interuniversity Community of Mathematical Geographers and subsequently on that of the Institute of Mathematical Geography).

On the side, John was an outstanding photographer and excelled in all activities that involved his keen sense of spatial relations: from framing a photograph to training a dog to catch a frisbee. He offered valued commentary and advice to a wide range of governmental and municipal authorities, implementing his belief in strong interaction between the real world and the academic. He was on the Board and a consulting member of Community Systems Foundation in evaluating programs to improve quality of life, particularly for mothers and children in communities around the world.

In the early 1960s John and Gwen met with the seven Sierra Club members who lived in Ann Arbor (out of the 40 who lived in Michigan). They began meeting regularly, going on outings, and working on conservation issues. John was active in recruiting students and faculty from his and related departments. By 1967 they had a large enough membership to become a local Sierra Club group and ultimately formed the state chapter in Michigan. Over the succeeding years, John continued his work on local and state issues – contributing to our local Natural Features Inventory and supporting Gwen in an amphibian survey in local ponds. John also contributed his photography and sketching skills to many local conservation efforts.

John was athletic; football was his favorite sport. He played halfback on the varsity in high school and in college for the Golden Bears coached by Pappy Waldorf. That team went to the Rose Bowl two seasons, losing against Ohio State and then University of Michigan, which he never forgot. He went to every game and watched every play, able to tell which player missed a tackle, or how the play unfolded. At age 90 he attended his last Michigan game with great pleasure when the 2021 season ended with Michigan trouncing Ohio State 42-17.

Besides a desire to travel, John and Gwen shared a fondness for nature, and a weakness for pets. The variety included many cats, two owls, fish, a chameleon, a tortoise, and frogs and toads, and also including vacation care of a parakeet and a skunk. For many years John and Gwen volunteered for nighttime amphibian surveys. Most of all they took care of a series of much beloved dogs.

John leaves behind a legion of close friends, all of whom remember the extraordinary holiday celebrations chez Nystuen in their craftsman, frog-green home on Olivia Avenue. If their dining room table could talk, what stories it would have of fabulous dinner parties, with Gwen bringing out a seemingly non-ending string of international dishes while John tended to carving a joint and ensuring that all had an ample supply of fine wine. Whether they entertained their friends from the 'Grand Crew' wine-tasting group, or deliberated over a friendly meal with academic colleagues from universities across the area and around the world, or celebrated a close-knit family/friends New Year's eve party, one could always be certain that a uniquely memorable time was had by all.

John is survived by his wife of 67 years, Gwen Nystuen, and their daughter, Dr. Leslie Ann Nystuen, M.D. [Peter Leopold], sister-in-law Gaile Hoffman [Augustus] of Oakland, California, and nieces and nephews in California, Washington, New Mexico, Canada and Australia. John was predeceased (2020) by their son, Dr.

Jeffrey A. Nystuen, Ph.D., of the University of Washington in Seattle, Applied
Physics Laboratory, and sisters, Patricia Jean Nystuen Harlow, [Frank], 2022, age
94, of Los Alamos NM; and by Carol Ann Nystuen Ivie, 2005, age 76, Woodside CA; and niece, Carol Harlow Muiznieks, 2014, Australia.

> *To see a World in a Grain of Sand*
> *And a Heaven in a Wild Flower*
> *Hold Infinity in the palm of your hand*
> *And Eternity in an Hour*
>
> *William Blake, Auguries of Innocence, 1803.*

If you wish to memorialize the life of John D. Nystuen with a gift, please consider making a thoughtful contribution in his name to a charity of your choice.

Robert F. Austin

Robert F. Austin (Bob), Ph.D., GISP, age 72, of Clearwater, Florida and Asheville, North Carolina passed away on August 14, 2022 after sustaining critical injuries in an accident.

Bob was born on May 17, 1950 to Margaret Louise (Hammond) Austin and Robert O. Austin in Petoskey, Michigan. He graduated from Southfield High in 1968 where he lettered in basketball and tennis and then attended the University of Michigan in Ann Arbor on an academic scholarship. He earned his Bachelor of Arts and Master of Arts degrees while studying Geography and Southeast Asian Studies. He also studied Thai and learned to speak it quite well, thanks to regular practice with a group of his students from Thailand. Upon graduation he was admitted to the doctoral program and spent a year abroad in the United Kingdom, Brunei, Malaysia, Thailand and Singapore conducting research for his dissertation. He received his Ph.D. in Geography from the University of Michigan at the age of 27.

After leaving Michigan, he continued in academia at the University of Missouri where he was an Assistant Professor and Chair of the Geography department. While at Missouri, he received a Fulbright Fellowship and spent a year lecturing and teaching at Oxford Polytechnic in England. In 1984 Bob left academia to pursue advancing technological opportunities in the private sector; he took his first position in that arena with Chicago Aerial Survey (later Geonex) where he was like a kid in a candy shop with all the computer and photogrammetry equipment on site. He applied his past experience working in the field for telephone companies during summers while in college, along with his knowledge of computer mapping and database management systems, to develop large projects and training programs for telephone and other utility companies converting their archives of paper maps and records to digital format.

Bob worked as a consultant in the telephone and engineering industries nationally and internationally and had long term assignments in Russia and Malaysia. He also never lost his love of teaching and designed and taught training seminars as President of Austin Communications Education Services (ACES), a consulting company started by his father. Over the years, he taught courses and/or lectured at several universities including Virginia Tech, University of Tampa and Delta State. Having experienced careers in both the academic and
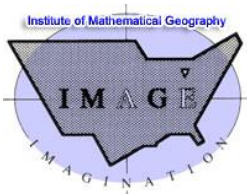
private sectors, Bob spent his last years of employment in public service with the City of Tampa in the Department of Technology and Innovation where he was the Enterprise Applications Integration Manager.

Always excited about learning more and sharing the many ways he envisioned GIS benefitting the world, Bob greatly enjoyed collaborating with other scholars and colleagues in several professional organizations. He was an active member of AM/FM International (later GITA) where he was a regular presenter at conferences and assumed the roles of conference Chair and President. He also had the great privilege of serving as a Member and Chair of the National Geospatial Advisory Committee which is a Secretary of State appointment. Bob was quite dedicated to the use of geospatial to save lives and property. In 2016 he travelled to Vietnam as a subject matter expert for UN-SPIDER (United Nations Platform for Space-based Information for Disaster Management and Emergency Response).

In addition to his many published papers, monographs and book chapters, Bob was a regular contributor and served on the editorial board of Solstice: An Electronic Journal of Geography and Mathematics. After retiring he continued to write and co-published a textbook on GIS for Critical Infrastructure Protection. He also published The Big Cabbage: A Memoir of Life in Russia in the 1990s. At the time of his passing he was working on a book of historical fiction set primarily in Barbados and the American colonies in the 18 th century.

Like most geographers, Bob had a great love of travel and was happiest when he could take his family along even when, for him, they often were working vacations. He and his wife, Michelle, accomplished their goal of visiting every continent with a trip to Antarctica in 2014. His daughters, Alexandra and Lisa, were also along for many of their excursions and whether they were digging for thunder eggs in Australia, playing with orangutans on Borneo or exploring museums in Cairo he enthusiastically took on the role of tour guide. Just last summer Bob and Michelle took their grandchildren to the U.S. Space and Rocket Center in Huntsville, Alabama. Bob enjoyed all of the arts, but one of his greatest passions was music. He was a big fan of the folk, blues-based and psychedelic rock music introduced in his youth, but never stopped
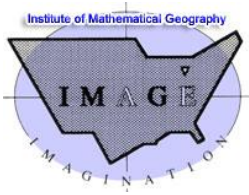
seeking out and discovering new sounds. Even in his later years, he and Michelle regularly attended concerts where he was often at least one generation older than the other audience members and was greatly amused when it was assumed he was related to the band. Other hobbies and subjects of interest included linguistics, archeology, oenology, cooking, science fiction and humor. He started every day reading the funnies and was everyone's favorite partner in Trivial Pursuit.

Bob was an only child but was adored by Michelle's mother and sisters as the son and brother they never had. He loved hosting holiday gatherings and delighted everyone with his inspired cooking and humorous tales. He was preceded in death by both of his parents, his mother in law, Tina Poppleton, and his nephew, Andrew Schnitker. He leaves behind his wife, Michelle, daughters Alexandra Austin and Lisa Gillespie and was an adoring "PawPaw" to grandchildren Benjamin and Molly Gillespie. He will also be missed by his sisters-in-law Melinda Schnitker [Chuck], Nancy Keenan [Andy] and Carole Schrading [Walt] as well as by nephews Logan Schnitker, Noah Keenan and niece, Allison Keenan.
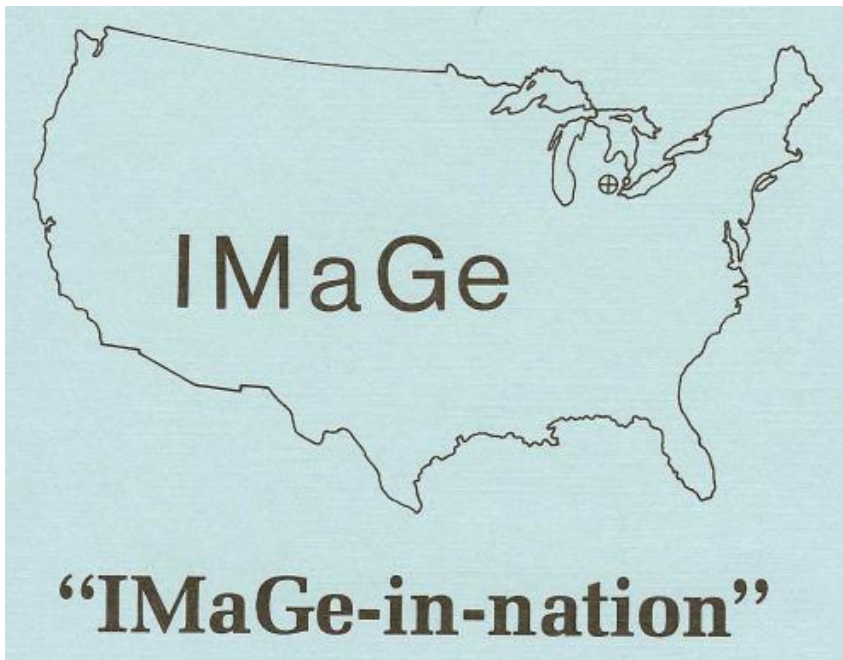
Plans are being developed to honor Bob's life with a scholarship. But any gesture that lends a helping hand to someone in need in Bob's memory would be appreciated.
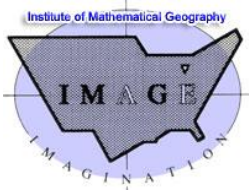
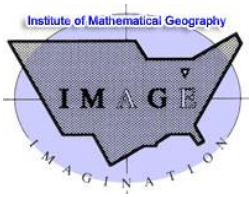# Logo Evolution: Institute of Mathematical Geography (IMaGe)

Sandra L. Arlinghaus

1985: Founding IMaGe logo (created and drawn by Sandra L. Arlinghaus (SLA). India Ink was used on vellum, using a Goode's base map (University of Chicago series) to create a large map which was then photographically reduced. Rapidograph pens were used to do the inking. The lettering was done using Zip-A-Tone transfer lettering. The circle representing Ann Arbor was done with a template and India Ink, and the target inside the circle was also drawn the India Ink and employed a T-square and right triangle to ensure orthogonal line segments. From 1985 to 1987, this logo in black and white, served as letterhead on stationery and as the image on for the IMaGe Monograph series.
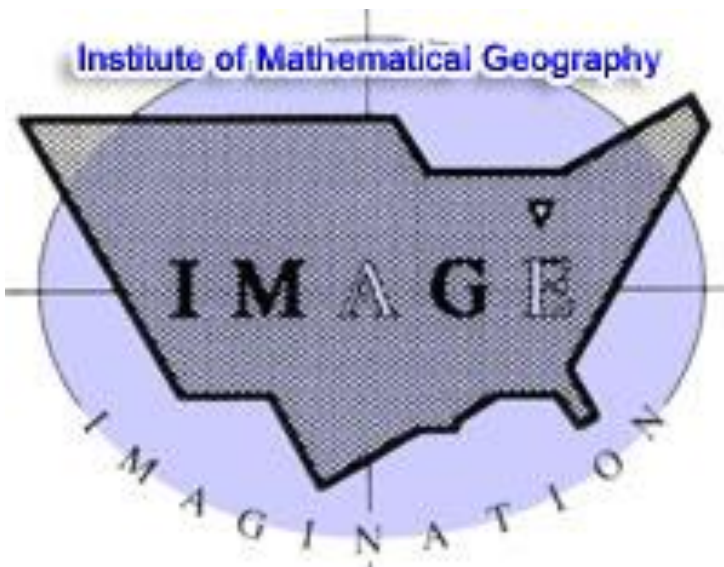
1987: Allen K. Philbrick (AKP) offered to update and stylize the logo from 1987. His original design was done in black and white, and served, directly as he created and drew it, as the image on letterhead from 1987 forward. SLA modified it in numerous simple ways to serve as an official mark for various IMaGe publications. The modification shown here was the one she made for the IMaGe Monographs from 1987 forward. It has served IMaGe very well for 35 years; greatest appreciation goes to Professors Philbrick and Bjorklund.
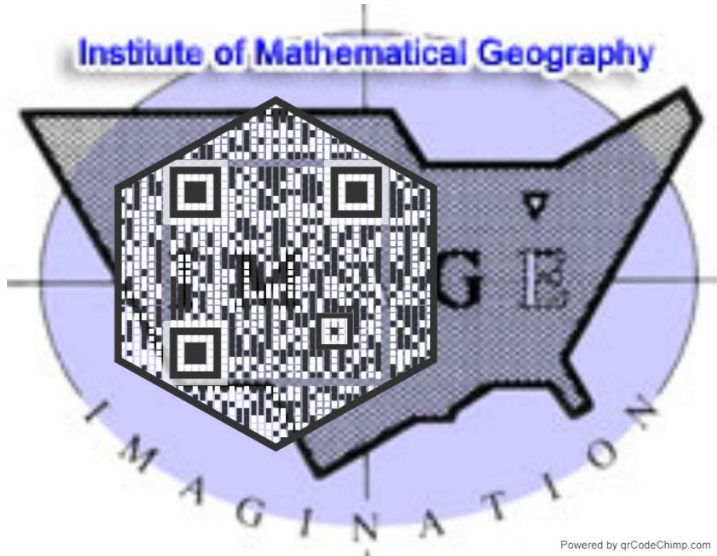
2022: SLA modified the earlier design to reflect contemporary modes of communication. The hexagonal QR code shown here links to the IMaGe Deep Blue archive at The University of Michigan. Of particular importance is that this QR code is 'dynamic'. If the URL changes in the future, this QR code will route the scan to the new server location, thus affording IMaGe yet another form of archival perpetuity. The QR code is powered by QRcodeChimp and analytics regarding geographic information of scan initiation/hits is housed in an account on a dashboard on their server

Sequential Connections: Geography to Mathematics and Back Again

Sandra L. Arlinghaus

Basics: Maps to Math and Back

Millions of maps are different from each other; yet, those millions will contain many common elements. Sets of basic map elements are abundant on the Internet and in cartography and other textbooks. Some of the elements often listed include:

- The main body, the actual content of the map
- Title
- Legend
- Scale
- Orientation
- Neatline or boundary outlining the edge of the map
- Reference systems, such as laltitude and longitude
- Inset map
- Source notes
- Projection and related information

These are a set of basic bones on which to layer spatial information which will yield a useful finished map, either using digital or manual graphic techniques. A map, however, is drawn in the plane; thus, geometry is involved. Euclidean geometry is also clearly structured on the basis of fundamental ideas. To forge strong mathematical geography structure, the material below identifies intervening background concepts that lead from maps to math (and back).

- Sequence 1:
  - GEO. Main body of the map: the Universe of Discourse
  - MATH: The Universe of Discourse: Set Theory

33nd year (1990-2022) of publication of *Solstice:*
An Electronic Journal of Geography and Mathematics
Volume XXXIII, Number 2;
Wednesday, December 21, 2022; 3:47 pm, Central Time
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Institute of Mathematical Geography and the authors.

- Sequence 2:

    - GEO: Inset Map: A Map within a Map

    - MATH: A Map within a Map: Subsets

- Sequence 3:

    - GEO: Legend: Layers and Organization

    - MATH: Layers and Organization: Order of Operations and Parentheses

- Sequence 4:

    - GEO: Orientation: Rotational Location

    - MATH: Rotational Location: Trigonometry

- Sequence 5:

    - GEO: Reference System: Grids

    - MATH: Grids: Graphing

Bivariate Thematic Mapping and Venn Diagrams

Using such sequences as mental benchmarks may facilitate clarity in understanding complicated-looking subjects. For example, a bivariate thematic map can be a powerful display of spatial data; it can also be a bit daunting to grasp. If one wishes to visualize the USA, by county, with the counties shaded according to predominance of Black or Hispanic population, a bivariate thematic map can be useful. There are two variables: "Black" and "Hispanic". Imagine that the data set for "Black" is shaded in various intensities of blue, in four intervals, depending on the density of that population within a given county. Imagine that the data set for "Hispanic" is shaded similarly in various intensities of red. Counties which have measurable populations of each variable will be shaded in purple (blue mixed with red). So, there will be sixteen different colors possible for each county, displayed in a legend in a four-by-four matrix with four intensities of blue along one axis and four
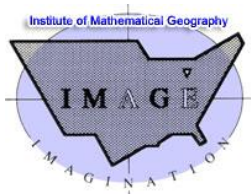
intensities of red along an intersecting (possibly orthogonal) axis, and eight interstitial cells shaded in various shades and intensities of red-violet, violet, and blue-violet (depending on domination of one variable over the other). While the main body of this map is complicated, the underlying concept is not. It is simply a set of Venn diagrams, from set theory, with blue and red as the two variables and set intersections generating varying shades of purple/violet depending on the intensity of the shading. When that is clearly understood, creating bivariate thematic maps becomes easy to do; and, perhaps even more to the point, so does explaining them clearly enough to teach students about both mapping and set theory.
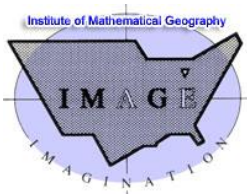
Teaching Mathematics

Anyone who has taught mathematics to post-covid pandemic students (who may not be particularly interested in mathematics) will immediately see the value of an approach that integrates mathematical ideas with other ideas. As universal as such an approach is with all students, it has unique power with this unusual group that will, over the next decade, be moving through all levels of academics and may need special help in picking up missed or neglected topics from the highly linear curriculum of mathematics.

In a forthcoming book, co-authored with Joseph Kerski and William C. Arlinghaus, we will explore the power of this sort of interactive approach in various contexts. In the meantime, until it is published, please consider these few sequences offered here, along with a single example, as tidbits to tantalize your imagination and prompt you to think of your own sequences and examples—and feel free to submit them to *Solstice* for possible inclusion at a later date!

Reference.

Arlinghaus, S. L.; Kerski, J. J.; and, Arlinghaus, W. C. 2023 (forthcoming). *Teaching Mathematics Using Interactive Mapping*. Boca Raton: CRC Press.

# QR-graphs: Codes and Nodes, Places and Spaces

Sandra L. Arlinghaus*

Introduction

QR codes offer a now-familiar way to link a static paper image to a server using a smart phone camera: a truly remarkable way to breathe digital life into an otherwise static piece of paper. As exciting as that concept is, one has to imagine that over the past decade or more, other conceptual capabilities are also feeding into the unique QR world. A few such examples are considered here with hints for other directions.

Many of the models of classical mathematical geography may be represented in a graphical manner with places represented as dots, or nodes, of no geometric dimension and having no character or culture of their own (within the model context). Classical central place theory, for example, represents places as dots and focuses on how these city-dots, or village-dots, create varying patterns of interstitial space to share with each other. Some patterns might emphasize marketing, others transportation, and yet others administration. Yet, such complicated human structures are based in far more than distances among competing centers; the nature of the activities within associated competing areas surely influences pattern, as well. One simple way to integrate as much basic complexity as desired into the model, without sacrificing model simplicity and clarity, might be to represent the points as QR codes where those QR codes link to a plethora of cultural information about the city-dots. Hence, the QR *code* transforms the dimensionless geometric dot into a richly endowed QR *node* and its associated flat *place* into a human *space*.

Fitness Smartphone Apps

One sees hints of this sort of approach in a variety of contexts. For example, a smartphone app, called Argus, can be used to monitor fitness and health factors of various sorts. Different measures are summarized by a tiled pattern of hexagons, each linked to individual health measures: number of steps taken, weight, heart rate, and so forth. Some link directly to measures monitored by software
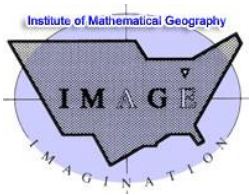
carried by the wearer, while others link to data entered manually by the user. All are presented together in the display to offer a general picture of fitness. It is, however, the manually entered data sets that really suggest guidance for the future as one imagines that someday all the manual data of today will be auto-data of tomorrow, along with a host of other measures perhaps as yet unimagined.

Pacemaker Recycling: Project My Heart, Your Heart

Link to the Project My Heart, Your Heart home page to read about this important and fascinating project, led by Dr. Kim Eagle and Dr. Thomas Crawford of The University of Michigan Frankel Cardiovascular Center (Figure 1). The project goal is to save, possibly millions, of lives in developing nations in populations that have no access, otherwise, to cardiac relief that a pacemaker could bring. The project provides refurbished used pacemakers (from deceased Americans) and training of local medical staff to implement the project.

Figure 1. Left: Project My Heart Your Heart logo, reprinted with permission of Director Thomas Crawford of Project My Heart, Your Heart, from http://www.myheartyourheart.org/. Right: QR code linking to My Heart Your Heart persistent space in Deep Blue, retrieved from https://deepblue.lib.umich.edu/handle/2027.42/109408
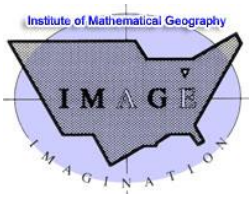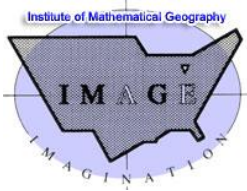
My Heart, Your Heart is an altruistic project that has been chronicled in scholarly publications as well as in mass media at the international level. QR codes can help with keeping track of publications, but one problem noted in employing static QR codes to do so is that the collection is constantly changing. One solution is to have QR codes link to indexing pages that do not change but which could have new links added to them (observations derivative of earlier work, summarized in 2019 in Arlinghaus, Kerski, Larimore, and Naud, 2019). The indexing pages were then stored in Deep Blue, the persistent digital archive of The University of Michigan. The QR code in Figure 1 provides a direct link from print to that archive.   Please follow the QR archive (**QRchive**), of the next section, about this project to save millions of lives around the world!

Index Pages Form a QRchive.

Figure 2 displays a QRchive for Project My Heart Your Heart.   QR codes are inserted, one for each year in the study to an index page in Deep Blue listing My Heart, Your Heart publications for the year. Scan the QR code with a smart phone camera or with a free application to read these two-dimensional bar codes and get taken directly to the appropriate index page within Deep Blue. The use of intervening index pages makes it possible to keep the QR archive fresh; new work can be added without requiring any changes to existing static QR codes.
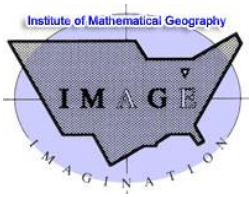
QRchive for Project My Heart, Your Heart; First Decade

QR	Year	Items	Authors
	2009	5 items	Abelardo NS, Baman TS, Eagle KA, Goldman EB, Grezlik R, Kirkpatrick JN, Lange DC, Oral H, Romero A, Romero J, Samson G, Sison EO, Tangco RV.
	2010	2 items	Abelardo NS, Baman TS, Caplan AL, Eagle KA, Fuller K, Gakenheimer L, Goldman EB, Kemp SR, Kota K, Kirkpatrick JN, Lange DC, Machado CE, Morgenstern K, Nosowsky R, Oral H, Papini C, Romero A, Romero J, Samson G, Sison EO, Sovitch P, Tangco RV, Verdino RJ.

33nd year (1990-2022) of publication of *Solstice:*
An Electronic Journal of Geography and Mathematics
Volume XXXIII, Number 2;
Wednesday, December 21, 2022; 3:47 pm, Central Time
Copyright ©2022-- All rights reserved.
Institute of Mathematical Geography and the authors.

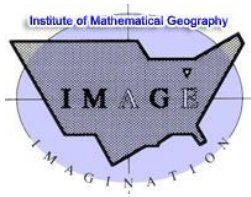|			
	2011	7 items	Aragam KG, Arlinghaus, SL, **Baman TS**, Brown AC, **Crawford TC**, Duarte C, **Eagle KA**, Feldman D, Gakenheimer L, Ghanbari H, Goldman EB, Hasan R, Kirkpatrick JN, Lange DC, Machado C, Meier P, Menesses D, Oral H, Rivas D, Romero J, Sovitch P, Zakhem NC.
	2012	2 items	Arlinghaus, FH Jr., **Baman TS**, **Crawford TC**, **Eagle KA**, Gakenheimer L, Goldman EB, Goold SD, Kirkpatrick JN, Meier P, Oral H, Samson G, Sovitch N, Sovitch P, VanArtsdalen J, Wasserman B.
	2013	1 item	Barrera F, Brugada J, Colín L, Gómez J, Iturralde P, Márquez MF, Morales JL, Nava S.
	2014	5 items	Arlinghaus SL, **Baman TS**, **Crawford TC**, Desai N, **Eagle KA**, Gakenheimer L, Hagan L, Hughey AB, Kirkpatrick JN, Montgomery D, Oral H, Romero J, Smith CA.
	2015	0 items	
	2016	0 items	
	2017	3 items	Allmendinger C, Alyeshmerni D, Arlinghaus SL, **Baman TS**, Brown A, Carrigan T, **Crawford TC**, Davis S, **Eagle KA**, Emanuel EJ, Goldman E, Hughey A, Klugman N, Kune D, Lautenbach D, Lavan B, Newman C, Oral H, Persad GC, Samson G, Snell J, Sovitch N, Sovitch P, Tandon K, Wasserman B, Weatherwax K.
	2018	3 items	Arlinghaus SL, Crane J, Crawford TC, Deering TF, Eagle KA, Haynes D, Marine JE, Pavri BB, Purvis EM, Sinha SK, Sundaram S, Vlay SC, Ward M.

Figure 2. The QR codes link to index pages of publications, by year. Lists of author names, by year, are arranged in alphabetical order (for convenience in locating an individual) on the index pages.

Dynamic QR Codes

These extra varied QR uses have similarities to each other although not identical to each other or to the original QR code. Their similarity might be captured by viewing them as QR-graphs, in the sense of Graph Theory: as QR nodes with links joining them when there is a connection of some sort. While this idea seems to have power on its own, further thought suggests a severe limitation—what happens when the information to which the QR node links undergoes a significant change? Then the QR-graph is useless; it is out of date. This situation is the standard problem with the static model. With hand-drawn maps, a change in a territorial boundary required us to scrape off the India ink of the old boundary, painstakingly restore the surface of the vellum paper using Pounce or a similar product, and then re-ink the boundary and hope for no smears lest we have to throw the entire map away and start all over again. Enter digital mapping, where boundary changes took place in response to underlying data! Problem solved! Static mapping became dynamic. So too, for the QR-graph to become a truly important tool, it would need a transformation to move from static to dynamic: the index pages of the previous section fulfilled that purpose to some extent but only at the introduction of an extra layer of complexity for the creator.
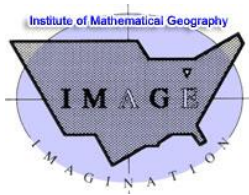
Today, however, with the advent of the ***dynamic*** QR code, the code can be altered to respond to underlying changes in linked server location. Thus, when dynamic QR codes are used as QR nodes, the QR-graph, itself, becomes directly dynamic. This important change is noted in *Solstice* by entering a dynamic hexagonal QR code as part of the IMaGe logo, carried originally in this issue and moved forward to future editions of IMaGe publications, our website, and our digital archive. Print it out and carry it on a business card sized item and you are linked to the full set of IMaGe properties wherever you go, independent of server storage with codes and nodes directing the reader to various places and spaces.

Reference

Arlinghaus, S.; Kerski, J.; Larimore, A.; Naud, M. 2019. *Spatial Thinking in Environmental Contexts*. Boca Raton: CRC Press.

Appendices

Three Novellas by Mitchell J. Rycus

Commentary of Sandra L. Arlinghaus and William C. Arlinghaus

Long-time IMaGe friend and colleague, Mitchell J. Rycus, has an extensive writing career layered over his various professional careers, including as a Professor of Urban Planning at The University of Michigan. Recently, Mitch sent me a copy of his latest book: *Three Novellas: A Death in Detroit*; *Not with a Whimper*; and, *Paperback Writer*. It was a pleasure for me to share, via *Solstice*, Mitch's view of the content of *A Death in Detroit* shortly after it first appea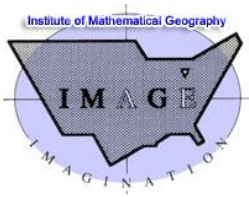red in the Spring of 2021: link to archived pdf in Deep Blue (https://deepblue.lib.umich.edu/bitstream/handle/2027.42/168218/SolsticeVolumeXXXIINumber1Final.pdf?sequence=1&isAllowed=y)

Summaries of the content appear in various locations on the Internet; includinig on Amazon, https://www.amazon.com/Death-Detroit-Mitchell-J-Rycus/dp/B095L6V4P8 where one can also order this material, digital or print copy. One comment from Amazon notes:

> "The master story-teller Mitchell J. Rycus approaches virtuoso status with this novella. Mysteries are often enjoyable because the reader is encouraged to form some theory about how things will turn out. This one requires several radical gear shifts before the final conclusion is reached. Along the way, you will need to brush up your Detroit geography and your Yiddish, but it's well worth the effort, especially with an excellent schlemiel/schlimazel example."

I always like to know what folks think who, in some sense, are primary sources. Thus, I asked William C. Arlinghaus, who grew up in the City of Detroit, at a time overlapping (but a bit later than) when Mitch grew up there, how he found the Novella centered on Detroit of 1946. Bill said that.

> *"A Death in Detroit* gives readers a charming view of post-war Detroit when street cars were still in use. It is a nostalgic and probably autobiographical view of the city in 1946."

I was interested that Bill focused on the street cars, as that dovetailed with my own experience in interacting with Mitch--the urban planner always looking at the broad perspective of how the city, any city, might be organized in relation to its infrastructure. Indeed, the die had been cast early in his life as public transportation clearly became an integral part of Mitch's growing and learning. I recall similar feelings about the public transportation networks, especially the IC, as a child growing up in Chicago and going around the city on my own, mostly from Hyde Park to Downtown Museums, via this safe and interesting form of transit that permeated that city. The 'editor' in me, on the other hand, enjoyed Mitch's playful use of language, from regional English variations in word use and spelling, to non-English insertions as appropriate. From a native Detroiter of an overlapping era to a transplanted Michigander, there were numerous enjoyable elements of this first Novella. Bill notes that *Not With a Whimper*, is a view of a world in the future which may never exist, and that the third Novella is left to tantalize the prospective reader—all to say that like the first novella, the second and third also boast universal, rather than merely regional, appeal!
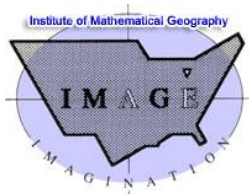
From George Mokray: Geometry Links, November 9, 2022.

3D printed wood that morphs from flat to shaped

https://www.newscientist.com/article/2334808-3d-printed-wood-could-start-flat-then-twist-into-furniture-as-it-dries/

https://www.core77.com/posts/116702/3D-Printing-Wood-That-Morphs-from-Flat-to-Shaped

Video: https://www.youtube.com/watch?v=XHj4Rg8z7LU

Gary Doskas' tetrahelix research lecture series (7 videos)

https://www.youtube.com/playlist?list=PLOqvAAXNHjIilhnFKskpPkbaOTc23MwGi

Cosmati Pavement mosaic floor of the High Altar of Westminster Abbey laid down in 1268

https://www.facebook.com/photo/?fbid=10154664247595337&set=a.401579910336

hat tip Rita Cummings

225 paper bag hats

https://www.kiraod.com/moses/mydadshats.html

Polyhedral perspective from The Polyhedrists: Art and Geometry in the Long Sixteenth Century by Noam Andrews

https://publicdomainreview.org/essay/polyhedral-perspective
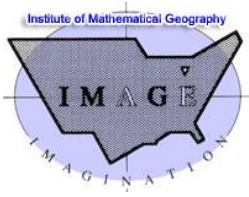
The rippled β-sheet layer configuration—a novel supramolecular architecture based on predictions by Pauling and Corey in 1953

https://pubs.rsc.org/en/content/articlelanding/2022/SC/D2SC02531K

hat tip scitechdaily.com

Sylvia Rucker's geometric quilts

http://www.sylviarucker.com

Editorial Comment: Sylvia Rucker is the wife of mathematician and sf writer Rudy Rucker

Geometric patterns of planets

https://www.cosmic-core.org/free/article-254-geometry-of-the-solar-system-part-1-geometric-patterns-of-planets/

Editorial Comment: May be a little outside for some but the patterns of the planets' orbits in relation to each other are very spirographic, if you remember that toy, and beautiful

Geometry to simulate the moon's gravity

https://twitter.com/Rainmaker1973/status/1584897053770932224

More at   https://buff.ly/3HOAqbT

Geometric tent with advanced materials

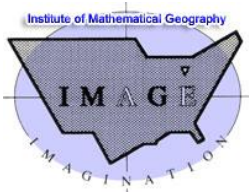https://shiftpod.com/shiftpod/

Scott Albrechts typographical art

https://scottalbrecht.com

https://boingboing.net/2022/11/01/stunning-new-book-of-scott-albrechts-deconstructed-typographical-art-plus-a-gallery-show-in-san-francisco.html
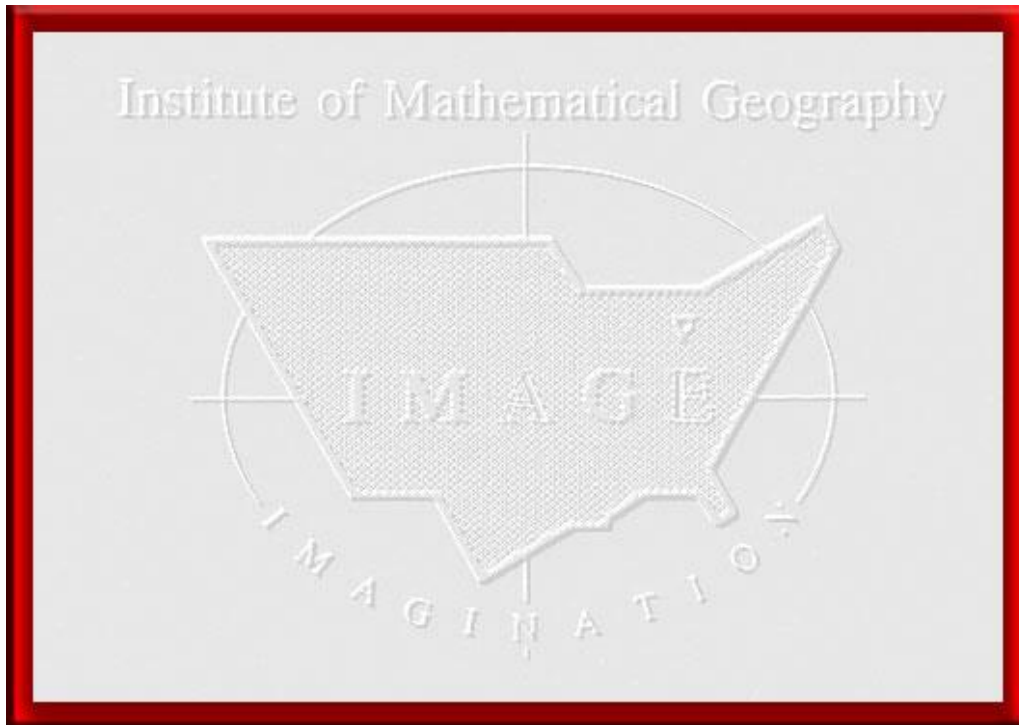
Sacred geometry children's course - a little expensive and too outside for many but may be interesting to some, book coming soon

https://jain108academy.com/sacred-geometry-children-course/

Endmatter

Original logo designed by Sandra L. Arlinghaus and stylized and redrafted by Allen K. Philbrick.

🌍 AWARDS AND SELECTED COMMENTS

- *Solstice* page translated into Belorussian, April, 2016; many thanks to Valerie Bastiaan.
- *Solstice* cover materials translated into Ukranian, August 25, 2011; many thanks to Galina Miklosic.
- *Solstice* was a Pirelli INTERNETional Award Semi-Finalist, 2001 (top 80 out of over 1000 entries worldwide)
- One article in Solstice was a Pirelli INTERNETional Award Semi-Finalist, 2003 (Spatial Synthesis Sampler).
- *American Mathematical Monthly*, September 1992, in Telegraphic Reviews section notes *Solstice* as "one of the world's first electronic journals using TeX." L. A. Steen.
- *Science News*, 25 January, 1992. Article about *Solstice.*
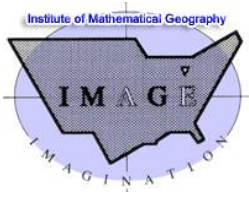
- *Science*, AAAS, 29 November, 1991. Article about *Solstice*.

🌎 LISTINGS IN DIRECTORIES AND DATABASES

- IMaGe is listed as a "Collection" in the persistent online archive, **DeepBlue**, of The University of Michigan library. It is listed under "Mathematical Geography" on the Collections link.
- *Solstice* has been listed in the Directory of Open Access Journals (for its first 28 years) maintained by the University of Lund.
- *Solstice* is listed on the journals section of the website of the American Mathematical Society, **http://www.ams.org/**
- *Solstice* has been listed in the EBSCO database.
- IMaGe has been listed on the website of the Numerical Cartography Lab of The Ohio State University, with thanks to Harold Moellering.
- *Solstice* was listed in Geoscience e-Journals, with thanks to Bruno Granier.

Sandra L. Arlinghaus, celebrated over 30 full years of archived *Solstice* publication in 2020.