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***Geographical Analysis* (GA)**

Technical Style Sheet

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Article elements

RIGHT RUNNING HEAD

Example:

Geographical Analysis

Notes:

- Running head should be in title case.
- Journal title
-

LEFT RUNNING HEAD

Example:

Gudrun Carl and Ingolf Kühn Wavelet-based Extension of Generalized Linear Models

Yuko Aayoma (flush left) B-to-B e-Commerce and Logistics (flush right)

OR

Yuko Aayoma and Halan Lu (flush left) B-to-B e-Commerce and Logistics (flush right)

OR

Yuko Aayoma et al. (flush left) B-to-B e-Commerce and Logistics (flush right)

Notes:

- Short title should be given and it should be in Title Case.
- Give the full author names.
- For two author names ‘and’ should be given between the two names.
- For more than two author names ‘first author and et al.’ should be given.

TITLE

Example:

A Wavelet-based Extension of Generalized Linear Models to Remove the Effect of Spatial Autocorrelation

Modeling the Impact of Business-to-Business Electronic Commerce on the Organization of the Logistics Industry

Notes:

- Should be in Title Case.
- Ragged left and in bold
- Subtitle with the colon and running the subtitle on with the main title.
-

AUTHOR BYLINE

Example:

Gudrun Carl[1,2], Ingolf Kühn[1,2]

Notes:

- Placed below title
- First author names should be full.
- Each author name should be separated by comma.
- Affiliation links should be superscript nos. and it should be given after the comma.
-

AUTHOR AFFILIATION

Example:

[1]UFZ—Helmholtz Centre for Environmental Research, Department Community Ecology (BZF), Theodor-Lieser-Strasse 4, 06120 Halle, Germany, [2]Virtual Institute Macroecology, Theodor-Lieser-Strasse 4, 06120 Halle, Germany

[1]Neural Computing Research Group, Aston University, Birmingham, U.K., [2]Empirical Inference for Machine Learning and Perception Group, Max Planck Institute for Biological Cybernetics, Bonn, Germany, [3]School of Electronics and Computer Science, Southampton University, Southampton, U.K.

Notes:

- Placed below the author group.
- Superscript Nos. should be used for linking affiliations.
- Brief affiliation.

AUTHOR CORRESPONDENCE

Example:

Correspondence: Gudrun Carl, UFZ—Helmholtz Centre for Environmental Research, Department Community Ecology (BZF), Theodor-Lieser-Strasse 4, 06120 Halle, Germany
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Correspondence: Yuko Aoyama, Graduate School of Geography, The George Perkins Marsh Research Institute, Clark University, 950 Main Street, Worcester, MA 0160-1477

e-mail: yaoyama@clarku, edu

Notes:

- The heading should be given as ‘Correspondence:’.
- Followed with author name, em rule and complete affiliation. (The sequence of elements should be as Name, Address (break)e-mail:.)
- E-mail should be in next line.

COPYRIGHT LINE

Example:

Top of title page

Geographical Analysis ISSN 0016-7363

Geographical Analysis **41** (2009) 411–417 © 2009 The Ohio State University **411**

Notes:

- Journal title, bold volume number, year in parenthesis, page range followed by copyright symbol and the text “The Ohio State University” .
-

AUTHOR BIO (IF APPLICABLE)

Example:

Notes:

-
-

ABSTRACT/SUMMARY

Example:

This article outlines the context in geography and statistics in the mid 1960s, at the height of geography's so-called "quantitative revolution," that led us into a long-term collaboration about spatial statistics, which has continued in surges and lulls for some 40 years. We focus upon problems in spatial autocorrelation, including the measurement of autocorrelation, distribution theory, and variable geographical lattices. This narrative may not describe how it was, but it does describe how we remember the

Notes:

- Abstract should be in italics and with out heading.
- In paragraph.
-

KEYWORDS (IF APPLICABLE)

Example:

Notes:

- No Keywords
-

RECEIVED/REVISED/ACCEPTED DATES

Example:

Submitted: June 14, 2007. Revised version accepted: June 5, 2008.

Submitted: August 8, 2003. Revised version accepted: August 3, 2004.

Notes:

- Styled as above.
- History line with the end point.
- Placed on first page bottom as a footnote after the correspondence.
-

LEVEL HEADINGS

Examples:

A head : **Introduction / The logistics industry in the information age**

Introduction

Methods

The quasi-score equation

Notes:

- A head: bold and sentence case.
- B head: bold, sentence case, and slightly smaller point size.
- No numbers should be given for section level headings.
-

LISTS (NOTE WHETHER NUMBERED, BULLETED, OR RUN-ON)

Example:

domly selected susceptible vertex and follows the interacting rules below:

(1) all the vertices are susceptible or vaccinated before the simulation starts;
(2) the infectious vertex can only infect its susceptible connected neighbors with 90% probability;
(3) infected vertices become recovered after a period of infection;
(4) the traced (controlled) vertices will become recovered if they were infected and susceptible if they were susceptible; and
(5) recovered vertices will remain recovered and unable to be infected again for the rest of their life cycle. Fig. 3 depicts schematically the possible change map of the status of a vertex throughout its life cycle.

Our first simulation is an epidemic propagating on the spectrum of networks without applying any intervention strategies. This simulation is also used as a con-

- pure spatial autoregressive model: $y = \rho Wy + \varepsilon$, $\varepsilon \sim N(0, \sigma^2)$,
- spatially lagged model: $y = \rho Wy + X\beta + \varepsilon$, $\varepsilon \sim N(0, \sigma^2)$,
- spatial moving average model: $y = X\beta + \varepsilon$, $\varepsilon = \theta W\varepsilon + \eta$, $\eta \sim N(0, \sigma^2)$, and
- spatially lagged moving average model: $y = \rho Wy + X\beta + \varepsilon$, $\varepsilon = \theta W\varepsilon + \eta$, $\eta \sim N(0, \sigma^2)$,

Notes:

- Numbers should be in parenthesis.
- Take-over lines should be aligned below the first line. (Hanging indent)
- Bulleted lists should be with hanging indent.
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-

EQUATIONS

Example:

$$\mathbf{U} = (\mathbf{P}\mathbf{W}^{1/2}\mathbf{X})' \quad \mathbf{P}\mathbf{A}^{-1/2}(\mathbf{y} - \boldsymbol{\mu})) = \mathbf{0} \tag{1}$$

$$\begin{aligned} F(x, y) = &\sum_{m=1}^{3}\sum_{j=1}^{J}\sum_{k_x,k_y} d^{m}_{j,k_x,k_y}\Psi^{m}_{j,k_x,k_y}(x, y) \\ &+ \sum_{k_x,k_y} s_{J,k_x,k_y}\Phi_{J,k_x,k_y}(x, y) \end{aligned} \tag{5}$$

$$W^* = b \cdot (1_n 1_n' - I_n) = \begin{pmatrix} 0 & b & \cdots & b \\ b & 0 & & \vdots \\ \vdots & & \ddots & b \\ b & \cdots & b & 0 \end{pmatrix} \tag{19}$$

Lemma 4. *For any matrices $A, B \in R^{n\times k}$ of full column rank,*

$$P_A = P_B \Leftrightarrow P_A B = B \tag{42}$$

As shown in Appendix A, this result yields the following key identity between SL models (1) and SE models (36) for the case of maximally connected weight matrices.

Proposition 4. *If $W = W^*$ in models* (1) *and* (36), *then the concentrated likelihood functions L_{sl} and L_{se} are identical for all* $\rho \in [W^*]$.

Proof of Lemma 3: Observe from Lemma 2, together with the symmetry of W^* and M, that for any $\rho \in [W^*]$ and dataset (y, X),

$$\begin{aligned} y'(I_n - \rho W^*)'M(I_n - \rho W^*)y &= y'(I_n - \rho W^*)'(M - \rho M W^*)y \\ &= y'(M - \rho M W^* - \rho W^* M + \rho^2 W^* M W^*)y \\ &= y'(M + \rho b M + \rho b M + \rho^2 b^2 M)y \\ &= (1 + 2\rho b + \rho^2 b^2) \cdot y'My \\ &= (1 + \rho b)^2 \cdot y'My \end{aligned} \tag{A6}$$

Remark:

The proof sketched above also shows (from the persistence of negative slopes) that for strongly connected weight matrices under conditions of *no* spatial dependence, the null hypothesis, $\rho = 0$, will tend to be falsely rejected in favor of *negative* dependencies ($\rho < 0$). Moreover, in cases where such dependencies are actually negative, it is equally clear the strength of these dependencies will tend to be overestimated.

Proof of Lemma 4: **Proof:** Because $P_B B = B$, it follows at once that $P_A = P_B \Rightarrow P_A B = P_B B = B$. Thus, we need only establish the converse. To do so, observe that

$$P_A B = B \;\Rightarrow\; P_A B\,[(B'B)^{-1}B'] = B\,[(B'B)^{-1}B'] \;\Rightarrow\; P_A P_B = P_B \tag{A14}$$

Notes:

- Equations punctuated.
- MLV, follow author; notions, roman.
- Build-ups allowed in text. But case fraction size.
- Differential *d* italic; exponential *e* italics; order O roman; partial ∂ roman; ≥ ≤ straight.
- Greek characters roman.
- Citation—equation (1), equations (1)–(2) etc.
- Equation nos. should be to the right of the equation.
- Equation should be full form in the places of citation in the text.
- For Integral side limits.
- For Summation top and bottom limit in equation and side limit in the inside text.
- Appendix equations should be numbered as A1, A2, A3 etc or it can be in continuous number from the text
- Appendix should be named as Appendix A, Appendix B, etc
-
-
- **Enunciations**
- **Theorem 1** (Rose and Casler 1969)**.** *Theorem text in italic*....... .(follow same style for Lemma, Corollary, Claim, Proposition, Conjecture)
- **Proof.** Proof text in roman......... .Λ
- **Definition 1.**.Definition text in roman............ .(follow same style for Example, Remark)
- **Condition 1.** Text follow author for font......... .(follow same style for Hypothesis).
- Follow author for Fact, Problem, Question, Property.

EXTRACTS

Example:

nized until we received a comment from the editor, which we appreciate. This viewpoint was put forth by Ripley (1990b, pp. 55–56) when he notes:

> . . . point patterns *per se* are becoming less important . . . Spatial point processes have had a golden few years . . . current point processes are being eclipsed by statistical image analysis, and I suspect developments in point processes in the near future will be less prolific.

Ripley (1990a, p. 3) also emphasizes that between 1969 and 1990, ''Over two decades a very satisfactory methodology has been developed'' for spatial auto-regressive models. Much of the research about spatial processes before 1969 had

Notes:

- Should be with above and below a line space
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NOTES/ENDNOTES

Example:

Notes

1 Because of the emergence of Problem-Oriented Policing (Goldstein 1979, 1990; Scott et al. 2008), Situational Crime Prevention (Clarke 1997, 2008), and Crime Mapping (Eck and Weisburd 1995; Weisburd and McEwen 1997) and the literature on crime prevention generally (Sherman et al. 1997).
2 To be clear the review does include studies that specifically deal with spatial autocorrelation and the authors did comment on the lack of consistency in the way that area effects were operationalized or theoretically framed. Even so, the fact that the four major classes of neighborhood mechanisms they identify do not include adjacency underscores the dominance of the ecological tradition.
3 In the simplest case, a square (the census tract) might contain two circles, A and B, centered on a bar and a subway, respectively. Assuming there is an intersection between A and B, such a census tract would have four observations: (i) A without B, (ii) B without A, (iii) A and B, and (iv) neither A nor B.

Notes:

- Should be Online nos. and an N-space should be given after the no.
- The heading ‘Notes’ should be given and placed after ‘Acknowledgements’ and Before ‘References’
-

REFERENCES/WORKS CITED

Example:

Reference in text

Moran (1948) and Krishna Iyer (1949) dealt with join count statistics, whereas Moran (1950) and Geary (1954) considered tests for interval-scaled data using binary weights. Building upon his ground-breaking work in time series, Peter Whittle (1954, 1963) had developed the theory for a spatial autoregressive model on a regular lattice. At that time, our focus was very much on testing for spatial pattern, so we did not pursue his work until later (Cliff and Ord 1975). Another line of research that lay beyond our purview was Matérn's (1960) work about spatial point processes; only

In reference list

References

Alpargu, G., and P. Dutilleul. (2006). ''Stepwise Regression in Mixed Quantitative Linear Models with Autocorrelated Errors.'' *Communications in Statistics—Simulation and Computation* 35, 79–104.

Badeck, F., S. Pompe, I. Kühn, and A. Glauer. (2008). ''Wetterextreme und Artenvielfalt, Zeitlich hochauflösende Klimainformationen auf dem Messtischblattraster und für Schutzgebiete in Deutschland.'' *Naturschutz und Landschaftsplanung* 40, 343–45.

Journal style

Aoyama, Y. P. (2001a). "Structural Foundations for Electronic Commerce: A Comparative Organization of Retails Trade." *Urban Geography* 22(3), 130–53.

Edited book

Andersson, S., K. Jansen, and J. Waidringer. (1997). "Optimisation of a Generic Multi-Mode Transportation and Logistics Network." In *Information Systems in Logistics and Transportation*, 2nd ed., 329–34, edited by T. Bernhard and S. D. Brunn. Oxford: Pergamon Press.

Book

Baltagi, B. H. (2001). *Econometric Analysis of Panel Data*, 2nd ed. Chichester, U.K.: Wiley.

Thesis/Report

Elhorst, J. P., T. Knaap, J. Oosterhaven, W. E. Romp, and E. Gerritsen. (2000). "Ruimtelijk Ecomomische Effecten van Zes Zuiderzeelijn Varianten." REG-Publication 22, University of Groningen.

Notes:

- References arranged alphabetically in the list.
- Journal names in full.
- No repetition of page numbers but 130–35, 124–51, 1287–1305, 1507–77
- Reference in text: Inside brackets (Pione and Sabel 1984a, b; Lipietz 1986; Andersen, Jansen, and Waidringer 1997; Chan et al. 1999)
- Outside brackets - Pione and Sabel (1984a, b), Andersen, Jansen, and Waidringer (1997)
-
- <u>References</u>: In **TEXT, CHRONOLOGICAL** arrangement and in **Reference Section, ALPHABETICAL** arrangement
- References in the text: For 3 author names, all the 3 names of authors should be given in all occurrences in the text. For more than 3 author names give first author and et al. in the citation.
- <u>ARTICLE TITLE</u>: should be Title case.
- <u>SUBTITLE</u>: should start with upper case.
- <u>JOURNAL TITLE</u>: should be Title case.
- <u>BOOK TITLE</u>: should be Title case.
- <u>Issue</u>: should be within parentheses.
-

FIGURES, FIGURE PLACEMENT

Examples:

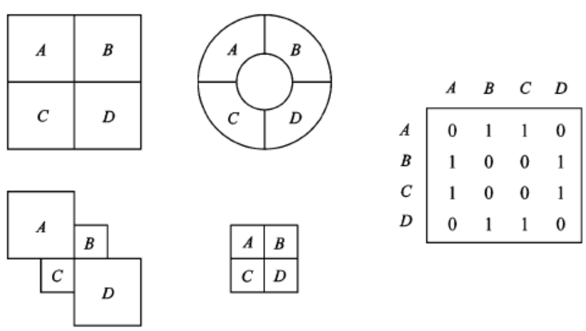

Figure 1. Topological invariance. All four of the diagrams yield the same spatial weights contiguity matrix. Redrawn and extended from Cliff and Ord (1973, p. 10).

Notes:

- Follow general Wiley-Blackwell instructions for figure reproduction, sizing, and placement.
- Figure can be placed in single or landscape and full page figures with facing page captions.
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FIGURE LEGENDS

Example:

Figure 1. Performance of parameter estimates in terms of type I errors as the empirical probability of significance p of different methods for a theoretical significance level of 0.05. The validity band is given as $0.035 < P < 0.065$. The probabilities are calculated based on 1,000 randomly generated datasets for: (a) a Gaussian distribution, 30-by-30 grid cells; (b) a binomial distribution, 30-by-30 grid cells; (c) a Poisson distribution, 30-by-30 grid cells; (d) a Gaussian distribution, 50-by-50 grid cells; (e) a binomial distribution, 50-by-50 grid cells; and (f) a Poisson distribution, 50-by-50 grid cells.

Notes:

- Sentence case.
- In caption it should be given as ‘Figure 1. (N-space)Caption’.
- Dot should be given at the end of the caption.
- Parts of figure can be upper or lower case. Follow author for parts or labels in figure(s). Figure parts (a, b, c, etc.).
-

FIGURE CITATIONS IN TEXT

Example:

In this context, the distinguishing feature of this analysis is its focus on the up-
per right-hand neighborhood of Fig. 1, which for the moment we loosely designate
as ‘‘strongly connected’’ weight matrices.[6] The central objective is not only to show

Notes:

- Cited as Fig. 1, Fig. 2, Figs. 1 and 2, even at the beginning of a sentence.
- In text it should be given as ‘Fig. 1’.
-

TABLES, TABLE PLACEMENT

Example:

Table 2 Results for Estimated Regression Parameters b_j and their P-values, Comparing Different Methods for the Plant genus *Utricularia* in Germany Treated as a Poisson Random Variable

Model	Intercept		Altitude		Precipitation		Moor/swamp	
	b_0	P	b_A	P	b_P	P	b_M	P
GLM	− 0.63	<0.001	− 0.93	<0.001	0.44	<0.001	0.60	<0.001
GEE	− 0.37	0.0035	− 0.90	<0.001	0.10	0.4790	0.46	<0.001
WRM haar-1	− 0.72	0.0069	− 1.31	0.0148	0.17	0.4928	0.44	<0.001
WRM haar-2	− 0.60	<0.001	− 0.86	0.0010	0.28	0.0772	0.46	<0.001
WRM d4-1	− 0.57	0.0821	− 1.55	0.0129	− 0.37	0.1694	0.40	0.0015
WRM d4-2	− 0.75	<0.001	− 1.52	<0.001	0.34	0.0862	0.47	<0.001
WRM la16-1	− 0.49	0.1533	− 3.23	<0.001	− 0.31	0.2492	0.40	0.0082
WRM la16-2	− 0.54	0.0103	− 1.22	0.0015	0.11	0.5864	0.45	<0.001

Notes:

- In caption it should be given as ‘Table 1 (N-space)Caption’.
- No dot at the end of the caption and the caption matter should be in Title Case.
- Table headings: should be left aligned.
-
- No end point.
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TABLE NOTES

Example:

(multilevel models)

Note: Table adapted from Elffers (2003).

MRDI $(n^{\cdot} - 3n^{-} + 5n^{-} - n+2)/2$ $n^{-} - n+2$

MRSA, PHMR model with single assignment; MRMA, PHMR model with multiple assignments; MDSA, PHMD model with single assignment; MDMA, PHMD model with multiple assignments; MRDI, multiobjective reliable p-hub dispersion model.

Case IV

*“Direct route” include the “nonhub to hub” and “hub-to-hub” routes, which are expressed as X_{ijjj}, X_{ijii}, and X_{ijij} in Fig. 3. Notice that the flow in the category of direct routes looks similar in that the route delivers traffic directly without any intermediate hub, but the origin and destination are different in notation. For instance, the destination of the route X_{ijjj} is a hub while the origin is a hub in the route X_{ijii}.
MRSA, PHMR model with single assignment; MRMA, PHMR model with multiple assignments.

Notes:

- Should have *, †, ‡ and all should be superscript.
-

TABLE CITATIONS IN TEXT

Example:

ness (as indicated by rewiring probability) of the networks and vaccination proportions. Table 1 summarizes the most effective intervention strategies for the networks with different degrees of randomness.

Notes:

- As shown above.
-

APPENDICES

Example:

Appendix

We give the following algorithm for calculating regression parameters via the WRM:

Step 1. Find an initial estimate $\mathbf{b}_0$.
Step 2. Use $\mathbf{b}_0$ to obtain $\boldsymbol{\mu}_0$.
Step 3. Calculate $\mathbf{A}_0$, $\mathbf{W}_0$, $\mathbf{X}_{\text{new}} = \mathbf{W}_0^{1/2}\mathbf{X}$, $\mathbf{z}_{\text{new}} = \mathbf{W}_0^{1/2}\mathbf{z}_0$.
Step 4. Create matrices for $\mathbf{z}_{\text{new}}$ and all columns of $\mathbf{X}_{\text{new}}$ according to the spatial structure.
Step 5. Perform multiresolution analysis on these matrices.
Step 6. Sum all orthogonal image components except the last one to pick up all detail components (and no smooth ones). This yields $\mathbf{Pz}_{\text{new}}$ and $\mathbf{PX}_{\text{new}}$.
Step 7. Transform matrices into vectors.
Step 8. Use equation (3) to estimate the regression model and to obtain the new estimator $\mathbf{b}_1$.
Step 9. Substitute $\mathbf{b}_1$ for $\mathbf{b}_0$ and return to step 2.
Step 10. Continue iterating until convergence is achieved.

UNCORRECTED

Appendix A. Proofs of results in the text

Proof of Lemma 1: It follows from Searle (1982, section 12.3.d) that the eigenvalues of any matrix of the form $A = aI + c11'$ are given by

$$\lambda(A) = \{a, \ldots, a, (a + nc)\} \qquad \text{(A1)}$$

where a has multiplicity $n - 1$. Hence the eigenvalues of

$$W^* = b \cdot (1_n 1_n' - I_n) = (-b)I_n + (b)1_n 1_n' \qquad \text{(A2)}$$

Notes:

- After acknowledgement and before the reference sections
- Set as A head
- Should be placed Before References.
- The sequence of elements should be as ‘Acknowledgements, Notes, Appendix, References’.
-
-

ACKNOWLEDGEMENTS

Example:

Acknowledgements

We acknowledge support by the Virtual Institute for Macroecology, the Integrated Project ALARM: Assessing LArge scale environmental Risks with tested Methods (GOCE-CT-2003-506675) from European Commission within Framework Programme 6 as well as Sven Pompe (UFZ) and Franz Badeck (PIK) of the project Modelling the Impact of Climate Change and Plant Distribution in Germany, funded by the German Federal Agency for Nature Conservation (BfN) (FKZ: 805 81 00), for providing precipitation data.

Notes:

- with “e”
- The heading should be given as ‘Acknowledgements’ and the matter as paragraph at the end and Before references, Before Notes.

AUTHOR INDEX ENTRIES (IF APPLICABLE)

Example:

Notes:

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SUBJECT INDEX ENTRIES (IF APPLICABLE)

Example:

Notes:

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Article type details

EDITORIALS

Example:

Geographical Analysis ISSN 0016-7363

Editorial

Celebrating 40 Years of Scientific Impacts by Cliff and Ord

Daniel A. Griffith

Editor
Geographical Analysis
dagriffith@utdallas.edu

Cliff and Ord (1969) published ''The Problem of Spatial Autocorrelation,'' which established the foundation for their pioneering book entitled *Spatial Autocorrelation* (1973), whose revised edition appeared as *Spatial Processes: Models and Applications* (1981). This book has become a classic in human geography (Getis 1995). This year marks the 40th anniversary of their original article, and this special issue of *Geographical Analysis* celebrates it as the beginning of the dissemination of their innovative thinking and of their major interdisciplinary and multidisciplinary contribution to science in general and to theoretical geography in particular. The commentaries included in this special issue cover thematic and methodological areas in which spatial autocorrelation flourishes today, namely, criminology, ecology, epidemiology, geography, housing and house prices, local statistics, network autocorrelation, spatial autoregression, spatial econometrics, spatial statistical computation and simulation, statistics, and the nature of the geographic weights matrix. Because of his principal impact on their thinking, which Cliff and Ord fully acknowledge in their retrospective essay, this special issue also contains an encomium for Michael Dacey, who passed away in 2006. Many articles appearing in more recent issues of this journal furnish examples of state-of-the-art spatial analysis advancements whose research lineage can be traced to the Cliff and Ord (1969) article.

The 1969 article was successful in popularizing the spatial autocorrelation indices developed by Moran (I) and by Geary (c) and the Irish data used by Geary for illustrative purposes. Cliff and Ord emphasize that ''[t]he topological invariance of I and c, and the fact that these statistics test only for first order correlation between the x_i can be eliminated by weighting'' (p. 30). They further note that ''there is no virtue in using binary weights'' (p. 50). Practices observed today reveal that they were only partly successful in promoting the use of nonbinary geographic weights. Nevertheless, criteria for specifying geographic weights continues to be an active research area, with a general recognition that having reasonable nonzero weights, even if they are slightly misspecified, is better than assuming zero weights.

The 1969 article also states that ''[t]he assumption that the data are drawn from a normal population does not seem to be crucial in evaluating the variance for the cross-product coefficients'' (p. 50). One disappointment has been a failure of analytical spatial autocorrelation results to be developed for nonnormal random

It highlighted differences between dependencies in time series and spatial series. It refocused attention on violation of the independence assumption when traditional statistical techniques are applied to georeferenced data. It promoted the need to develop statistical distribution theory in the presence of spatial autocorrelation. It outlined convincing arguments for positing geographic weights other than the simple binary 0–1 values. It established the basis for Cliff and Ord's classic book. And, it proposed a research agenda, parts of which continue to be relevant today.

References

Cliff, A., and J. Ord. (1969). ''The Problem of Spatial Autocorrelation.'' In *London Papers in Regional Science*, 25–55, edited by A. Scott. London: Pion.

Getis, A. (1995). ''Classics in Human Geography Revisited.'' *Progress in Human Geography* 19, 245–49.

Notes:

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REVIEW ESSAYS

Example:

Notes:

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BOOK REVIEWS

Example:

Notes:

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LETTERS TO THE EDITOR

Example:

Notes:

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ERRATA/CORRIGENDA

Example:

Notes:

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ENCOMIUM

Example:

Encomium

Michael Francis Dacey: A Tribute

Michael Dacey was born in Holyoke, Massachusetts, on March 23, 1932. He attended Bates College in Maine for 1 year (1950–1951) before transferring to the University of Kansas, where he earned a bachelor's degree (major in geography) in 1954. He then spent a year at the University of Washington (UW) in Seattle, where he received a master's degree under the supervision of the cartographer John C. Sherman. Two years in the United States Army followed, during which time Dacey served in the Army Map Service, notably in Japan. He returned to UW when he was discharged from military service in 1958 and there began the career in mathematical geography for which he is known.

Although Dacey was strongly influenced by William L. Garrison and his fellow students while at UW, his dissertation advisor was Edward L. Ullman, with whom he published the results of his dissertation, ''The Minimum Requirements Approach to the Urban Economic Base.'' Dacey was appointed Assistant Professor of Regional Science at the University of Pennsylvania (Pennsylvania) in 1960, a position he held until moving to Northwestern University (NU) in 1964.

Dacey's interests ranged widely over the topics quantitative geographers were studying in the 1960s, and his forays into diverse bodies of literature considerably broadened the field. A famous Dacey dictum was, ''no matter what the topic, you can find a literature on it,'' and he was generally successful in following his own advice. He was drawn to central place theory—and made more studies of its geometry and mathematics than perhaps any other geographer. He once observed that, through formalizing central place theory, mathematicians would understand it—even if they did not understand why the theory was interesting to geographers. He was attracted to the formal elegance of central place theory but found its rigidity unappealing for analyzing real settlement patterns.

Without a doubt, his most important contributions were in the realm of probability models of spatial patterns (both as point processes and area counts), particularly urban location patterns. He sought to extend and broaden location theory, which consisted largely of static models, by introducing a stochastic component. His interests overlapped with those of Torsten Hagerstrand and Leslie Curry, and their work will have influenced him. But he was not attracted to the Monte Carlo simulation procedures of Hagerstrand that lacked a formal mathematical structure, and he applied a more formal step-by-step mathematical rigor to problems than did Curry. Another of his dictums was that, in applying mathematical reasoning, ''if you cannot prove it, you do not know it's true.'' The style of his articles reflects this, setting his published work apart from many of his contemporaries. Dacey turned

Geographical Analysis **41** (2009) 346–350 © 2009 The Ohio State University

more toward probability models after he left Pennsylvania and moved to the Geography Department at NU in 1964.

His strongest influences at NU seem to have been the mathematicians Alexandra Ionescu-Tulcea (Bellow) and Erhan Cinlar, the latter appointed in Industrial Engineering. Dacey sat in on their courses on stochastic processes, and their influence soon showed. The period from 1964 to the early 1970s was his most innovative and productive time. His ''Modified Poisson Probability Law for Point Pattern More Regular than Random'' was a marked departure from anything a geographer had contributed to the literature before and perhaps his most original contribution to the subject—a new type of probability distribution with a variance smaller than the mean. The model, obtained by superimposing a Bernoulli process (for county seats) onto a Poisson process (for noncounty seats) was an excellent fit to frequency counts of some Midwestern settlement distributions. Dacey later expanded his model, relaxing, for example, the assumption of areal homogeneity (linked to varying population density) in ''A Compound Probability Law for a Pattern More Dispersed than Random and with Area Inhomogeneity.''

In the context of his research about stochastic location models is where Dacey encountered and became interested in spatial autocorrelation. In ''An Empirical Study of the Areal Distribution of Houses in Puerto Rico,'' published in 1968, he articulates the importance of taking into account the spatial arrangement properties of data in location modeling and indicates the different ways (theoretical and empirical) spatial arrangement might be introduced into location models. He already had written a technical report in 1965 (''A Review of Measures of Contiguity for Two and K-Color Maps'') where he reviews the spatial autocorrelation test statistics that had been developed by statisticians in the late 1940s and early 1950s. In that report, published in 1968, he details the deficiencies of these statistics when applied to irregular areal frameworks and presents a new statistic. Unfortunately, the moments of his statistic under the null hypothesis could not be derived, nor its distribution simulated with the computer technology of the time, but he has rightly earned credit for this early work as acknowledged in this special issue.

When *Geographical Analysis* was founded in 1969, Dacey became a regular contributor, but by the mid 1970s, Dacey appears to have retired from research—at least in terms of publishing. In ''Mathematics for the Undergraduate in the Social Sciences,'' published in 1971 in *American Mathematical Monthly*, he sketches the problems of designing and delivering a mathematics program for social science undergraduates and postgraduates and suggested ways forward. In 1978, he founded the Mathematical Methods in the Social Sciences program at NU, to which he devoted much of his energy in his later years. He passed away in the fall of 2006.

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