

***Complexity in Geomorphology***  
**Binghamton Geomorphology Symposium**  
**October, 2007, Durham, North Carolina**

Organizers:

Mark A. Fonstad, Texas State University

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The last two decades in geomorphology has seen a virtual explosion of research on basic questions involving strongly nonlinear dynamics with complex causality relationships between and within geomorphic systems. We can call this quickly-growing branch of geomorphic theory “Complexity in Geomorphology”. The study of nonlinear geomorphic systems has grown enormously with the introduction of large spatiotemporal geomorphic datasets, the development of computer models, incorporation of nonlinear mathematical techniques, and the construction of innovative theories of complex geomorphic behavior from fieldwork. Nevertheless, though the number of geomorphic systems linked directly to nonlinear dynamics grows monthly, the spread of these ideas into mainstream geomorphic education and applied geomorphic practice has been slow. Furthermore, it is apparent that researchers in separate sub-disciplines of geomorphology have occasionally had to “reinvent the complexity wheel” because of the lack of sharing of many ideas between diverse research groups.

The Binghamton Geomorphology Symposium in 2007 will highlight complexity science ideas as a critical body of geomorphic theory, encourage intra-disciplinary pollenization of complexity science theories and methods, and produce a cutting-edge volume of articles that sets the standard for future breakthroughs in complexity and geomorphology. The main topics of this symposium will be the different facets of “complexity science” in geomorphology, including such topics as

deterministic chaos, self-organized criticality, complex adaptive systems, self-organization, and emergence. We hope to bring together scholars from a diverse variety of geomorphic sub-disciplines and concentrate the symposium’s discussion on the shared complexity ideas, including newly formed theories as well as accomplishments and needs in the fusion of complexity science and geomorphology.

Historically, ideas of geomorphic causality (derived from theory or developed from observation) were focused on reasonably simple, interacting forms and processes, under the assumption that simple interactions lead to simple behaviors. Chaos theory and the study of complex systems has shown that with nonlinear feedbacks, even simple interactions can lead to complicated behavior. This development creates a new perspective on causal relationships, as does the corollary—that understanding and predicting the behavior of complicated-looking systems may not require a myriad of detailed, interacting processes. These perspectives present new opportunities; many of the geomorphic systems that display highly nonlinear behavior are amenable to understanding and some level of prediction by using the rapidly-evolving techniques in the complexity sciences approach, and this new mode of understanding demands a high level of visibility in geomorphology. The topic is timely because it presents an opportunity to further advance the cutting-edge activities of geologists and geographers, who have traditionally comprised the majority of Binghamton participants, with complexity

science developments originating in ecology, mathematics, and physics.

**Objectives.** Our primary goal is to host a symposium that will stimulate cross-discipline ideas on the theory and application of complexity principles. To do this, we will try to bring together a large range of researchers who have developed and applied different theories of nonlinear dynamics applied to geomorphic system behavior. We wish to solicit papers from the speakers that show a range of approaches towards understanding complex behavior, such as numerical models, experimental approaches, field observation, and analytical reasoning.

**Program Structure.** Although the schedule will undoubtedly evolve, the tentative structure of the program is given in the following table. Each session will center on an approach to studying complexity in geomorphology, whether that be through theoretical deduction, numerical modeling, enlightened observation, or other vantage points. In order to increase the cross-pollination of ideas, we will work to arrange the speakers so that different geomorphic topical areas (biogeomorphology and periglacial geomorphology, for example) are combined into sessions of similar research approaches.

**Friday:**

Daytime Fieldtrip

4:00 – 8:00 Registration and icebreaker

**Saturday:**

7:30 – 8:30: Registration and Breakfast

8:30 – 10:00 3 speakers

10:00 – 10:30 Coffee and Posters

11:00 – 12:30 3 speakers (*incl. Keynote*)

12:30 – 2:00 Lunch

2:00 – 3:30 3 speakers

3:30 – 4:00 Coffee and Posters

4:00 – 5:30 3 speakers (*incl. Keynote*)

5:30 – 7:00 Group Discussion,

7:00 – 8:00 Banquet

**Sunday:**

8:00 – 9:00 Breakfast and Posters

9:00 – 10:30 3 speakers

10:30 – 11:00 Coffee and Posters

11:00 – 12:30 3 speakers

2:00 – 5:30 Half-Day Fieldtrip

**Potential Speakers.** We have compiled a diverse a list of possible participants that combines many well known scholars in the field with a varied cross-section of viewpoints, areas of concern, and regions of study. Several international scholars are included on the list, and initial responses to our inquiries suggest that we will have substantial participation by senior scholars from abroad. Given the great interest in the topic at hand, there will not be a shortage of talented scholarship to draw upon as we fill the program.

**Venue.** The formal venue for the symposium will be Duke University. Brad Murray, the co-organizer is a professor at this location and has direct ties to campus-based complexity research through the Center for Nonlinear and Complex Systems, as well as the Nicholas School of the Environment and Earth Sciences, which has suitable conference-hosting venues on campus. The location is centrally located for easy access and it maintains the historical tradition of hosting the conference in the American east. We wish to hold the symposium in early October (October 5-7) so that (a) the climate is particularly suitable to day-long field trips, and (b) there is no conflict with the Denver GSA meetings at the end of the month of October.

All events will take place on the campus of Duke University, which is served by the Raleigh-Durham International Airport

(RDU). We are still finalizing the conference and lodging arrangements that will make the conference highly economical and also of high logistical quality.

**Symposium Proceedings.** We have been in contact with editor Dick Marston and plan to publish reviewed papers both as a proceedings volume prior to the meeting and through the journal *Geomorphology*. In the past, these publications have produced a lasting record of the Binghamton papers while providing additional incentives to senior scholars to participate and produce

quality papers. The Maroon book series has become a cornerstone for serious geomorphic research and we plan to maintain the rigorous level of scholarships that has marked this collection. The *Binghamton Steering Committee* has approved this proposal and is encouraging us to develop the proceedings volume early so that it will be ready prior to the meetings. This will require an extra effort by all participants to adhere to deadlines.

*We look forward to seeing you at Duke in 2007*

## **Binghamton Geomorphology Symposium – A Brief History**

In 1966 four geomorphologists and physical geographers at the State University of New York – Binghamton, all graduates of A.N. Strahler at Columbia University, began organizing weekly “brown bag lunches” and discussing informally about their common interests: geomorphology and water. As the discussions became more focused over the next few years, and with the addition of Marie Morisawa to SUNY-Binghamton in 1970, the group put on the first Binghamton Geomorphology Symposium, focusing specifically on Environmental Geomorphology. These co-conspirators were dismayed at the increasing specialization and compartmentalization that had occurred in the sciences, and noted that many of the intriguing problems in science had become interdisciplinary. Because many problems in environmental science transcend traditional science and cut across scientific disciplines, they viewed the geomorphologist, as the surviving generalist in earth science, as being particularly capable of interacting in emerging environmental issues. Thus, they convened the first Binghamton Symposium, stating that “This Symposium is the first in what will be an annual symposia series in geomorphology.” And so it was. The Binghamton Symposium has been held annually ever since for over three decades. Each year the Symposium covers a specific topic as it relates to geomorphology:

1. Environmental Geomorphology (1970)
2. Quantitative Geomorphology (1971)
3. Coastal Geomorphology (1972)
4. Fluvial Geomorphology (1973)
5. Glacial Geomorphology (1974)
6. Theories of Landform Development (1975)
7. Geomorphology and Engineering (1976)
8. Geomorphology in Arid Regions (1977)
9. Thresholds in Geomorphology (1978)
10. Adjustments of the Fluvial System (1979)
11. Applied Geomorphology (1980)
12. Space and Time in Geomorphology (1981)
13. Groundwater as a Geomorphic Agent (1982)
14. Models in Geomorphology (1983)
15. Tectonic Geomorphology (1984)
16. Hillslope Processes (1985)
17. Aeolian Geomorphology (1986)

18. Catastrophic Flooding (1987)
19. History of Geomorphology (1988)
20. Appalachian Geomorphology (1989)
21. Soils and Landscape Evolution (1990)
22. Periglacial Geomorphology (1991)
23. Geomorphic Systems (1992)
24. Geomorphology: The Research Frontier and Beyond (1993)
25. Geomorphology and Natural Hazards (1994)
26. Biogeomorphology (1995)
27. The Scientific Nature of Geomorphology (1996)
28. Engineering Geomorphology (1997)
29. Coastal Geomorphology (1998)
30. Geomorphology in the Public Eye (1999)
31. Modeling and Geomorphology (2000)
32. Mountain Geomorphology (2001)
33. Dams and Geomorphology (2002)
34. Ice Sheet Geomorphology (2003)
35. Weathering and Landscape Evolution (2004)
36. Geomorphology and Ecosystems (2005)
37. Human Impacts on Fluvial Systems (2006)
38. Complexity in Geomorphology (2007)