

# The Compass: Earth Science Journal of Sigma Gamma Epsilon

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Volume 84 | Issue 2

Article 2

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4-17-2012

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### Recommended Citation

Davis, Larry E. (2012) "Another Geoscience Department 'Bites the Dust'," *The Compass: Earth Science Journal of Sigma Gamma Epsilon*: Vol. 84: Iss. 2, Article 2.

Available at: <https://digitalcommons.csbsju.edu/compass/vol84/iss2/2>

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## Another Geoscience Department ‘Bites the Dust’

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Recently, I was reading a brief history of the American Association for the Advancement of Science (AAAS) and a couple of points were quite revealing. On 20 September 1848, AAAS was ‘born’ as a reorganization of the Association of American Geologists and Naturalists and William Redfield, a New York meteorologist and geologist was elected as the first president of AAAS (AAAS, 2012). The historical perspective further stated, “Geology was central to the development of American science in the early to mid-19<sup>th</sup> century as America explored the continent and its natural resources” (AAAS, 2012). At the height of McCarthyism, Kirtley Mather, a geologist, in his 1953 AAAS Presidential Address *The Common Ground of Science and Politics*, chose not to make a traditional speech about developments in his field, but rather spoke to the problems of intellectual freedom and the need for science and scientists to be independent from politics (AAAS, 2012). Additionally, other than making reference to a particular individual’s scientific discipline, there was no segregation of the sciences (chemistry, biology, geology, physics) when mentioning topics such as the discovery of neptunium, genes and cytoplasm, energy sources, and waves and rhythms, but rather the article always made reference to ‘SCIENCE’! It seemed to me that AAAS sees an inter-connection between all of the sciences.

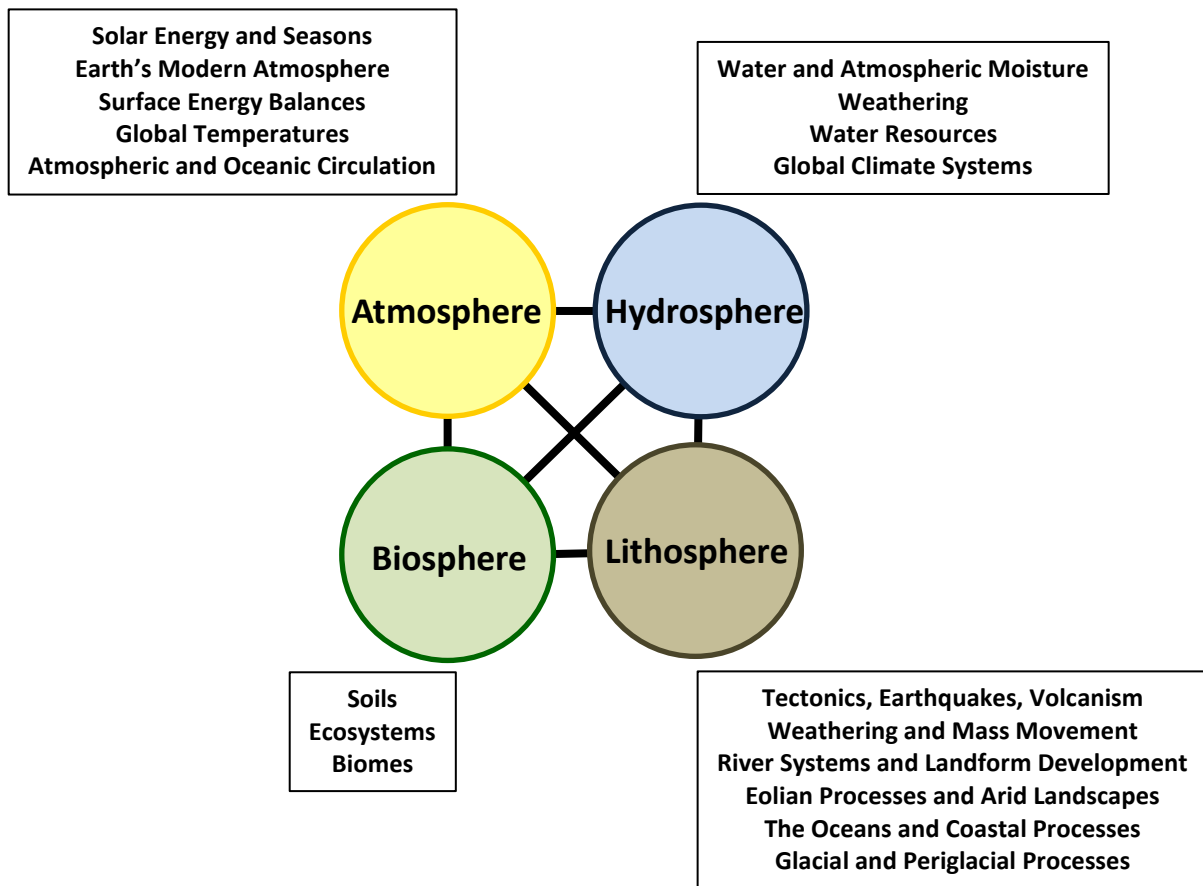
This past semester, I received a desk copy of *Conceptual Integrated Science* (Hewitt, *et al.*, 2007) and in the section titled “To the Student” the authors make the following statements.

“The science you’ll learn here is INTEGRATED. That means we’ll explore the individual science disciplines of physics, chemistry, biology, earth science, and astronomy PLUS the areas where these disciplines overlap. Most of the scientific questions you’re curious about, or need to know about, involve not just one discipline, but several of them in an overlapping way.”

Most scientific questions involve not just one discipline, but several overlapping science disciplines! Science IS NOT a collection disciplinary silos, although that seems to be the structure of many colleges and universities. I know I’m biased, but geology seems to integrate the sciences best of all. I know of no higher education degrees in biology, chemistry, or physics

that require geology, but to the best of my knowledge, every geology degrees requires chemistry and physics, and many include biology. But, I digress.

Illustrations, such as fig. 1, are fairly common in introductory science books and are meant to demonstrate the interconnectedness of Earth's four spheres. The sciences (geology, biology, chemistry, physics), mathematics, computer science engineering, and social sciences (anthropology) are all important in the study of Earth's systems. Each of the disciplines has input, to greater or lesser degrees, to studies in each of the spheres. The boxed information adjacent to the spheres represents the contributions of geology to the study of Earth's systems. Obviously, there is a great input from geology in the study of the lithosphere, but geology still has something to contribute in the studies of each of the other spheres. It is impossible to separate the various science disciplines if one truly desires to understand the Earth – most scientific questions involve several overlapping science disciplines (sometimes redundancy is useful when making a point).



**Figure 1.** Earth's four spheres. Studies of each sphere are represented in the boxes.

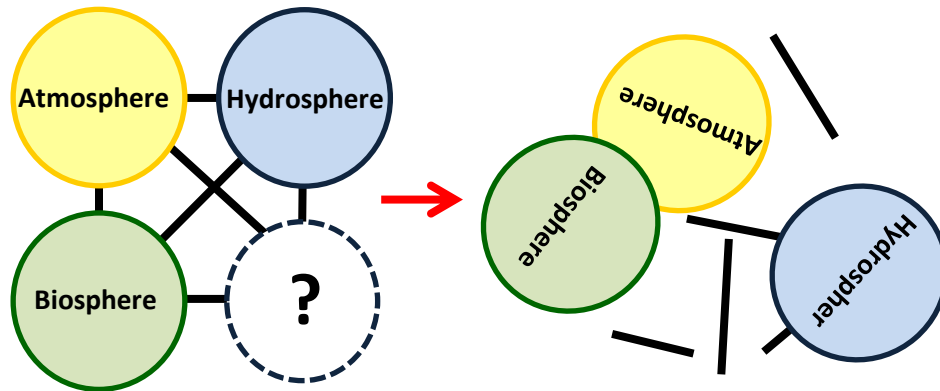
My question is this - why are colleges and universities closing geoscience departments? The obvious answer is that in lean times, such as the present, 'bean counters' look at graduation numbers and decide to cut the departments with the fewest graduates. But, what administrators

need to appreciate is the overall impact the geosciences make on the studies of the Earth. Decisions should NOT be based simply on dollars and cents!

Let us consider the Lithosphere and the contributions of the geosciences to the study of the Earth. The Lithosphere is the ultimate storehouse of all resources and the substrate upon, or within, which the Biosphere rests. As figure 1 illustrates there is also a direct connection between the Lithosphere and the Atmosphere and Hydrosphere. The geological sciences are central to solving the world's major environmental problems associated with the Earth's spheres – availability of clean water supplies, global climate change, land use, natural hazards, soil quality and depletion, pollution and waste management, and the availability of metallic, non-metallic and energy resources. Solutions to these, and future, problems are grounded within the geosciences.

So what happens if the Lithosphere is removed from the diagram? What happens if studies of the Lithosphere (or any of the spheres) are devalued? I would suggest our ability to understand the Earth and to solve important issues and problems is severely compromised. As previously mentioned, most colleges and universities have arranged their various academic disciplines within disciplinary silos. The sciences are viewed as separated departments – chemistry, physics, geology, biology. Occasionally, there are overlapping areas such as Earth and environmental science, astronomy and physics, biochemistry. It's a bit unfortunate that we maintain these disciplinary silos, but it is what it is. Regrettably, the separation of science departments creates 'turf wars' as each individual department scrambles for students and resources. Colleges and universities further exacerbate the silo-effect by requiring students to take 2 or 3 science courses in different science disciplines in order to fulfill general education requirements, as if this will make the students more scientifically literate. Or worse, as they have done at my schools, reduce the general education requirement to one science course and then claim to offer an outstanding liberal arts education! When a college or university eliminates any science department, they may solve a financial problem, but they also send the message that a particular science discipline is unimportant. Although any small department, regardless of the discipline, has the potential to be eliminated, geology is more often than not, on the chopping block. Like the TV show on the Food Network –*Chopped!* The consequences, however, are greater (fig 2).

Colleges and universities are at the forefront of scientifically addressing and solving various global problems. By removing a science department, administrators have effectively handicapped the school's ability to participate in these endeavors. If a geoscience department is removed, the administration has lost the one science which is the most integrated; the most eclectic. Administrators may maintain the introductory geology course to fulfill a general education requirement, but the message is still clear – the geosciences are not really important!



**Figure 2.** The author’s concept of devaluing studies of the Lithosphere. The same effect would occur if studies in any one of the other spheres were devalued.

On 14 March 2012, I received an e-mail from Dr. Siobahn Morgan, Chair, Department of Earth Science at Northern Iowa University (UNI) titled “Closure of geology program at UNI”. Northern Iowa University announced the elimination of the following degree programs – Geology (BA), Geology (BS), Earth Science Interpretive Naturalist Emphasis (BA) and minors in Astronomy, Geology, and Meteorology. Only the Earth Science and Earth Science Teaching majors were retained. Tenured faculty will be offered buy-outs. If buy-outs don’t reduce the faculty numbers, then lay-offs will occur. I was shocked, to say the least. According to Dr. Morgan, the sole criterion for selection as a department to be eliminated was having less than 10 graduating seniors per year. Dr. Morgan further stated that other criteria were not considered, such as: (1) the overall impact on the general education program, (2) an increase of 50% in the growth of the department over the past 5 years to 29 geology majors, with 9 or more slated to graduate in 2014, (3) 20 students will have to transfer if they intend to graduate in geology, (4) the Geology Department has received \$2.7M in external grants in the past 7 years, (5) of the 33 departments on campus, Earth Science has the 11<sup>th</sup> lowest cost per student served, (6) Geology faculty take part in a wide variety of outreach programs, (7) the state of Iowa has a large demand for environmental geology and water quality specialists, and (8) no attention was paid to the quality and rigor of the academic program. Elimination of UNI’s Earth Science Department occurred in the shadow of Governor Terry Branstad’s announcement that the STEM (Science, Technology, Engineering and Mathematics) Advisory Council will work to “grow Iowa’s commitment to bolstering STEM education, STEM innovation and to better position Iowa’s young people and the state’s economy for the future”. Cutting the Earth Science department, which directly supports the STEM initiative, hardly promotes STEM!

Closure of the Geoscience Department at the University of Northern Iowa is NOT an isolated event. Between 1989 and 2002, the number of geology (geological sciences or geoscience) departments in the United States decreased by 16% and Earth science departments decreased by 22%. During the same period, 19 colleges and universities stopped offering any

bachelor's degree that could be listed in the American Geological Institute's *Directory of Geoscience Departments* (Rossbacher and Rhodes, 2004a).

Rossbacher and Rhodes (2004b) make an interesting observation, which I quote:

“At the beginning of the 21<sup>st</sup> century, the two cultures of higher education are those disciplines that have a virtually unquestioned right to exist and those with an uncertain future. The ‘first culture,’ those programs whose right to exist is never questioned, currently includes departments such as English, mathematics, biology, chemistry, political science and history. No matter how badly the people in these programs behave, no matter how poorly they perform, no matter how much they cost, no matter how little they produce, the program (though not necessarily every individual) will survive. The ‘second culture’ includes the departments that academic administrators tend to regard as being too expensive, too low in ‘return on investment’ too small, too hard to defend, or simply too much trouble to continue supporting. These departments don’t have enough value – by whatever definition of ‘value’ is operative – to keep around. Examples of these ‘second culture’ disciplines include classical studies, modern languages other than Spanish, art, music, physics (sometimes), geography – and geology.”

As Rossbacher and Rhodes (2004b) state, “geology departments are under siege” and for those departments under siege, I encourage you to read Rossbacher and Rhodes (2004c). While you are at it, be sure to read Geoff Feiss’ editorial “Opportunities and Threats: A View from the Top” (Feiss, 2005). If your department is facing extinction, you may want to read Feiss’ editorial twice; the first time may just piss you off, the second time you start to see his point. Feiss (2005) provides some very good ‘tips’ on how to be a winner on the administrator’s program of ‘chopped!’. Feiss (2005) also provides a list of loser characteristics, and one should look into the mirror of truth. As I read the list of loser characteristics, all of a sudden I recognized my former geology department, which a few years after I left was ‘strengthened’ by being combined with a department of environmental science (truth be known,  $0 + 0 = 0$ , but the numbers were greater). Let me be clear about one thing, I am NOT suggesting that the Department of Earth Sciences at the University of Northern Iowa exhibits any of the characteristics of losers. I fully except the premise that administrators saw the department as having ‘low’ numbers and said, “you’ve been chopped”.

Since I suspect the majority of the readers are students, this editorial may seem strange for *The Compass*, but I think the message is critical. As students, you are the benefactors of a strong department and you have a responsibility to be part of the solution, rather than part of the problem. Students need to reflect on Feiss’ (2005) list of positive characteristics, and consider how they can contribute to the success of a geoscience department. (1) Some of you aspire to an academic career, therefore these are lessons you need to learn now. (2) If you desire to work in any professional setting, you need to know how to represent your constituency. (3) It is

important for you remember that geology is the most integrated of the science disciplines. Geology is the nexus of science and you [students] need make that proclamation! (4) And, of critical importance to Sigma Gamma Epsilon, the University of Northern Iowa is the 'new' home for the National Office of Sigma Gamma Epsilon. Reasons for the transfer of the SGE National Office to UNI was the strong leadership role Dr. James Walters has played in Sigma Gamma Epsilon and the fact that UNI had one of the most active SGE chapters in the nation. I can't remember attending a Geological Society of American meeting in which one or more UNI students were not presenting their research. The Department of Geosciences at the University of Northern Iowa needs and deserves our support. Feiss (2005) doesn't put much stock in calls or letters of protest, BUT the proposed elimination of the Department of Geology and Geophysics at the University of Alaska - Fairbanks created such rousing protest from the scientific community the Provost's decision was reversed four days after being announced. Potential people to contact:

- 1) Dr. Gloria J. Gibson, Executive Vice President and Provost, University of Northern Iowa, 1227 West 27<sup>th</sup> Street, Cedar Falls, IA 50614.
- 2) Mr. James O'Connor, Executive Director of University Relations, University of Northern Iowa, 1227 West 27<sup>th</sup> Street, Cedar Falls, IA 50614.
- 3) Office of the Governor, State Capitol, 1007 East Grand Avenue, Des Moines, Iowa 50319. You can file an opinion with the governor's office at: <https://governor.iowa.gov/constituent-services/register-opinion>

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