

**IMPROVING THE GEOSCIENCE MAJOR: DEVELOPING  
COMMUNITY EXPERTISE IN CURRICULUM DESIGN  
AND ASSESSMENT**

***SITE STUDIES OF FOUR GEOSCIENCE DEPARTMENTS:  
AN EVALUATION STUDY***

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## INTRODUCTION TO SITE STUDIES

Over the past 5-6 years principal investigators from Carleton, William and Mary, and the University of Arizona have received several NSF grants to “raise the ability of geoscience departments nationwide to respond to changes in the nature of geoscience research, academic pressures and the needs of the geoscience workforce” (Proposal). The first two grants were *Building Strong Geoscience Departments* and *Building Strong Geoscience Departments II*. Under these grants the PIs offered “topical workshops addressing topics of high interest to geoscience departments” (Proposal) as well as on-line resources available to the public.

To extend this work the PIs secured a third grant from the National Science Foundation, *Improving the Geoscience Major: Developing Community Expertise in Curriculum Design and Assessment*. This grant proposed to

... enhance the design and implementation of geoscience programs and majors across the country through a series of workshops and on-line resources that foster sharing of information and resources among geoscience departments; bring education research and the experiences of other STEM disciplines into these discussions; and build skills in program design, assessment, and leadership. (Proposal)

Under this grant the PIs offered two national 2.5-day workshops, and traveling workshops. Interested geoscience/geology faculty members applied to one or more workshops and were selected by Carleton project staff members.

The first national workshop, *Assessing Geoscience Programs: Theory and Practice*, took place at Carleton College in February 2009. As described on the SERC Carleton website,

Departments are increasingly called upon to assess the impact of their programs on students and to measure the degree to which they meet stated goals. This workshop will showcase the methods and instruments that geoscience departments are using for this assessment, as well as providing opportunities to learn more about evaluation theory and practice from experts in the field.

The second national workshop, *Strengthening Your Geoscience Program: A Practical Workshop with Ideas and Examples*, took place June 2009, at the College of William and Mary. According to the website, and confirmed through observation,

This workshop focused on areas of high interest to participants, such as student recruitment, curriculum, co-curricular programs, assessment, and leading/managing change. Participants drew on strategies and examples from past workshops to develop practical solutions to the challenges facing participants' departments. (SERC/Carleton website)

This workshop was comprised of presentations, breakout sessions, and working time for teams from departments.

The workshop included approximately 70 participants. There were remarks and presentations to the entire group, numerous topic-related breakout sessions, and time for team activities that included the development of action plans describing the steps teams would take on return to their colleges and universities. The topic-related sessions included: Curriculum and Program Design; Preparing Students for the Workforce; Recruiting and Retaining Students; Program Assessment; Beyond the Curriculum; and Building a Department Team; Dealing with Disciplines; Reaching Beyond Your Institution; Working with Alumni; Graduate Programs; and Incorporating a Stronger Field Component in Your Curriculum. Participants developed action plans describing the steps they would take on return to their colleges and universities.

The traveling workshop program was designed to “bring the knowledge gained from the topical workshops onto campuses in a way that supports conversation and planning by the department as a whole.” In applying, a department faculty selected the workshop topics from a menu of choices, as well as the workshop dates, and length (1-2.5 days). A team of two leaders then developed a customized workshop for each department. The topics included:

- Curriculum and Program Design
- Departmental Activities Beyond the Curriculum
- Recruiting Students
- Preparing Students for the Workforce
- Program Assessment.

Traveling workshops were deliberately designed with several features in mind. First, on-site workshops are cheaper for departments than are national workshops, and allow an entire faculty to participate. Second, the faculty decides what topics are most pertinent to their situation and goals. And third, with two workshop leaders, each can bring different expertise, perspective, and knowledge of a home institution.

## **THE SITE STUDIES**

Early in 2009 the Carleton PI and internal and external evaluators designed a study to assess the value/impact of the workshops as well as the ways in which the national and traveling workshops informed departmental change over time, if at all. The study included post-workshop surveys disseminated by Carleton and a small qualitative study of four geoscience/geology departments selected by the Carleton PI. The departments were situated in both large and small universities/colleges and offered BAs, or both BAs and MAs. They also met the following criteria:

- The departments were poised for change, and a workshop might have an impact
- Each was at least a 4-year institution; no community colleges were included

- Faculty submitted strong applications

## **DATA COLLECTION**

The evaluator collected the following data for each site, where available:

- Workshop applications
- Pre-workshop interviews (for traveling workshop sites)
- Action plans
- Post-workshop surveys
- Post workshop interviews
- Email exchanges
- Final interview, late spring 2010

Data was analyzed in order to understand change over time, within a framework informed by Carleton's Characteristics of a Thriving Geoscience Department.

Names and other identifying information have been altered for purposes of anonymity.

# **FAIRLANE**

## **THE WORKSHOP**

Two faculty members from the Department of Geological Sciences attended the June 2009 workshop at the College of William and Mary: *Strengthening Your Geoscience Program: A Practical Workshop With Ideas and Examples*. One was slated to become the chair of the department June 2010. All quotes in this report are taken from interviews with, and emails from them.

## **THE COLLEGE**

Fairlane College was originally founded in 1860 and joined the state university system as a liberal arts college around 1950. It is currently considered to be an honors college in the university system, offering fifty degree-programs. It is located in a small rural town with under 10,000 inhabitants. The college has an enrollment of about 5,500 students, 96% of whom are undergraduates, and 74% are white (13% unknown).

The state university system and, therefore the college, is in the midst of a budget crisis. The Fairlane budget has been substantially cut and currently there is a hiring freeze. When a faculty member retires his or her position is not filled for 1-2 years and when the position reopens it may not be in the same department. The president is now emphasizing energy and sustainability and to that end she formed a coalition of colleges and universities dedicated to that goal. The administration is emphasizing increasing enrollments and recruiting more majors as well as other potentially financially beneficial endeavors, such as an increase in summer courses and on-line courses.

## **THE DEPARTMENT OF GEOLOGICAL SCIENCES**

There are 6 faculty members in the Geological Sciences Department including 2 full professors and 4 assistant professors (3 are tenured and 3 are not). Students select among four tracks: Geophysics, Geochemistry, Geological sciences, and Civil Engineering. Traditionally it has averaged 8-9 majors per year. According to the website the faculty strives to prepare their students for graduate study in the geological sciences, but also for jobs in which they apply a scientific methodology to Earth systems and materials. Approximately 70% of the majors in geological sciences have attended graduate programs.

The curriculum is traditional “in terms of what we expect and how we order the classes”. While the curriculum includes environmental topics, courses stress rigorous geoscience concepts. It is important to the faculty that their program is high quality and up to date. The department works as a team and professors work together congenially. The faculty deliberately cultivates a sense of community among their students by scheduling activities that allow students to get to know one another outside the classroom. During the January break on alternate years the faculty takes all junior and senior majors on a 2-week field trip, and each fall they take all students (majors and minors) on 2-day field trip as well. As a department they work within the confines of the university —“the

machine”—and not against it, and enjoy a positive campus-wide reputation and respect. Their external reviews have always been good.

Budget cuts to the department were greater than anticipated and the faculty is concerned about the department’s future, even though the department is well respected. The department budget was not decreased during a second round of cuts last January (they were informed that this was because they had used up all of their funds) and, consequently, no teaching assistants had to be laid off. In their workshop application they described the situation as follows:

The College is brainstorming cost-reducing or revenue-generating initiatives to prevent the elimination of programs. If the College is unsuccessful at bridging the budget deficit, then programmatic cuts will occur in 2-3 years. Although currently the College administration considers the geosciences to be a very strong, well-functioning department committed to serving our majors and the Mission of the College, being a small department makes us an easy target. Assuming that we’re safe would be naive.

### **Recent History of Department**

This small department has undergone several changes in recent years. The well-regarded and beloved chair of 16 years retired three years ago, and the current chair completes his third and final term during spring 2010. In addition, three new professors joined the department in the past 4 years and a fourth joined seven years ago, shifting the balances of professors’ ages as well as the numbers with tenure. During each semester, each faculty teaches one upper level and an introductory course and any associated labs. In some cases, a faculty member might solely teach courses at the 200 level or higher due to her/his expertise and the departmental needs.

With any future hires, the department will continue to seek candidates “whose personalities will fit well with our culture so we can sustain (the departmental culture)”. The department also hopes that the administration will maintain the current number of faculty members in the future and won’t decrease that number.

With the influx of the newer professors the departmental program is infusing climate change into courses in the otherwise traditional curriculum.

Fairlane is in the process of creating an Environmental Sciences major with a Geological Sciences track. The department has selected courses they consider critical for students going into environmental science and will also develop and offer interdisciplinary seminars for juniors and seniors. Winding its way through the approval process, it is not clear if or when the new program will be offered: The first gate-keeping step is approval at the state level.

A new 5-year Masters degree program in Education is under discussion and will offer students a traditional geology degree and a masters degree in education with the 5<sup>th</sup> year of study. The Department of Geological Sciences will develop two new courses for this masters program including an Earth systems science course and an advanced physical geology course.

Recently the department was relocated to a new building with twice the space they had had as well as new analytical capabilities.

The faculty honed assessment tools to help with the 2005 external review. These included student performance in specific courses and assignments as well as numerical data such as the number of students participating in research and internships, acceptance rates of graduates into graduate programs and alumni survey data. In addition, the department has writing requirements and keeps student portfolios. The faculty track the numbers of students who go to graduate school within 2-3 years or get jobs in the geosciences in the same period, and use these as indicators of how well their programs are serving students. In addition, they have the traditional internal and external reviews.

Past external reviews have been positive, which have been helpful politically. At the same time, one professor said that a drawback of the last review was that reviewers did not list any actionable items for change/improvement, since such feedback might have caused the faculty to examine their program in a constructive manner. The department generally refers to the American Geological Institute's site as one component of review preparation, checking to see if their program is "following the trend and paying attention to what is effective in geology". The next review is scheduled for 2010-2011.

The budget cuts present one challenge to the department. The professors, fearing for the department's future, have been seeking ways to establish its value to the university.

One challenge is, how do we work within our department but work to be valuable to the university at the same time? We do not want change that negatively impacts how we are viewed by the administration.

## **THE WORKSHOP**

Two professors from Geological Sciences applied as a team to the *Strengthening Your Geoscience Program* workshop.

### **Goals**

On their application the professors indicated several reasons for attending the workshop and what they hoped to address: 1) faculty turnover and the need to determine the next faculty line; 2) what constitutes successful geology programs; 3) preparation for their external review; 4) better ways of assessing courses, and; 5) strategies for increasing the number of minority students.

### **The action plan**

Between the time when the faculty applied to the workshop and attended it the College increased an emphasis on building enrollments and recruiting majors, which informed the two professors' thinking and planning. They developed an ambitious set of ideas during the workshop including incorporating a service-learning component into two courses; developing two new courses that "tap into the hot topics of sustainability and climate change", increasing the department's outreach and visibility; and improving recruiting efforts. At the end of the workshop they developed a detailed action plan.

The two faculty members filled out a post-workshop survey that indicates that they found the workshop very useful and that participation as a team was important:

- *The sessions met their needs:* Specific sessions met their need for strategies for obtaining administrative buy-in, student recruitment, and "tools for addressing the concerns of the department"

- *Learning about other geology programs:* They left the workshop reassured that their program was ‘current’ and that their ideas for implementation were similar to others’
- *The action plan:* They found that developing their action plan was beneficial: “It was really good for us... We asked every step of the way, ‘Why take this step, how do we determine if it is working?’”

## **OUTCOMES: WHAT DIFFERENCE DID THE WORKSHOP MAKE?**

After the workshop the two professors shared their action plan during a departmental meeting. They introduced the Strengths, Weaknesses, Opportunities and Threats (SWOT) matrix that they had used during the workshop as a tool to use in a fall retreat. The faculty as a whole agreed that service learning is important to the College and should be better integrated into their courses. They also agreed that a new course on energy and sustainability was needed in the college and should be associated with the Geological Sciences Department, and that this course should be an introductory course that could potentially increase the number of majors.

### **SWOT Matrix**

Being introduced to and using the SWOT matrix was arguably the most useful aspect of the workshop for the Fairlane professors. They believe that it will help them achieve one of their initial goals of pulling the faculty together:

The SWOT was really, really helpful. We are usually on the same page and feel free to be open (in our meetings). We suggested that we use this approach with more challenging topics as it allows young untenured faculty an opportunity to voice issues, concerns, or strengths in a non-threatening arena.

The non-tenured faculty members in particular liked the idea of using the SWOT and the department is considering using this tool.

One of the professors continues to use SWOT matrix as often as he can, “right and left”, and has used it with a campus task force he is on when members bring opposing agendas: This tool helps faculty assess the strengths and weaknesses of each argument.

This spring the two professors had many conversations with the incoming chair and shared the ideas they had formulated at the June 2009 workshop—for example, tools to help people focus on the department’s mission and goals “in a non-threatening and constructive atmosphere”, ways to ‘get through’ the external review as well as how to position the department within the College. The three discussed the SWOT tool and its value:

(We discussed) how a technique like that allowed an untenured person to feel they have more freedom to speak their minds. As the six (faculty members) we think we get along well but it does not mean the untenured person says the things they want to say. (The incoming chair) understood this as an untenured person at that time. I think it will be important to us since the junior-most faculty member barely says a word at department meetings and we don’t know what she is thinking so this is a way to see what clever ideas she has. It could be tremendously beneficial to the program.



Following these discussions, the incoming chair visited the SERC website and downloaded the Characteristics of a Thriving Geoscience Department, and read about geology/geoscience departments that had been eliminated.

### **Curriculum**

Given the fact that the college president signed a climate commitment contract, a college task force highlighted the need for a course (available to all students) on sustainability and climate change since none existed in its report to the administration. Faculty members in the department quickly offered to, and then developed such a course—a smart and strategic move, in line with the department's action plan. This course was first taught as a class for honors students, and then as a more general 200-level course. After being thoroughly tested, the course was translated into a new 100-level general education course on the geology of energy and sustainability. It will be taught in the fall and will enroll 120 students.

It (the 100-level course) will become a permanent course as result of our attending the conference last June and seeing the significance of teaching this – coming back and saying this needs to happen.

### **Department and faculty visibility**

Mid year the two professors reported that the department had not made major strides in increasing the department's visibility although they had increased community networking. Over the course of the year they carried out several community-related activities (both near and far):

- The department co-hosted local teachers to help design enrichment curriculum for teaching about energy. One of the attendees arranged to bring his students to work with the departmental wave tank and hunt fossils in the field with faculty members
- The paleontology faculty member led a community field trip for the local nature conservancy
- One faculty member presented details regarding the department's seminar series as an exemplar of student-driven research at a national meeting.

This spring the College administration acknowledged three geology professors in significant ways either unrelated to, or as an indirect outcome of the faculty participation in the workshop, a vote of confidence in the department.

Two professors were recommended for tenure; one professor was given a major teaching award; two professors were asked to serve on 2 different task forces for the College, one as a co-chair; one was asked to participate in the academic dismissal hearings; and one professor was elected to a Senator-At-Large position within the college senate. Finally, when one professor was writing a proposal to the NSF for a \$400,000 piece of equipment, the college vice president of finance and management contacted him, communicating that the college had located funds to purchase the equipment.

### **Internal and external reviews**

At the workshop the professors realized that the department should be less passive and more proactive in preparing for their reviews than they had been in the past. Through the workshop they identified a potential external reviewer and suggested her/him to the chair.

This year they expect to prepare the department's external review by using the Characteristics of Thriving Departments to provide a focus and organizational framework. One of the professors commented on its usefulness:

For me it is a frame of mind issue. It has helped me to constantly go back to the Characteristics of Thriving Departments and I have it on my bulletin board. It is constantly reminding me of the theme and will become a focus as we go through the process of our review—how to do it honestly but with this in mind and promoting the department's strengths. As we write the review together and put the dialogue together, using these characteristics will help set up the framework. (The Characteristics of Thriving Departments) also takes what we think of as daunting and provides us with a clear framework with which to work.

## **DEPARTMENT AS OF JUNE 2010**

A new chair of the department will assume this role in the fall.

*Courses:* The honors course committee asked one of the workshop participants to develop and teach a new course on forensics. Another faculty member will incorporate service learning into his hydrology course.

*Recruitment:* The plan to recruit minorities has yet to be addressed as a result of inaction on the part of the admissions department and the outgoing department chair. Meanwhile, one workshop participant took the step of inviting students with C's to become geology majors for the first time, hoping that the pool will include minority students.

Two faculty members gave sample lectures to prospective students (students who were undecided whether or not to attend the college). As an outcome of the lectures the admissions office requested a meeting this summer to learn more about the department and its facilities, among other information, in order to help recruit students.

*Politics:* Departmental faculty members communicated their concerns about the budget to their alumni: Several sent letters to the College President stressing the strength and importance of the geology program, endorsement for the department. Subsequently the department received strong and encouraging words from the College President, commenting that he was aware of the strength of the geosciences program and did not believe it to be at risk of being cut.

## **SUMMARY**

The Fairlane Geological Sciences Department faculty made, and continues to make changes in their program and departmental activities in alignment with Carleton's Characteristics of a Thriving Geoscience Department. As an outcome of the workshop:

- Faculty realized the importance of adding a new course on climate change, and strategically volunteered to develop one at the 100-level in keeping with the President's climate change contract and in response to a college task force recommendation for such a course. Two professors have designed the course.

- The new 100-level course will meet Gen Ed requirements, may bring in more majors (a goal), and will increase the department's value to the university;
- New hires are teaching more climate change-related courses;
- One of the professors who attended the workshop refers to, and has used the SWOT matrix to evaluate the geology program/courses in various departmental meetings
- The two professors who attended the workshop have become more proactive in preparing for the next departmental review and are using the Characteristics of a Thriving Geoscience Department as the framework.

# CAUSSET COLLEGE

## THE WORKSHOPS

The Geology Department at Causset College hosted a traveling workshop in February 2010 with a focus on curriculum and assessment. All quotes are taken from interviews with the department chair unless otherwise indicated. Note: The Geology Department recently merged with the department of Environmental Science and Studies, which has a common chair. For this report we will refer to the former Geology chair as ‘chair’ or Dr. Armitage. We will refer to the chair of the combined departments as the *new* chair.

## THE COLLEGE

Causset College is a small, private, liberal arts college located in a rural setting. Situated on several hundred acres of land, approximately 1,600 students attend annually. The college graduates around 79% of its students, of whom 96% graduate within 4 years. A statewide decline in high school seniors has the potential to affect the college overall, including the Geology Department. In this instance, the college would likely trim staff: If the Geology Department were reduced from the current three tenured faculty members to two it would be devastating. In addition, college budgets are very tight which has already affected the Geology Department. The college once enjoyed research funding from a foundation but that funding stream is drying up, research across departments has been reduced, and scientists are competing for what remains. Administrative attention is focused on enrollment, which has increased according to recent reports.

## THE GEOLOGY DEPARTMENT

The Geology Department is small, with one full professor, one associate professor and one assistant professor. Dr. Armitage is contemplating retirement in 5 years but is likely to postpone this if he believes that the geology major would be endangered. The department offers a field-oriented undergraduate geology program: Most courses include fieldwork, and freshmen take *at least* 10 field trips their first year. Professors emphasize the development of “a well defined set of skills” in their courses. An off-campus field station complements the on-campus program. On the Causset website the geology major is described as serving students who want a career as practicing geologists or who plan to attend graduate school. Majors may eventually earn state certification as professional geologists. The chair noted that the faculty has largely been allowed to make curricular decisions without interference.

Over the past few years the faculty has involved an increasing number of students in independent research projects and presenting their research at poster sessions at annual meetings of the Geological Society of America. The faculty as a whole would like to mentor more upper level students who are conducting research but have to layer student mentoring on top of their existing course loads.

## RECENT HISTORY OF DEPARTMENT

The Geology Department lost one faculty member recently. She was replaced by a young assistant professor, the faculty strengthened their amicable relationships, and the professors currently work well together.

Approximately two years ago the provost initiated a significant change when he proposed a merger between the departments of Environmental Science and Studies (ESS) and Geology, creating a new department of Earth and Environmental Sciences (EES) with a combined faculty of six. Although the ESS department was formed ten years ago, is newer than the Geology Department, and has a smaller faculty, it has always drawn more students:

The Geology Department, as an independent unit, has always offered accessible natural science distribution courses to the student body at large. While we built a small but strong geology program, supported by larger enrollments in the service courses, the newer Environmental Science and Studies program, though having a smaller faculty, has always had a much stronger recruitment record resulting in a ballooning of enrollments in ESS courses. Enrollments in geology courses did not balloon in the same way.

Initially the provost proposed that the two departments ‘try’ the merger. All faculty members saw benefits for students. Each department retained a chair, the departments’ budgets were separate, but the faculties regularly held meetings. The Geology faculty was “willing to give it a shot”. At some point the university president announced that the merger had taken place. Since then the two departments have been merged administratively with the new chair coming from the former ESS department. Several factors led to the merger including:

- During the 2002 external review the reviewers commented on course redundancy and tensions between the two departments and suggested increased cooperation between the two.
- The college enrollment office, with an eye to increasing enrollment, believed that they could more successfully market a combined department than two individual ones.

According to the chair of the Geology Department, the merger has not been easy, attributable more to individual than disciplinary differences.

No student in Earth and Environmental Sciences carries a degree that says Earth science. They (the ESS faculty) have a lot less in common among themselves and no more or less in common with any of us. It was going to be a challenge no matter how it was resolved. We are not hunkered down, but to all of us who define ourselves as geologists there has been an absolute commitment to say, “Whatever we do we need to preserve the geology major we can be proud of and send students on to careers”. At some level we are minding our own business and trying not to raise or wave many red flags. The awkwardness of a (merged) department of 6 is that it offers as many distinct majors as faculty.

The chair described key differences in the cultures and approaches of the two departments. Environmental Science has a more menu-driven cafeteria-style program than Geology, which is more pyramidal in its structure. ESS students select among multiple options, resulting in a less coherent program than there might be otherwise. The curriculum focuses on issues, projects and problems. The three ESS professors operate as

individuals for the most part, working little with each other or the Geology faculty. The geology curriculum tends to focus on skill development in the labs, field training and general approaches to problem solving rather than issues. The three faculty members work together well and make decisions together.

One of the positive outcomes of the merger has been an increase in cross enrollment. More of those students who identify themselves as ESS now take upper level geology courses. While only geology students would have taken mineralogy in the past, this past spring the students were more diverse, with a positive consequence:

For almost the first time I had a chemist take the class and some Earth Science students also took it, and that worked well for me and the students and led to incremental changes in how I deliver the materials and it (worked) for the students as well.

Two years ago the Geology chair developed a successful new course in sustainable agriculture that was responsive to current issues of interest:

We are not oblivious to change in surrounding environment and student interest. And this includes non-science student interest as well. Two years ago I instituted a one-credit class in sustainable agriculture that has been extraordinarily well received.

As an outcome of the merger there have been several changes in the geology curriculum. The merger provided an opportunity for faculty to eliminate two courses that were also offered by ESS, and replace them with two new and interesting ones. This is significant in such a small department where faculty cannot add a new course without eliminating another. The courses the faculty decided to eliminate include an entry-level distribution course in meteorology and aqueous geochemistry. New courses include climate change (building on the new faculty member's strengths) and a revised energy, minerals, and society course, last offered ten years ago.

Following discussion between all faculty members in the merged department, the Environmental Science faculty made a commitment to send their freshmen to the introductory geology course, which Geology perceived as important since they consider this a gatekeeper course:

(The concession is) small but important for us, and it speaks to some attempt to accommodate all of us in one program together. It was the willingness of Environmental Science to say that geology is important enough that we will ask students to take it in the freshman year. It's been important to us since that is a gatekeeper course for us. It makes it possible for students to discover that we exist and elect to take other courses.

Causset College expects all departments to carry out internal self-studies in addition to external reviews. The Geology Department's most recent external review was in 2002. The new EES department was in the midst of a college-mandated periodic review when Dr. Armitage applied to the traveling workshop program. Completed last fall, the Geology faculty invested considerable time developing/writing the self-study with limited contributions from ESS faculty members:

A large part of my involvement in writing the self-study report was in trying to document that we are getting good outcomes for our students and are not an extravagant staff and our program mirrors what happens at other quality institutions.

The Geology chair approaches external reviews as useful, even though in the past there was little follow-through. While the department tried to locate external reviewers from merged departments for the spring 2010 review they found this difficult: “To be honest, very few mirrored our structure”. Consequently invitations to reviews were sent too late in the spring to set up a spring visit. The external review should take place in the fall.

The Geology faculty believes that it is important to respond to change and approached the workshop as an opportunity to tweak their program.

## THE TRAVELING WORKSHOP

I think (a traveling workshop will be) very timely for us since it gets us thinking seriously whether there are curricular issues we should be considering rather than the status quo. Everyone everywhere is talking more about accountability and assessment. While we do not have a lot to be embarrassed about, we do not have effective ways of assessing our program and components. We are good at the conceptual side of what we want students to emerge with, but in terms of proving this, we do not know how to do that.

Dr. Armitage identified three focal areas in which the faculty sought guidance on the Causset College workshop application—assessment, the role of the department within a larger department, and the faculty ownership of the geology program, particularly by the new faculty member who had inherited courses when she arrived. Through participating in the workshop the chair hoped that all faculty members would feel that their input was pivotal.

Dr. Armitage outlined the workshop outcomes he hoped for during his pre-workshop interview:

- A critique of the curriculum: The faculty felt that they had an ‘old model’ of course offerings, and wondered how the traveling team members would view their geology program and pedagogy
- Buying time: Dr. Armitage wanted strategies for ‘buying time’ while the department implements new features of the merged program. “As long as we run full tilt there will be little innovation”
- “Supportive ammunition”: He wanted the faculty to learn strategies for making their case to the entire department and to college administrators.

## The Workshop

According to the Geology chair, all faculty members were highly involved in the workshop. In addition, each of the two ES faculty members on campus at the time spent an hour and a half at the workshop, although they were only slightly involved given the workshop focus on the geology curriculum for majors. Workshop leaders introduced a curriculum matrix, a tool for evaluating programs/courses, and left the faculty with the task of developing an action plan that identified 3 goals, steps for attaining them, and a timeline for carrying them out.

Each of the faculty members filled out a post-workshop survey. Reviewing their responses—what each of them learned, the departmental shifts they anticipated, and what

they most valued— it is clear that they found the workshop very useful. Their comments included:

- 1.) *Gaining an increased focus/intentionality/deliberation*: The workshop encouraged a ‘deliberate approach’ as the faculty focused on their program and what they wanted their best students to get from it. In addition, with the presenters’ guidance, they identified what they wanted to improve, and realized that given their program flexibility they were able to revise their courses fairly easily.

A beneficial perspective was the encouragement to focus on what we want our best students to look like. Not just academically, but also in terms of people, leadership and experiential skills. Here, too, we see that by bringing intentionality to this area, we should be able to advance our students and ourselves through incremental adjustments. (Survey)

- 2.) *The curriculum matrix*: The three faculty members found the curriculum matrix a useful tool for assessing their program and identifying the content and skill set they wanted their students to acquire.
- 3.) *Politics*: Dr. Armitage wrote that the workshop was highly beneficial “as a structure parallel to our periodic review”. The fact that the presenters asked the faculty to look at themselves in a “non-adversarial, prove your value to us” format was encouraging and empowering.” A second professor understood the importance of making the geology program visible: “...by encouraging a deliberate approach and making our teaching/curriculum choices visible to the wider community— administration, faculty peers, and students”.
- 4.) *Collegial interaction*: The faculty highly valued meeting with the workshop team, hearing their experiences, learning about their departments, and hearing their perspectives on the Geology Department’s issues and concerns.

## **OUTCOMES: WHAT DIFFERENCE DID THE WORKSHOP MAKE?**

The Geology Department and its faculty members benefited from participating in the traveling workshop in a number of ways.

### **Amongst the faculty members:**

The workshop sparked valuable discussions, which continued past that day. Working with the curriculum matrix in and of itself helped the chair reach his goal of building faculty ownership of the geology program:

The fact of having sat down and talked about the courses we offer and the pieces in them—working with the matrix— provided a lot of support for that goal of making all faculty feel they were committed and had ownership of the curriculum and enabled us to see how as individuals we have opportunities and the flexibility to incorporate the component pieces we want.

### **Curriculum and curriculum matrix**

Discussions and activities that took place during that day illuminated several characteristics of the geology curriculum for the faculty. While the chair does not believe that there will be major curricular change, faculty insights reached during the workshop have implications for curricular revisions within existing courses. The faculty developed



a skills matrix based on their beliefs about a good geology education. In the process they—

1. Looked at each of their courses and indicated if/to what extent each addressed the matrix components
2. Structured their curriculum to discover whether or not it built skills progressively
3. Looked for course redundancy, and
4. Checked to make sure that they were adequately addressing important concepts.

The chair anticipates course adaptations as a result. The faculty is continuing to work on their matrix, and have yet to complete their skill set. They plan to ‘test’ their matrix against content standards and the literature. The curriculum matrix is seen as so valuable that in all likelihood the department will continue to use it on an ongoing basis. Dr. Armitage is also considering giving the matrix to all graduating seniors and asking them to identify where they built their skills within the Geology program.

The workshop was an affirming event: The faculty realized that their curriculum was appropriate and oriented towards developing skills rather than facts. As a consequence they identified items that should be addressed earlier in the curriculum. For example, the faculty realized that they should build students’ math skills earlier in the program, more deliberately, and with more direct instruction. They came to the conclusion that their courses are adaptive, and that faculty members can easily add to, or subtract material from them.

We do not picture major changes in our course offerings because we think we are all persuaded we can make adjustment in curriculum structure, and we all like the more pyramidal nature of course sequencing as opposed to 2-3 introductory courses and then a menu.

After the workshop the faculty developed an action plan that addressed three areas: 1) developing a skills and content matrix and using it to evaluate their curriculum; 2) determining if there are courses to collapse or introduce, or universal research experiences to add; and 3) re-examining the first year EES introductory course and comparing it to introductory geology.

### **Alumni Outreach**

Another outcome of the workshop is that the department established an alumni Facebook page, encouraging conversations/input about the geology curriculum. One alumnus, for example, responded that the geology program should consider adding a component that builds leadership skills, as these were important in his own job. According to the chair, the faculty had assumed that leadership developed automatically, and now realizes that this is not necessarily the case and consequently the faculty may build the development of leadership skills within their program.

### **Outcomes, the Merger, and Politics**

The chair of the Geology Department believes that each of the two merged departments will retain a certain degree of autonomy. He is hopeful that over time the combined faculties will find a way to “make the merger work”.

According to the Geology chair, the new chair of the *merged* EES department places greater value on the Geology Department than previously due to the selection of the Geology Department to host a traveling workshop, and the self-study report.

The fact of (the traveling workshop) program selecting us to be involved in the workshop in and of itself was an endorsement and I think we will be able to play that. The realization that we were participating in a workshop that was a competitive process, a selective process, proved important. And between that and the really substantial effort we put together with the self study we have brought the chair of the combined departments to the view that we are doing good and appropriate things and that this is not just a half baked, non-competitive, weak program on campus but that it has a history and a (curriculum) trajectory, that we are involved with our students and their outcomes, and he had not seen this before...We gained a good deal of credibility and comprehension about why it is important for us to retain some level of autonomy... I think we did a good job and acquitted ourselves very well in looking at the important pieces and providing a framework for looking at how our program compares with others nationally.

## **DEPARTMENT AS OF JUNE 2010**

*Courses:* The new geology professor offered a special topics class during the spring term on climate past and present, working with a colleague in the political science department. The class offered not only a new perspective on geology but benefited the students and the Geology Department as well:

(Professor) has taken an interesting twist in a positive way that's good for students and for us on campus. She has worked collaboratively with a colleague in the political science department and will morph this class into a team taught course that will meet one college requirement of an interdisciplinary colloquium. With more attention to social and political aspects as well as science, that collaboration is really grand in other ways. It called attention to an obvious aspect of climate that a narrow scientific orientation class would not do or address in a way that has broader appeal to students. And it's also building bridges with other departments.

Team-taught interdisciplinary courses are not new to the department, but the climate course is of current importance and of high interest, and comes at a time when it serves the department well politically.

Building on the success of the sustainable agriculture course he first offered 2 years ago, Dr. Armitage is considering developing a new course on soil science, and sees it as a bridge between Geology and ES. However, he asks, "What do we give up?"

*Student survey:* An Earth and Space Secondary Education major worked with the new geology professor last spring to develop a survey based on recent research on spatial skills. He administered it to juniors and seniors across the campus and found that geology students outperformed those in other departments. This activity "put the geology program on the map" as paying attention to assessment, according to Armitage. He is considering administering a skills-based test to geology students throughout the year to discover whether individual courses affect the development of spatial skills.

*Grant-writing:* At this time there is a major grant-writing effort at the college to secure funds for STEM education, including geology. In addition, the University is approaching local oil companies for support: These companies have had relationships with just the Geology Department to date, which may operate in the Department's favor.

## **SUMMARY**

Following the traveling workshop the geoscience faculty took several steps that align with Carleton's Characteristics of a Thriving Geoscience Department, particularly in regard to the curriculum.

- They used the curriculum matrix to examine each course and if/how each built competency, and may continue to use the matrix in the future.
- They looked for redundancy between the courses they offered and those offered by ES. As a consequence they eliminated 2 courses and developing two new and appealing ones including an interdisciplinary course offered in collaboration with a professor from political science, which will become team taught to meet university requirement of one interdisciplinary colloquium.
- The faculty realized that they could adapt courses by shuffling material in and out.
- They developed a Facebook page in order to collect feedback about the geology program from their graduates.

At this time all faculty feel ownership for the curriculum. The new chair perceives that the Geology Department faculty is doing "good and appropriate things with a curriculum trajectory". His view is based on the department's self study, their selection for the traveling workshop, and succeeding activities.

# **LANSDALE STATE UNIVERSITY**

## **THE WORKSHOPS**

The Lansdale Geoscience Department chair attended the February 2009 workshop, *Assessing Geoscience Programs: Theory and Practice* at Carleton College, and hosted a one-day traveling workshop mid winter 2010, with a focus on their curriculum and the preservation of the department. All quotes have been taken from one of three interviews with the department chair unless otherwise indicated.

## **THE UNIVERSITY**

Lansdale is a relatively small campus within the state university system, established in the 1970s, and located near large oil fields. There are fewer than 10,000 undergraduate and graduate students, with a large minority enrollment. Recently the university, like many others, has faced and will continue to face major budget cuts through at least 2011. At this time if a faculty member leaves due to retirement or takes on administrative positions within the university s/he cannot be replaced.

## **THE GEOSCIENCE DEPARTMENT**

The Geoscience Department offers both undergraduate and masters degrees. According to the chair the curriculum is traditional with a focus on the applied fields of petroleum geology and hydrogeology of regional interest. The department is one of the smaller departments at the university but is highly regarded. There are 5 tenure-track faculty members, with only one of them untenured and all others at the full professor level. The four senior faculty members are likely to retire over the next ten years. Almost all courses include labs, and field trips are routine. There were seventy undergraduate geoscience majors and twenty-two graduate students during the 2009-2010 academic year. The department has some difficulty retaining good faculty members, who leave for positions elsewhere, as is the case within other departments as well.

### **Recent History of Department**

Over the past few years there have been several changes within the department. The number of students has grown: In 2006 there were 25 undergraduates and by 2009 there were 70, and the number of graduate students doubled in the same period of time.

The budget cuts have had a profound and far-reaching impact on the department. While the number of students has been increasing, the number of faculty has decreased. The department has some difficulty retaining strong junior faculty members: Two hires over the last ten years left for better positions elsewhere after only one year in the department. The last internal review was in spring 2009. While at one time about a third of the courses were taught by adjuncts, most adjuncts were let go due to budget cuts, and tenured faculty members taught these courses during 2009-10.

There has been a drastic reduction in the number of units that the department offers: From 205 units in the 2006 year, the number dropped to 165 in 2009 and will be 145 in 2010-2011. Yet at the same time the university expects the department to reach and teach the same number of students.

You lay off those who teach less and are less expensive and then have regular faculty who cost more and teach less. That has been a big change.

While the curriculum itself has remained the same, the reduction in faculty has affected the curriculum in other ways. Last fall, in advance of the traveling workshop, the department was considering eliminating field trips, eliminating labs from some courses and reducing their number in others.

The department faces other challenges as well. This is a commuter college with a non-traditional student body. Many students have families and some have full time jobs. Retention and graduation rates are of concern as they are across the campus. There are many local geology jobs. According to the chair, some students take a few courses and then leave for internships and jobs. Others drop out of the program “because it is not an easy major...they may be able to get through other programs with a limited effort”.

The Dean is supportive of the department, but at the same time the Geoscience Department is only one of many of his concerns:

He is sympathetic but we are a little speck on his radar screen. We have a lot of squeaky wheels in the larger departments that take a lot of attention.

## **GOALS FOR WORKSHOP AND ACTION PLANS**

### **Assessment Workshop**

In his application to the *Assessing Geoscience Programs* Workshop the chair described why he wanted to attend the workshop, his concerns, and what he wanted to achieve. His comments foreshadowed events that have since unfolded as well as changes the department made since that time. Possible threats to the department's existence were looming on the horizon:

We are vulnerable in terms of the number of students and graduates compared to other science departments should there ever be a need for serious cuts at our institution, which is quite possible given the state's budget malaise.

He understood some benefits of a robust assessment system, but some of his colleagues were resistant:

I am a member of a department with a tradition of resisting the push towards formal assessment, arguing that it is a waste of time that distracts from more important issues. However, I realize that assessment is here to stay and can provide important information for program improvement and for justifying our program.

From participating in the workshop he hoped to learn what constituted a successful, formalized assessment program. As he noted during a later interview,

I wanted to find ways for us, with as little effort and pain as possible, to meet the assessment we are supposed to do and then turn them into something we could use positively for our department.

At the workshop the chair found it particularly valuable to see examples where faculty used assessments to the department's advantage, and he got a better sense of the steps to take in developing an assessment plan. He realized that it's possible to use student and alumni survey data in seeking additional resources from the administration, for example arguing that the department should offer a particular course that has been identified by alumni as needed. On leaving the workshop he hoped to develop and implement "exit surveys, an alumni survey, and rubrics-based evaluation of senior theses, MS proposals, MS theses, and MS thesis defenses." (Post workshop survey)

During his pre-traveling workshop interview he noted that the department's non-participation in assessment had been hurting the department.

### **Traveling Workshop**

I hope we come out of (the traveling workshop) energized and with a plan to be more proactive in this climate and with ideas to go forward with to position us well. Right now we are trying to keep our heads above water. You lose the big picture and maybe this will help us regain a broader outlook.

Seven months later, when the chair applied to the traveling workshop program in September 2009, the faculty was aware that the department was in a precarious position. The administration had announced that it did not want across-the-board cuts. The chair noted that this meant that the administration would cut departments, and he was concerned that the Geoscience Department would be one of them: With the exception of geoscience courses for majors and two others, the other classes offered by the Geoscience Department could be replaced by faculty in other departments.

There had been university-wide unsubstantiated rumors that the entire department might be eliminated. The faculty was rethinking the curriculum and exploring strategies to preserve their program and strengthen the department's position within the university. At the same time the Geoscience Department was positioned well in some respects. The department had a good reputation, enjoyed community support, the provost appreciated the faculty and the president was aware of this too.

Faculty members had carried out collaborative research with one potential member of the traveling team and had requested him to be on the traveling workshop team. Three of the five faculty members had met with him at a recent Geophysical Society of America meeting and believed that he understood their situation and could be helpful.

The faculty requested that the traveling workshop address several topics. The key topic on their list was "surviving and positioning ourselves to be strong in the future", followed by their curriculum.

One of the two presenters, stuck in a snowstorm, took part in the workshop via video conferencing, but this did not seem to detract from the day's activities and discussions. At the end of the day the faculty and the on-site traveling team member met with the Dean. The faculty was positive about the workshop.

Following the workshop the department completed a post-workshop survey and developed an action plan. On their survey the respondents described what they had learned and what was most valuable about the workshop.

- *Being proactive:* The importance of being proactive: three faculty members stressed this, joined by the chair during his interview.

I think the main thing was trying to think like an administrator and address their concerns in order to get what we want—in other words, work within the system.” “It made me much more aware about how the appearance of interfaces (website, dept displays, offices, etc) with the public, potential students, and administration influence general opinion.

- *SWOT analysis:* The SWOT analysis was important, mentioned variously by several faculty members. One noted that s/he learned the importance of self-analysis, and being aware of departmental strengths and weaknesses.
- *SERC website:* For two faculty, learning about the Carleton website and resources was most valuable.
- *Meeting as a department:* Having the opportunity to meet together for a day to reach agreement on several issues and make strategic plans was also valuable.

According to the chair, the most interesting and useful aspect of the workshop was exploring “things that make your department strong outside of teaching... we saw things we were doing well and things we could do a little more”. Directly following the workshop the chair reported that the department had identified successes “to be happy about, opportunities to pursue, and weakness to address”. One weakness he described was the makeup and health of the department, which he did not feel was good because it was constituted with five full professors, four of them anticipating retirement, and only one junior, non-tenured faculty member. A healthy department, as he defined it, has a more balanced mixture of faculty members, and is aligned with the characteristics of thriving departments:

A healthy structure would be a mix of junior, mid level and senior faculty. You have to bring in fresh blood. People like me, much as we try to do a good job, burn out and we need people with new ideas and new energy and then you don’t want a situation with all retiring at same time. It makes you vulnerable.

## **OUTCOMES: WHAT DIFFERENCE HAVE THE WORKSHOPS MADE, IF ANY?**

### **Politics—No Longer Ostriches:**

We always prided ourselves on publishing and research but now realize more that you have to do other things as well...One of our weakness was we did not engage in politics, in promoting the department.
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### **Politics**

Possibly the most critical thing that the faculty realized was that it is not enough to do your job well—to teach well and conduct good research. Advice from the traveling workshop team that “everything counts” was instrumental in changes the faculty made. In retrospect the chair believes that the traveling workshop presenters made a significant difference, helping the faculty understand the importance of advocating for themselves

within the university and by sharing strategies they could use to strengthen the department and reinforce its position within the university.

Because geosciences is a small department it was represented on only a few university committees. As a consequence of the workshop one faculty member joined a university wide program review committee, and the department is now more proactive in promoting itself, with positive results.

We were already active in research and grant writing but we were not out there at the university telling them what we were doing. Now, when something positive happens, I forward to the Provost and Dean. During his presentation (workshop presenter) commented that everything counts. We have used a lot of these (suggestions). We (want them to know that) we are still here and the contributions we make. Every time I see the provost she says, "I saw your announcement". She now has a positive perception of the department. We have not done this much in past. We thought we are so good it speaks for itself. In terms of (administrators) too, when they talk to the community, for example a petroleum company, they can say the Geoscience Department did this.

The chair commented that he feels that the department has successfully positioned itself within the university as one workshop outcome.

### **Preparation for external reviews**

As an outcome of the Assessment Workshop the chair began to systematically collect data which the department will use in preparation for their next external review. This contrasts with the past when the faculty did little advance planning:

I have really started to collect the data as we go. I got ideas from the workshop so you don't have to scramble (at the last minute) and have all the data at your fingertips. I keep enrollments in classes, publications, when I hear from an alumnus, that (contact) is automatically kept somewhere. Before it was always the review comes or someone needs something and we scramble and things get forgotten.

### **Assessment**

As an outcome of both the Assessment and Traveling workshops, first the chair and then the rest of the geoscience faculty understood why assessment is a valuable tool for generating information that is useful both within the Geoscience Department as well as externally within the university.

After the Assessment Workshop the chair came developed a plan to design student and alumni surveys, as well as a series of rubrics, and further detailed them in the traveling workshop action plan. Accordingly, student and alumni surveys have been designed and distributed. Students from the business school administered exit surveys to seniors and will distribute the alumni survey this June. The development of rubrics, proposed after the Assessment workshop, has not yet taken place given more urgent departmental issues.

The Geology Department hopes to gather suggestions from graduating students for improving the geoscience curriculum, as well as collect other data such as how long it took people to get through the program, the number hours they worked in a course, their jobs and plans, opinions about course instruction, and what kept them from graduating faster.



From the alumni survey the chair also hopes for feedback on the curriculum. Ultimately he plans to use the survey data politically to illustrate the success of geoscience graduates as well as their regional contributions.

### **SWOT analysis:**

The faculty has yet to complete the SWOT analysis they began during the traveling workshop. The professors identified four departmental strengths and weaknesses on post-its, and subsequently divided the post-its up, with each faculty member taking a stack to summarize. To date, three of the four have been completed. When the analysis is finalized, the department may take it to the Dean on the advice of one of the workshop presenters. But the chair said that even if they do not finish the analysis, the process was useful since it resulted in faculty consensus about the threats to, and weaknesses strengths and opportunities of the program.

### **Carleton SERC Site**

The department chair became very familiar with the SERC website during the Assessment workshop and noted that he uses it all the time. Other professors became aware of the site during the traveling workshop: “It was a real eye-opener for my colleagues to see the choices that were there”. At least one professor has been using lesson plans posted on the site since that time.

### **DEPARTMENT AS OF JUNE 2010**

The only change in the curriculum is that the senior thesis, required in the past, is now optional, in part because of the increasing number of students taking geoscience courses and faculty overload. Professors lack the time to oversee all the theses that would have been written if required.

The department continues its successful student recruitment program and has recently been “extremely successful” according to the chair. At this time, while the “funding problems are not as big as they appeared,” the state budget is in limbo and tax receipts are below projections. Talk of eliminating the department continues, but the Dean is very supportive of the Geoscience Department. While the chair feels that the department remains fairly well positioned, he still considers that the faculty is in survival mode due to the stress from budget problems and the resulting increased workloads. The chair is concerned because he knows that his faculty has been “pushed to the limit” and senses that they are burning out: “I can see it in their eyes”.

### **SUMMARY**

Given severe budget cuts and the threat of the department’s elimination, the Lansdale Geoscience Department chose to focus their workshop on their survival. As an outcome the faculty has taken the following steps, aligned with the Characteristics of a Thriving Geoscience Department to the extent possible:

- Faculty members reached consensus that the threat to the department’s survival was significant and agreed on the steps they should take in response;

- All professors realized that publishing and research were not adequate for maintaining their place within the university, and that they had to be more visible within, and valuable to, the university;
- Professors have actively promoted their program and department;
- The chair now forwards positive news and departmental accomplishments to the provost and dean.
- Surveys of graduating seniors and alumni have been completed and results will be used to improve the department's programs and demonstrate its contribution to the community.

Other changes that they would like to make are on hold for lack of funds. Currently the department is safe from being cut but the university's budget situation is unstable

# **MARTINSON UNIVERSITY**

## **THE WORKSHOP**

The Martinson University Geology Department faculty hosted a one and a half-day traveling workshop in March 2010, with a focus on addressing the department's low General Education full time equivalents (FTE), low enrollment of geology majors and the survival of the department. All quotes in this report have been taken from one of two interviews with the department chair unless otherwise indicated.

## **THE UNIVERSITY**

Martinson is a campus of the state university system. Founded seventy years ago as a land-grant university, it is situated on 300 acres of land, and offers approximately 180 degree-granting programs to about 20,000 students. Recently the administration initiated campus-wide program and department evaluation with the goal of eliminating six to ten departments and degree programs in response to budget cuts. At the same time, the campus is engaged in reform of the general education core curriculum with a stronger emphasis on outcomes, and increased rigor in tenure and promotion requirements commensurate with an increased emphasis on PhD education and research.

## **THE GEOLOGY DEPARTMENT**

The Geology Department has 19 faculty members including 7 full, 7 associate, and 5 assistant professors and offers undergraduate, masters, and doctoral degrees.

Undergraduates choose between Geology, Earth Sciences and Environmental Geology. Students at the graduate level select from Geology, Geophysics, Hydrogeology and Soil Science. During 2009-2010 the department had 64 undergraduate and 60 graduate majors.

The department grew over 2006-2008, adding 2 professors, and then budget cuts were made in the following 2 years: When the department lost two professors they were unable to replace them. The chair currently expects that the number of faculty will either gradually shrink by one or two due to retirements or be maintained.

The curriculum has not been overhauled for 15 years, although 10 years ago the department began to increasingly emphasize environmental geology and surficial processes research expertise, with newly hired faculty in soil science, paleoclimatology, and low temperature geochemistry. A Gen Ed class in global climate change was also offered. Faculty members generally work well together but recently curriculum revisions became a somewhat divisive topic. The faculty splits between disciplinary areas: Those whose research areas include significant geologic mapping and/or study of rocks favor the current traditional curriculum with an emphasis on Earth's materials while those within hydrogeology, soil science and climate change favor a more flexible, interdisciplinary curriculum with fewer requirements of geology majors.

The department is well respected within the university and the quality of its graduate program is recognized. The university rewards Geology MS students for 'best thesis' about 30% of the time. Over the past 10 years the faculty began to concentrate on growing their graduate program and increasing the numbers of its graduates. As a result, they reached a critical mass of students and theirs is now considered a research-intensive Earth Sciences program. With that increase they met the US World and News Report's university ranking criteria and for the first time have been ranked, which the chair considers very positive.

When the chair applied to the traveling workshop program the department faced probable elimination within the coming two years. While the Dean told the chair that the Geology Department would probably be safe, the department remained vulnerable because the administration did not take research quality and secured external research funds into account, according to the chair. When he was interviewed last March the chair said that they were "neck to neck" with survival, having appeared on a published list of departments for possible elimination.

The number of students enrolling in geology Gen Ed courses has been declining. A new introductory level course, offered 2009-2010, attracted only 10-12 students and the chair hopes that the department will be able to increase this number. The Geology Department is one of the most expensive within the university in terms of cost/FTE. One factor contributing to low enrollments is a recent increase in general education science classes offered by other departments such as Introduction to Environmental Science and Human Nutrition, that may be more attractive than Introduction to Geology to students.

With the future of the department uncertain, students began to look at geology programs at other universities this past year, and professors focused more on those issues critical for themselves as professionals and that increased their marketability.

Fall 2009 the department held a two and a half-day retreat and the chair set the major topic to be addressed over the coming academic year as undergraduate curriculum reform. With minimal faculty interest and involvement, the chair made a top-down decision. At that retreat the faculty divided into three groups to study the curriculum: 1) existing models of curriculum; 2) an outcomes based approach for undergraduates; and 3) employers' expectations of graduates. Progress on implementing the action steps the faculty had identified was slow. On learning that the traveling workshop was scheduled, faculty "waited for the workshop conveners to come in with all the answers." Slow progress may have also been affected as the chair wrote the workshop application himself and the workshop focus was not shared by other faculty members.

Before the workshop most professors did not consider teaching introductory courses important (teaching them was not rewarded) and many viewed teaching 100-level courses negatively. Consequently, those courses were often taught by "not the most dynamic and engaging professors." A contributing reason is that with the change in tenure and promotion requirements some professors felt that they had to increase their research efforts to achieve tenure and promotion.

## TRAVELING WORKSHOP

Between the time when the chair applied to the traveling workshop program and the few weeks before it took place several factors led the chair to discuss revising the workshop focus with the traveling team. The university had decided to cut 6 to 10 departments, and listed a possible 20 for elimination. The Geology Department learned that they were on the list since they were one of the sixth most expensive departments and were teaching a far lower number of students at the 100-level than any other science department. While committed to curriculum reform the chair believed that to address this crisis and the department's survival the workshop should focus on increasing Gen Ed FTE, the undergraduate major's curriculum and other strategies for increasing the department's value to the university and beyond.

To prepare his faculty for the workshop the chair gave them the geology department's metrics and a 1996 article by Dr. Geoffrey Feiss to review in advance—"The Survival of Academic Geology Programs". (The chair did not know at that time that Dr. Feiss was one of several traveling workshop leaders.)

Before the workshop the chair asked the presenters to address a topic of concern to him and some of his colleagues: how does a department equitably allocate teaching, research and service among its members, so that all are recognized as contributing to the department's mission? He asked them to mention that all faculty members must share the workload in making change. The presenters brought this up by noting that the *type* of contribution a faculty member makes should vary depending on the strengths and interests of the faculty member, but that all must contribute for departments to run smoothly. In one presenter's words, "You can't ask a horse to bake a cake".

The workshop, which came at a critical time for the department, took place in mid March at a non-departmental location, and 18/19 professors participated (one was absent from campus). While most of the faculty were lukewarm about the workshop in advance, at the midpoint all commented on how valuable the workshop was, according to the chair.

The traveling team did not meet with the Dean, who was off campus at the time.

Following the workshop the participants completed a post-workshop survey and developed an action plan. On their survey the respondents described what they had learned from the workshop. All professors felt positive about the workshop, and their responses indicate that the chair's goal in terms faculty member's involvement had been met. Among other items faculty noted:

- *Meeting as one faculty*: "In one and a half days we accomplished what we could not do during an infinite number of faculty meetings". People mentioned that the workshop helped them feel like one team by facilitating learning more about each other and the various points of view as well as helping the entire faculty to focus on how to strengthen the department. The workshop also helped faculty examine the geology curriculum as a whole instead of each professor thinking only of her/his own courses.
- *Gen Ed courses*: Professors better understood the importance of increasing their FTE and how to go about it. One realized that everyone in the department needs

to contribute towards this goal, another learned that the department's approach to teaching Gen Ed courses was 'out of date,' and a third noted how valuable it was that the faculty reached consensus that the entire undergraduate curriculum needed a major overhaul.

- *Curriculum related:* During the workshop faculty discussed possible curriculum revisions, with all agreeing that revisions should be made. Some realized that their perceptions of curricular issues were wrong or outdated. All realized that there were too many undergraduate course requirements and one noted that *all* faculty should be involved in developing curriculum.
- *Other departments:* Faculty members described the value of talking with the presenters, and learning about other geology/geoscience departments and programs.
- *Environment:* Several professors noted that the workshop provided a safe environment that facilitated candid discussion.

The action plan lists the following central goal for action:

The overall goal stemming from the workshop is to increase our value to our institution and to better serve our undergraduate majors. More specifically, we need to increase our General Education (GE) FTE and also to revise our undergraduate degree programs... Our goal in revising our degree programs are to decrease the total number of required classes for the majors, and also to revitalize our curriculum by a careful study of program learning outcomes across our curriculum. (Action plan)

The plan listed the steps the department proposed taking to achieve their goals as well as how they would measure success. The chair noted the challenges he expected to face during implementation, including rallying other professors to actively join in:

The fundamental challenge will be getting all faculty members to contribute towards these efforts. As a faculty, we have a history of many joining in bringing forward many good ideas but fewer putting efforts towards follow-through. In this regard, I think the workshop did a great job in balancing the expression of urgency and what the outcome can be of complacency, with providing examples of strategies for success and optimism that change can take place even over fairly short (time) scales if faculty are committed. We have a good foundation for an action plan and I think much of this is within our abilities to achieve. (Action plan)

The chair and a number of other professors felt that the workshop format worked well. Being on site so that all faculty members could contribute was very important. Since two people external to the department moderated the workshop, the chair was able to be more relaxed, and listen and participate as a peer with his colleagues. Other faculty members also commented on the value of having external moderators.

## **OUTCOMES: WHAT DIFFERENCE DID THE WORKSHOP MAKE, IF ANY?**

Faculty members addressed several items in the action plan in the 3 months between the workshop and the final interview for this report.

### **Assuming responsibility for implementation**

All geology faculty members have assumed responsibility for implementing different activities and are now engaged in working toward the department's goal of curricular revisions, increasing enrollment in Gen Ed courses, and increasing the department's perceived value by the university. The faculty works as a team when they focus on issues discussed at the workshop. The department chair described how the workshop was linked to activities that have subsequently taken place:

The workshop helped us to reaffirm the need for some ongoing proactive initiatives to help in this area as well as to engage in some new initiatives. This was achieved by the workshop leaders outlining some models that work at other Universities as well as by commenting on our vulnerability resulting from our current relatively low GE FTE, and in general getting across the idea that taking care of GE FTE is a responsibility of all faculty, and not one that is reserved for faculty less engaged in research. This was very helpful. (Email)

### **Curriculum/FTE**

Members of the faculty first looked at grade distributions for their geology courses, and compared them to other disciplines within the university as well as geology courses at other institutions. They discovered that their introductory courses were too rigorous and perceived by students as requiring a lot of work. They subsequently developed standard grade distribution "targets for lower level rigor" with the potential to increase the popularity of classes.

We realized we were seen as offering classes with a whole lot of work... We realized that we were being too rigorous with our grades, so this was a welcome thing to stare in the face. Again, with survival in mind, we immediately addressed this.

Next they renamed/re-evaluated the names of all introductory courses, and rewrote course descriptions removing some potentially intimidating language. Professors from the department have been working with the University General Education Committee to develop grading parity/comparable rigor between GE courses, and examine the criteria and minimum requirements for what constitutes a science GE class.

The Geology faculty also developed a number of new courses including two distance-learning courses—a mid-semester course, Physical Geography, to be offered fall 2010, and Natural Disasters, to be offered spring 2011. Professors also designed three new lecture courses, which they consider both relevant and appealing: Global Warming (fall 2009), Planetary Geology (fall 2010), and Oceanography (fall 2011).

### **Curriculum revisions/geology majors**

While the average number of courses required by geology majors at other universities is ten, Martinson Geology majors are required to take seventeen. Although professors had begun to examine and revise their majors' curriculum pre-workshop, one outcome of the workshop was that all faculty members recognized the importance of revising the majors' curriculum in specific ways, as soon as possible. As described by the chair,

The workshop elevated the general level of concern among the faculty that this is something that needs to be addressed now rather than later, and perhaps most significantly, convinced our faculty that our program is currently too over-prescribed with required geology classes, too difficult for our students to navigate through in a 4 year time frame, and is focused on training future geologists rather than potentially being

a pathway for students who are interested in ultimately working in other career fields. Curriculum revision now has the full attention of the faculty. (Email)

The faculty is reducing the number of required geology credits in their degree programs, which may have the effect of increasing the appeal of majoring in geology. The faculty hoped that this spring they would reach agreement on curricular revisions and present them to the university for approval. However, professors have yet to reach agreement concerning the four rocks courses in their curriculum. Those professors who teach these courses hope to retain a four-semester course requirement, while other faculty members hope to reduce it to two. The department anticipates reaching a resolution during a one-day retreat before the fall 2010 semester. If they do, they will present their course recommendations for approval. The chair does not anticipate problems at the university level since the revisions they wish to make are in the number of credits, and the department is not recommending new programs.

### **Efforts to increase the number of students in geology degree programs**

Faculty members took several steps to increase the number of students in their degree programs and the department's value to the university. They gave several recruitment lectures—some in SCI 101, GEOL and GEOG GE classes, (highlighting career opportunities in geology) and one at a local community college. They will make a program presentation to all incoming science students in the fall. The faculty increased outreach efforts to high school students, for example hosting 32 high school honors students at the department's annual student research symposium last April.

### **Promoting the department on campus**

This spring faculty members visited the college's advising centers and spoke with academic advisors across the campus and placed advertisements about the Geology Department in the student newspaper.

### **Politics and survival**

The chair commented that as a result of participating in the workshop he learned to be proactive and make the strongest case for his department to the administration that he could. For example, late this spring when departmental cuts were under discussion, faculty members were awarded four grants from the NSF and NASA. The chair immediately shared this news with the Martinson President and other administrators, with positive feedback. In June the department was told that it is safe from being cut:

During this time period we have gotten very positive feedback from the Vice President for research, and the Dean of the graduate college that our program is finally valued, particularly our graduate program, and we should not be concerned about budget cuts.

Faculty consensus that a quality program and good research were not enough and that they *all* must immediately concentrate on increasing the department's value to the university was a crucial step along the way. Actions they took, described under the preceding headings, were instrumental in changing administrators' perceptions. The chair noted—

Through the workshop and faculty meetings, we have been successful in coupling the need to increase our value to the institution, and thus take care of our survival, with our need to revise our undergraduate curriculum. (Email)



While the students are more committed to staying at Martinson for the moment than they were, there will be another round of cuts next year and faculty members remain concerned. Faculty members, particularly assistant professors, continue to apply for other jobs at a rate not previously seen, according to the chair.

### **Benefits to the chair**

The chair values the relationship he developed with the two workshop presenters. He has remained in touch with them, seeking advice on various issues. They have shared resources with him including a recruitment PowerPoint, the content of the workshop presentations, and materials they developed for other geology/geoscience departments. He gratefully commiserates with them about the trials and tribulations of being a departmental chair.

### **SERC website**

Several professors learned about the SERC website at the workshop and since then have been visiting the site for activities to include in their introductory lectures and other courses.

### **SUMMARY**

The changes that the Geology Department is making are aligned with Carleton's Characteristics of a Thriving Geoscience Department.

- The faculty as one group identified and rallied around a common goal and all are implementing the steps they identified to revise their program and revitalize the department.
- The professors all realized the urgent importance of increasing the department's value to the university, particularly through increasing their Gen Ed FTE.
- Professors are developing a more up to date and appealing curriculum for their undergraduates as one strategy to increase course enrollments.
- The department is in the process of cutting back the number of courses required of graduate students, thereby increasing curricular flexibility and better serving those students considering a variety of careers.
- The faculty is increasing recruitment efforts.