

## Version 1: Course *with* diamond exploration project

Geologic Topics Covered	Connections Drawn to Non-Geologic Topics	Linkages to Public Policy
<p><b>North Africa Section</b></p> <p>fluvial features (deltas, floodplains, levees, etc.)</p> <p>topographic maps, aerial photos</p> <p>behavior of rivers and deltas (erosion, deposition, migration, aggradation, downcutting)</p> <p>geologic maps</p> <p>influence of bedrock on river geometry</p> <p>flooding</p> <p>depositional environments in fluvial and deltaic settings</p> <p>reconstructing river evolution from fluvial and deltaic deposits</p> <p>dams and influence on fluvial and deltaic systems</p> <p>intraplate seismicity and induced seismicity</p> <p>dam failure and effects of catastrophic flooding (both natural and artificial)</p> <p>groundwater systems (migration, artesian systems and oases, age of groundwater, depletion and pollution)</p> <p><sup>14</sup>C dating</p> <p>stratigraphic columns</p> <p>reconstructing paleoclimate from sediment sequences, fossils, pollen, and landforms</p> <p>Holocene and Pleistocene climate evolution in North Africa</p> <p>management of surface and subsurface water resources</p> <p>greenhouse warming</p>	<p><b>North Africa Section</b></p> <p>influence of bedrock geology on settlement patterns along Nile, unification of Egypt</p> <p>annual Nile floods and development of civilizations along the Nile</p> <p>fluctuations in climate and Nile behavior as influences on historical events in Nile Valley (settlement in the Nile Valley, development of agriculture, settlement patterns, rise and fall of dynasties)</p> <p>benefits and consequences for Egypt of damming the Nile at Aswan</p> <p>hydropolitics in North Africa</p> <p>vulnerability of the Aswan High Dam and the parameters of the disaster that would result from catastrophic failure of the Dam</p> <p>influence of rainfall fluctuations on rise and fall of Saharan/Sahelian habitation and empires</p> <p>modern hydrogeology in the Sahara and Sahel and the future of economic growth in North Africa</p> <p>water use and needs in North Africa</p> <p>future in the Sahara and Sahel – how geologic evidence helps us determine what greenhouse warming might do</p>	<p><b>North Africa Section</b></p> <p>water needs in North Africa, population growth, riparian rights, international hydropolitics and negotiations for water allocations from the Nile</p> <p>complexity of policy decisions related to need for water, only parts of which are governed by geologic/environmental considerations</p> <p>emergency plan for Egypt in event of failure of Aswan High Dam</p> <p>“public policy” in Ancient Egypt as a result of fluctuations in Nile flood levels</p> <p>exploitation of Saharan ground water reserves in Libya and the Western Desert of Egypt and complexity of policy decisions related to exploitation of Saharan groundwater</p> <p>use of geologic information to plan for a future in the Sahel when worldwide average temperatures may be higher</p>

<p><b>Diamond Exploration Project</b></p> <ul style="list-style-type: none"> <li>interior structure of the Earth</li> <li>mineralogy of the mantle</li> <li>weathering</li> <li>the Saharan environment</li> <li>topographic and geologic maps</li> <li>diamonds <ul style="list-style-type: none"> <li>mineralogy &amp; crystallography</li> <li>origin (including supernova diamonds), age</li> <li>worldwide distribution</li> <li>diamond cutting, valuation of cut stones</li> </ul> </li> <li>origin and emplacement of kimberlites</li> <li>prospecting for diamonds <ul style="list-style-type: none"> <li>panning, heavy mineral sampling</li> <li>use of heavy liquids and electromagnetic separation to separate minerals</li> <li>identification and use of indicator minerals</li> <li>development of exploration strategies</li> <li>microscopic examination of mineral samples</li> <li>garnet geochemistry, SEM-EDAX analysis of garnets</li> <li>airborne magnetic surveys</li> <li>electrical resistivity surveys</li> <li>diamond drilling</li> </ul> </li> <li>recent diamond discoveries</li> </ul>	<p><b>Diamond Exploration Project</b></p> <ul style="list-style-type: none"> <li>history of use of diamonds as gems</li> <li>history of diamond exploration and marketing, including development of market and artificially high prices for diamonds</li> <li>recent evolution of DeBeers cartel</li> <li>conflict diamonds and civil war in Africa</li> <li>business aspects and logistics of mineral exploration, including working within exploration budgets</li> <li>living and working in a hostile environment</li> <li>selling a prospect to a potential investor</li> </ul>	<p><b>Diamond Exploration Project</b></p> <ul style="list-style-type: none"> <li>use of diamonds to fund civil war in Africa</li> <li>difficulty of preventing conflict diamonds from reaching markets in the US</li> <li>influence of DeBeers on government policies in Africa and other areas of the world</li> <li>dilemma of Botswana in the 1980s regarding dealings with South Africa to market diamonds</li> <li>government involvement in mineral exploration/exploitation</li> </ul>
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<p><b>East African Rift Zone Section</b></p> <p>plate tectonics  continental rifting  Miocene and Pliocene plate tectonic evolution of Africa and surrounding plates  evolution of structures, topography, and sediment sequences in the EAR  rift zone volcanism &amp; origin of magmas  use of sediment sequences to reconstruct paleoenvironments at hominid sites  radiometric dating of ash layers  use of ash layers and vertebrate fossils to correlate sediment sequences  use of sediment sequences, palynology, and paleontology to reconstruct paleoclimates  hominid evolution</p>	<p><b>East African Rift Zone Section</b></p> <p>rift zone evolution and the preservation and exposure of hominid remains  development of the EAR as a possible environmental influence in hominid evolution</p>	<p><b>East African Rift Zone Section</b></p> <p>none</p>
<p><b>Mineral Resources Wrap-up</b></p> <p>origin of paleoplacer gold deposits of the Witwatersrand</p>	<p><b>Mineral Resources Wrap-up</b></p> <p>black oppression in South Africa</p>	<p><b>Mineral Resources Wrap-up</b></p> <p>influence of the South African mining industry in the late 19th century and early 20th century on taxation, pass, and homeland laws and the development of apartheid</p>