

**GEOMORPHIC PROCESSES
15-040-504**

Fall Quarter, 2000

Instructor:

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Text

Ritter, Dale F.; Kochel, R. Craig; and Miller, Jerry R., 1995. *Process Geomorphology*. Dubuque: William C. Brown Publishers. 538p. (**henceforth referred to as RKM**)

Grading

5-8 quizzes on reading randomly distributed throughout the quarter	15%
Midterm examination on October 30 (?)	25%
Final examination on Thursday - December 7, 8-10 AM	35%
5-8 exercises and laboratories	25%

Tentative Laboratory Schedule

- Week 1: Introduction to leveling and plane table mapping
- Week 2: Stream gaging laboratory I (probably during lab on Wednesday - September 29 1:00-5:00 PM)
- Week 3: Stream gaging laboratory II (probably during lab on Wednesday - October 6, 1:00-5:00 PM)
- Week 4: Mammoth Cave Field Trip Saturday and Sunday - October 28 & 29
- Week 5: Landscape evolution and analysis laboratory or trip to Adams County Saturday and Sunday - November TBA
- Week 6: Soil laboratory
- Week 7: Mass movement laboratory
- Week 8: Flooding frequency laboratory
- Week 9: Drainage Basin Analysis laboratory

Very Tentative Syllabus

(Note: Only selected reading will be assigned from among those listed)

September 20

Introduction and orientation

Thornbury's ten "Fundamental Concepts" of geomorphology

Uniformitarianism, gradualism, catastrophism, and the tempo of geomorphic change

Readings

RKM p. 1-23

September 25 - September 27

The Spokane flood

The Bonneville Flood

The *Chimu* flood and *El Ninos*

Apollo objects and astroblems

Magnitude and frequency analysis

Readings

RKM p. 25-46.

Baker, R. and Costa, J.E. 1987. Flood power. *in* Mayer, L., and Nash, D. *Catastrophic Flooding - The Binghamton Symposia in Geomorphology*, no. 18. p. 1-18.

Bloom, A., 1991, *Geomorphology - A Systematic Analysis of Late Cenozoic Landforms- Second Edition*, p. 1-18. (**henceforth referred to as Bloom**)

Canby, T.Y., 1984, El Nino's ill wind, *National Geographic*, 165(2):144-183.

Chorley, R.J.; Schumm, S.A., and Sugden, D.E., 1984, *Geomorphology*, New York: Methuen & Co., p. xxi-xxiii, 1-15. (**henceforth referred to as CSS**)

Dietz, R.S., 1961, Astroblemes, *Scientific American*, (March), p. 3-10.

Dury, G.H. 1975. Neocatastrophism. *Anais da Academia de Ciencias do Brasil (Suplemento)*. 47:135-151.

Easterbrook, Donald J., 1993, *Surface Processes and Landforms*, New York: MacMillan Publishing Company, p. 389-391 (and Figs. 14-11, 12, 14, 15, 16, 17, and 18); 474-493. (**henceforth referred to as Easterbrook**)

Gage, M., 1970, The tempo of geomorphic time, *J. of Geology*,

78:619-625.

- Gares, P.A., 1994, Geomorphology and natural hazards, *Geomorphology*, 10:1-18.
- Gould, Stephen Jay, 1980, The great scablands debate, Chapter 19, *The Panda's Thumb*.
- Gould, Stephen Jay, 1965, Is uniformitarianism necessary? *American Journal of Science*. 263:223-228.
- Grant, J.A.; Brooks, M.J.; and Taylor, B.E. 1998. New Constraints on the evolution of Carolina Bays from ground penetrating radar. *Geomorphology*, 22:325-345.
- Hansen, Michael C., 1994, Return to Sunken Mountain: the Serpent Mound Cryptoexplosion structure, *Ohio Geology*, p. 1-7.
- Jarrett, Robert D. and Malde, Harold E. 1987. Paleodischarge of the late Pleistocene Bonneville Flood, Snake River, Idaho computed from new evidence. *Geological Society of America Bulletin*. 99:127-134.
- Karrow, P.F. 1989. Quaternary continental stratigraphy and neocatastrophism. *Quaternary Science Reviews*. 8:277-282.
- Luczaj, John. 1998. Argument supporting explosive igneous activity for the origin of "cryptoexplosion" structures in the midcontinent, United States. *Geology*, 26:295-298.
- Malde, H.E., 1968, The Catastrophic Late Pleistocene Bonneville Flood in the Snake River Plain, Idaho, *U.S. Geological Survey Professional Paper 596*, p. 1-12, 47-51.
- Melosh, H.J. 1998. Craters unchained. *Nature*, 394:221-223.
- Nash, D.B., 1994, Effective sediment-transporting discharge from magnitude-frequency analysis, *Journal of Geology*, 102:79-95.
- Nash, D.B., 1988. Detection of a buried horizon with a high thermal diffusivity using thermal remote sensing. *Photogrammetric Engineering and Remote Sensing*. 54:1437-1446
- Nash, D.B.,
- Nials; Deeds; Moseley; Pozorski, T.; Pozorski, G.; Feldman, R.A., 1979, El Nino: The catastrophic flooding of coastal Peru. *Field Museum of Natural History Bulletin*, 50(7):4-14 (Part I) and 50(8):4-10 (Part II).
- Schumm, Stanley A, 1991. *To Interpret the Earth: Ten Ways to be Wrong*. Cambridge: Cambridge University Press. 133p. p. 66-70.
- Selby, M.J., 1985. *Earth's Changing Surface: An Introduction to Geomorphology*, Clarendon Press: Oxford, 607p. (**henceforth referred to as Selby**), p. 576-586.
- Shea, J.H., 1982, Twelve fallacies of uniformitarianism, *Geology*, 10:455-460.
- Short, Lowman, Freden, and Finch, 1976, *Mission to Earth: Landsat views the World*, p. 1-7, 11-18, Plates: 20, 21, 30, 109, 155, 156, 354, and 385.

Sturm, M.; Beget, J.; and Benson, C.. 1987. Observation of *jökulhlaups* from ice-dammed Strandline Lake, Alaska: Implications for paleohydrology. *in* Mayer, L., and Nash, D. *Catastrophic Flooding - The Binghampton Symposia in Geomorphology*, no. 18. p. 79-94.

Thornbury, W.D., 1969, *Principles of Geomorphology*, p. 16-33.

USGS, 1976, *The Channeled Scablands of Eastern Washington*, 23p.

Vitek, J.D. and Ritter, D.F., 1993, Geomorphology in the U.S.A. *in* *The Evolution of Geomorphology*, Walker, H.J. and W.E. Grabau eds., John Wiley and Sons: New York, p. 469-481.

Werritty, A. 1993, Geomorphology in the U.K. *in* *The Evolution of Geomorphology*, Walker, H.J. and W.E. Grabau eds., John Wiley and Sons: New York, p. 457-468.

Wetherill, G.W., 1979, Apollo Objects, *Scientific American*, (March), p. 54-65.

Wolman and Miller, 1960, Magnitude and frequency of forces in geomorphic processes, *J. of Geology*, 68:54-74.

October 2 - October 4

Evolution of Landscapes

Readings

Bloom, p. 297-326.

CSS, p. 17-40.

CSS, p. 43-72.

Easterbrook, p. 165-183.

Flemal, R.C. 1971. The attack on the Davisian system of geomorphology: a synopsis. *Journal of Geologic Education*. 19:3-13.

Nash, D. 1986. Morphologic Dating and Modeling the Degradation of Fault Scarps. *in* *Active Tectonics*, National Academy of Science/ National Research Council Studies in Geophysics. p. 181-193.

Schumm, S.A. 1965. Time, space, and causality in geomorphology. *American Journal of Science*. 263:110-119.

Schumm, S.A. 1993. River response to baselevel change: implications for sequence stratigraphy. *Journal of Geology* 101:279-294.

Selby, p. 513-529.

October 9 - October 11

Physical Weathering

Readings

RKM, p. 85-96

Bloom, p. 117-127.

CSS, p. 203-207.

Easterbrook, p. 13-21.

Ferguson, H.F., 1967, Valley stress release in the Allegheny Plateau, *Engineering Geology*, 4(1):63-71.

Hofman, H.J., 1966, Deformational structures near Cincinnati, Ohio, *Geological Society of America Bulletin*, 77:533-548.

Ollier, C.D., 1984, Physical Weathering, Chapter 2, *Weathering*, p. 4-29.

Selby, p. 189-209.

Walder, Joseph S. and Hallet, Bernard, 1986, The physical basis of frost weathering: toward a more fundamental and unified perspective, *Arctic and Alpine Research*, 18:27-32.

October 11

Chemical Weathering

Readings

RKM, p. 49-63.

Bloom, p. 127-134.

CSS, p. 207-224.

Easterbrook, p. 21-46.

Fookes, P.G.; Gourley, C.S.; and Ohikere, C., 1988. Rock weathering in engineering time, *Quarterly Journal of Engineering Geology*, 21:33-57.

Mitchell, J.K., 1976, *Fundamentals of Soil Behavior*, p. 27-46.

Ollier, Chapter 3, p. 30-51.

October 16 - October 18

Karst

Readings

RKM, p. 401-427.

Bloom, p. 148-174.

Easterbrook, p. 185-213.

Fookes, P.G. and Hawkins, A.B., 1988, Limestone weathering: its engineering significance and a proposed classification scheme, *Quarterly Journal of Engineering Geology*, 21:7-31.

Mission To Earth, Plates 246, 26.

Palmer, A.N., 1981, Chapter 2, The cave and its surrounding, *A geological Guide to Mammoth Cave National Park*, p. 3-24.

Palmer, A.N., 1991, Origin and Morphology of limestone caves, *Geological Society of America Bulletin*, 103:1-21.

Scovel, O'Brien, McCormack, and Chapman, 1965, *Atlas of Landforms*, p. 76-77.

Selby, p. 303-323.

Wells, S., 1973, *Geomorphology of the Sinkhole Plain in the Pennyroyal Plateau of Central Kentucky Karst*, M.S. Thesis, U of Cincinnati, p. 32-59.

October 18 - October 25

Soil

Readings

RKM, p. 63-82.

Bloom, p. 134-144.

CSS, p. 224-228.

Easterbrook, p. 46-52.

McNeil, M., 1964, Lateritic Soils, *Scientific American*, 211(5):96-102.

Olson, G.W., 1976, Criteria for making and interpreting a soil profile, *Kansas Geological Survey Bulletin* 212.

Ritter, D.F., 1978, *Process Geomorphology*, p. 99-126.

October 30

Midterm examination

November 1 - November 6

Mass Movement

Readings

RKM, p. 99-135.

Bloom, 175-1204.

CSS, p. 230-253.

Easterbrook, p. 59-89.

Fleming, Johnson, and Hough, 1981, Engineering geology of the Cincinnati area, *GSA Cincinnati 1981 Field Trip Guidebooks*.

Hsü, K.J., 1975, Catastrophic debris streams (*sturzstroms*) generated by rockfalls, *Bulletin of the Geological Society of America*, 86:129-140.

Mollard, J.D., 19??, Chapter 11, *Landforms and surface materials of Canada*, p. 11.0-11.34d.

Selby, p. 172-180; 219-238.

Shreve, R.L., 1968, The Blackhawk Landslide, *Geological Society of America Special Paper 108*, 47p.

Varnes, D.J., 1978, Chapter 2, Slope movement types and processes, *Landslides: Analysis and control*, Special Report 176, Transportation Research Board, NAS, p. 11-28.

November 8

Surface hydrology and erosion

Readings

RKM, 137-175.

RKM, 176-190.

Bloom, p. 246-288.

CSS, p. 258-266.

Horton, R.E., 1945, Erosional development of streams and their drainage basin; hydrophysical approach to quantitative morphology, *Bulletin of the Geological Society of America*, 56:306-331.

- Kirkby, M.J., 1971, Infiltration, throughflow, and overland flow, Chapter 5, *Introduction to Physical Hydrology*, p. 109-121.
- Rosgen, D. L., 1994, A classification of natural rivers, *Catena*, 22:169-199.
- Selby, p. 210-219.
- Schumm, S.A. and Brakenridge, G.R., 1987, River Response, *The Geology of North America*, Vol. K-3, North America and Adjacent Oceans During the Last Deglaciation, p. 221-240.
- Wischmeier, W.H., 1971, The erosion equation - a tool for conservation planning, *Proceedings of the 26th Annual Meeting of the Soil Conservation Society of America*, p. 73-78.

November 15 - November 27

Fluvial Processes

Readings

- RKM, p. 193-228.
- Allen, J.R.L. 1974. Reaction, relaxation and lag in natural sedimentary systems: general principles, examples and lessons. *Earth Science Reviews*. 10:263-342.
- Baker, V.B., 1994, Geomorphological understanding of floods, *Geomorphology*, 10:139-156.
- Bloom, p. 209-241.
- CSS, p. 278-314; 341-368.
- Easterbrook, p. 94-131.
- Kuczera, George. 1982. Robust flood frequency models. *Water Resources Research*. 18:315-324.
- Leopold and Langbein, 1966, River meanders, *Scientific American*, 214(6):60-70.
- Meade, Robert H.; Yuzyk, Ted R.; and Day, Terry J. 1990. Movement and storage of sediment in rivers of the United States and Canada. *The Geology of North America*, Vol. O-1, Surface Water Hydrology. The Geological Society of America. 255-280.
- Miall, A.D., 1977, A review of the braided-river depositional environment, *Earth-Science Reviews*, 13:1-18.
- Schumm, S.A., 1994, Erroneous perceptions of fluvial hazards, *Geomorphology*, 10:129-138.
- Selby, p. 239-259; 260-282.
- United States Water Resources Council. 1981. Guidelines for Determining Flood Flow Frequency. Bulletin 17B of the Hydrology Committee. Washington: U.S. Government Printing Office. 183p.
- Wolman, M. Gordon; Church, Michael; Newbury, Robert; Lapointe, Michel; Frenette, Marcel; Andrews, E.D.; Lisle, Thomas E.; Buchanan, John P.; Schumm, Stanley A.; Winkley, Brian

R. 1990. The riverscape. Chapter 12 in Wolman, M.G. and Riggs, H.C., eds, *Surfacewater hydrology*:Boulder, Colorado, Geological Society of America, *The Geology of North America*, v. O-1.

November 29

Fluvial Landscapes and Drainage Basin Analysis

Readings

RKM, p. 231-269.

CSS, p. 316-338.

Howard, A.D., 1967, Drainage analysis in geologic interpretation, *AAPG Bulletin*, 51:2246-2259.

Easterbrook, p. 138-164.

Lattman, L., 1968, Structural control in geomorphology, *The Encyclopedia of Geomorphology*, p. 1074-1079.

Schumm, S.A., 1993, River response to baselevel change: implications for sequence stratigraphy: *Journal of Geology*, 101:279-294.

Selby, p. 283-302.

November 29

Glaciers and the Pleistocene

Readings

RKM, p. 321-352.

CSS, p. 536-547.

Durrell, R.H., 1977, A recycled landscape, *Quarterly of the Cincinnati Museum of Natural History*, Vol 14, no. 2, 9p.

Flint, R.F., 1971, Late-Wisconsin glaciers in North America, Chapter, 18, *Glacial and Quaternary Geology*, p. 463-497.

Easterbrook, p. 379-405.

Goldthwait, Dreimanis, Forsyth, Karrow, and White, 1965, Pleistocene deposits of the Erie Lobe, *The Quaternary of the United States*, p. 86-97.

Selby, p. 468-494; 494-512.

December 4 - December 6

Glaciers, Glacial Landforms, and Periglacial Processes

Readings

RKM, p. 355-399.

Bloom, p. 392-410, 413-440.

Boulton, G.S., 1974, Processes and patterns of glacial erosion, Chapter 2, *Glacial Geomorphology*, p. 45-85.

Clayton and Moran, 1974, A glacial process - form model, Chapter 3, *Glacial Geomorphology*, p. 89-119.

CSS, 508-532.

CSS, p. 431-462.

Easterbrook, p. 307-329; 334-372.

Mollard, J.D., Chapter 3, *Landforms and Surface Materials of Canada*, p. 3.1-3.27.

Selby, p. 417-447; 447-467.

Final examination (Thursday - December 7, 8-10 AM)