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## **The China Environmental Health Project**

**Trip Report:  
Current Technology in Karst Hydrology and Water Resources Workshop  
Southwest University of China, Chongqing  
October 7-14, 2007**

**Submitted to  
John Pasch, P.E.  
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## **Executive Summary:**

In October of 2007 the China Environmental Health Project completed a key component of its educational activities by holding Current Technology in Karst Hydrology and Water Resources, a workshop for graduate and undergraduate students at the Southwest University of China.

## **Grant Participants:**

**Chris Groves**, Ph.D. Director, Kentucky University  
**Amelia Chung**, M. Sc. International Institute for Rural Reconstruction  
**Cathleen Webb**, Ph.D. Western Kentucky University  
**Eric Conte**, Ph.D. Western Kentucky University  
**Nico Goldscheider**, Ph.D. Univeristy of Neuchatel, Switzerland  
**Michiel Duser**, Ph.D. Royal Belgian Institute for Natural Sciences  
**Will White**, Ph.D., The Pennsylvania State University  
**Elizabeth White**, Ph.D. The Pennsylvania State University  
**Jonathan Martin**, Ph.D. University of Florida  
**Priscilla Baker**, M. Sc. Western Kentucky University

## **Partner Group Participants:**

**Yuan Daoxian**, Ph.D. Southwest University of China  
**Jiang Yongjun**, Ph.D. Southwest University of China

## **Key Successes:**

The workshop trained 210 Geographical science undergraduate students, and at least 42 graduate students. Additionally, five hydrologists representing Chongqing Municipality, Yunnan Province, and Guangxi province attended. 33 graduate students and 2 provincial hydrologists took the final examination. The faculty was pleased with the students' performance on the exam.

Two course-books were generated (one of core workshop presentations, and one of concurrent event research presentations) and copies were given to each graduate student.

Other key successes included demonstrating the newly-installed spectrofluorophotometer for dye trace analysis to the graduate students, and a successful dye injection field trip for the graduate students to Qing Muguan valley.

## **Problems Encountered:**

We learned on Sunday Oct 7 that the school's dean would only allow Geographical science undergraduates to attend 3 of the 8 planned 1-hr Concurrent Event research presentations (those by N. Goldscheider, C. Webb, and W. White). We then adapted the schedule to include the remaining research presentations into the schedule of the Core Workshop Activities. These presentations were attended by Geographical Science graduate students. Eric Conte's concurrent presentation was attended by faculty and students from the Chemistry Dept.

Additionally, we did not realize the need to take roll until Weds evening. So, we took roll in all classes Thursday- Saturday. We have this information on file in original and excel spreadsheet forms at WKU. Unfortunately, we do not have roll for our most attended concurrent lecture- Nico Goldscheider's lecture, *Microbial contamination of drinking water* – problems & solutions, which was held in a room with >200 seats. During this presentation, there was standing room only. We will conservatively report 210 students in attendance.

**Narrative:**

Ten workshop faculty members traveled to SWUC for the workshop. The workshop focused on thorough and intensive graduate level instruction on karst hydrology, geology, and water research. This included basic classroom instruction on water chemistry, including geochemical interactions, and hydrology. Building upon this foundation, the workshop strongly emphasized applying technology and research abilities to solving water quality questions and problems.

Applied instruction included:

- Groundwater tracing techniques, with special emphasis on dye tracing
- Analytical measurements of heavy metals
- Experimental design and Quality Assurance/Quality Control
- Social Science applications; working with local people, respecting and utilizing indigenous knowledge.

The workshop also featured research presentations by the instructors on their specialized areas of research, several of which were attended by undergraduate students in the School of Geographical Sciences.

All graduate students received course-books containing the workshop's powerpoint presentations, abstracts of the research presentations, and several practice exercises in geochemistry and hydrology. *Please refer to the schedule in the appendix for the titles, times, and descriptions of all presentations.*

Only two presentations was given in Mandarin Chinese, all others were given in English. The graduate students at SWUC generally have excellent English comprehension skills, though their English reading comprehension is better than their English listening comprehension. The course-book was a key effort in improving the students' ability to understand the presentations, and will also serve reference for them. Many undergraduates have good English comprehension also.

Outside of classroom instruction, a full-day field trip was held for all graduate students in the workshop on Wednesday Oct. 10. The entire group went to the nearby karst watershed of Qing Muguan for a dye trace demonstration. The group first visited the lower spring. Professor Yuan discussed the geology of the site. A graduate student, Yang Pingheng was using the area as a field site, and he explained his work to the other students. Here the students installed charcoal dye receptors, and a fluorometer, and Priscilla Baker discussed practical issues of dye tracing and the prevention of cross-contamination.

The group then traveled to the upper section of the valley, to a sinkhole known to feed the lower spring. There they performed a 2-dye injection. Nico Goldscheider and Priscilla Baker discussed practical concerns in a dye trace, and the nature of different dyes and their uses. Yang Pingheng did the injection. While the constant light rain did make everyone cold, it guaranteed there was the most important ingredient for a dye trace: water.

On Saturday, a 1-hour final examination was given, which included questions submitted by all faculty members. The exam emphasized subject comprehension rather than English skills. For the 2 hours prior to the examination, many faculty members were available to the students to answer questions pertaining to their lectures or homework problems given throughout the week. Most students took advantage of this opportunity.

The faculty members then graded the exams, and were pleased by the students' performance.

On Sunday morning, all students received a certificate of completion for the course and received their graded tests. The students with top grades were recognized. Many students discussed the lecture materials, test questions, and personal research questions with the professors afterward.

Additional activities during the week included:

- A tour and instructional demonstration of the new spectrofluorophotometry lab, led by Priscilla Baker
- Chemists Cathleen Webb and Eric Conte met with representatives from the Chemistry and Geosciences Departments to discuss analytical capabilities at SWUC
- Project Director Chris Groves met with Geoscience faculty to discuss further ways of integrating workshop material into classroom instruction.

Appendices:

Workshop schedule

## Schedule- Chongqing Karst Hydrogeology Workshop. October 7-14 2007

All Core Workshop Activities located in lab classroom of Geographical Sciences School, SWUC

Overview	Morning Session	Afternoon Session
<b>Sun. 7</b>	-All workshop faculty arrive by Sunday morning.	<b>TIME: 1500-1600</b> -Meeting of workshop faculty and SWUC faculty & staff <b>TIME: 1600-1700</b> -Workshop faculty planning meeting. <a href="#">Conference room of Yuan Daoxian</a>
<b>Mon. 8</b> Welcome, Karst Research and Hydrology Introduction  <b>Core Workshop Activities:</b>	<b>TIME: 800-1200</b> -Welcome from <i>C. Groves</i> , <i>Y. Daoxian</i> , SWUC admin. Introduction of workshop faculty (.5 hr) -China EHP description, goals <i>C. Groves</i> (.5 hr) -Karst & related water resource problems of Southwest China— <i>Y. Daoxian</i> (1 hr) -Framework for karst water quality investigations <i>C. Groves</i> (1 hr) -Geomorphology & karst hydrology <i>W. White</i> (1 hr)	<b>TIME: 1430-1730</b> -Geomorphology and karst hydrology intro (continued) <i>W. White</i> (2 hr)  - study period/exercises
<b>Concurrent event:</b>	<b>TIME: 1100-1200</b> -Microbial contamination of drinking water – problems & solutions <i>N. Goldscheider</i> (1 hr)  <a href="#">Geographical Sciences Conference Room</a>	<b>TIME: 1500-1700</b> <i>Y. Daoxian</i> , <i>C. Groves</i> , <i>J. Yongjun</i> , other workshop faculty meet with SWUC Geog. Faculty on curriculum development in karst geology, water resources, etc. <a href="#">Geographical Sciences Conference Room</a>
<b>Tues. 9</b> Hydrology Field Methods in dye tracing <b>Core Workshop Activities:</b>	<b>TIME: 800-1200</b> -Hydrology: surface water in karst, flow monitoring, statistical analysis <i>E. White</i> (2 hr) -Social science and rural development: International Institute of Rural Reconstruction efforts in Asia using a participatory approach <i>A. Chung</i> (1 hr lecture, class discussion)	<b>TIME: 1430-1730</b> -Classroom discussion: Introduction to Dye Tracing Field Methods; <i>N. Goldscheider</i> . study/exercises. (2.5 hrs) -Tour of spectrofluorophotometry lab <i>P. Baker</i> , <i>N. Goldscheider</i>
<b>Concurrent event:</b>	<b>TIME: 830-930</b> -Engaging communities and utilizing participatory approaches in technical research contributing to social development <i>A. Chung</i> (1 hr) <a href="#">Geographical Sciences Conference Room</a> <b>TIME: 830-930</b> - <i>C. Webb</i> , <i>E. Conte</i> meet with SWUC geography school researchers to discuss water quality program and analytical capabilities <a href="#">Conference room of Yuan Daoxian</a>	<b>TIME: 1500-1600</b> -Karst reservoirs for storage of natural gas, example from Belgium <i>M. Duser</i> (1 hr)  <a href="#">Geographical Sciences Conference Room</a>
<b>Weds. 10</b> Field Trip- Dye	<b>TIME: 800- 17 : 00</b> -Field Trip: Qing MuGuan Basin, placement of	Field Trip <i>N. Goldscheider</i> , <i>J. Yongjun</i> , <i>P. Baker</i> , <i>C.</i>

injection and field instruction <b>Core Workshop Activities:</b>	receptors, dye injection <i>N. Goldscheider, J. Yongjun, C. Groves, P. Baker, other faculty</i>	<i>Groves, other faculty</i>
<b>Concurrent event:</b>	<b>TIME: 8 : 30 - 9 : 30</b> -Chromatographic determination of Chongqing area pollutants <i>E. Conte</i> <a href="#">Geographical Sciences Conference Room</a>	
<b>Thurs. 11</b> Geochemistry Water Quality- <b>Core Workshop Activities:</b>	<b>TIME: 8:00-12:00</b> -Carbonate geochemistry <i>J. Martin</i> (2 hr) -Water quality issues (background, contaminants, methods of analysis, remediation) <i>E. Conte, C. Webb</i> (2 hr combined)	<b>TIME: 14:00-17:00</b> -Water quality issues (cont.) <i>E. Conte, C. Webb</i> (1.5 hr) -Microbial/bacterial contamination <i>N. Goldscheider</i> (1hr) -study/exercises
<b>Concurrent event:</b>	<b>TIME: 8:30 - 9:30</b> -Sediments in karst aquifers: (1) Clastic sediment transport and its role in contaminant transport (2) Speleothems and paleoclimate <i>W. White</i> (1 hr) <a href="#">Geographical Sciences Conference Room</a>	<b>TIME: 17:00-18:00</b> -Properties of fly ash and beneficial uses of this waste material from coal fired power plants <i>E. White</i> (1 hr) <a href="#">Geographical Sciences Conference Room</a>
<b>Fri. 12</b> Sensitivity Mapping, Basin Delineation, GIS applications Stakeholder Development <b>Core Workshop Activities:</b>	<b>TIME: 9:00-11:00</b> -GIS Issues: Groundwater sensitivity mapping/ landuse mapping <i>N. Goldscheider, J. Yongjun, P. Baker</i> (2 hr) <b>TIME: 11 : 00-12 : 00</b> - Karst hydrology in high porosity limestones, Florida case studies of study methodologies, <i>J. Martin</i> (2 hr)	<b>TIME: 14:00-17:00</b> -Social science aspects related to rural water resource development in Vietnam, Belgian work <i>M. Dusar</i> (2 hr)  -study/exercises <i>Balance</i> goes to Qing Muguan to collect dye receptors
<b>Concurrent event:</b>	<b>TIME: 8:00 - 9:00</b> -Submarine groundwater discharge: Origins, magnitudes & significance <i>J. Martin</i> (1 hr) <a href="#">Geographical Sciences Conference Room</a>	<b>TIME: 17:00-18:00</b> - <b>A novel method for arsenic remediation of drinking water</b> <i>C. Webb</i> (1 hr) <a href="#">Geographical Sciences Conference Room</a>
<b>Sat. 13</b> Field Methods: Hydrogeology, Water Quality <b>Core Workshop Activities:</b>	<b>TIME: 8:00-11:30</b> -Monitoring: data logging, <i>J. Martin</i> (1.5 hr), <i>C. Groves</i> (2 hr)	-study/exercises -synthesis <b>TIME: 15 : 00</b> final examination
<b>Sun. 14</b> <b>Core Workshop Activities:</b>	<b>TIME: 9 : 00-10:30</b> -graduation ceremony	-