The World Development Federation

Virtual
Global Super Projects Conference
November 2001

Emancipatory Oceanic Macro-engineering: A "New Atlantis" in 21st Century Tunisia-Algeria?

Richard B. Cathcart
Geographos
1608 East Broadway, Suite #107
Glendale, California 91205-1524
USA
(818) 246-8422
Email: rbcathcart@msn.com

There appears to be, minimally, a 1% chance that our world-ocean's sea-level will rise ~1 meter by the end of the 21st Century, a rise which will lap the Mediterranean Sea's ~13,000 kilometer-long Basin strand; the crudest estimate of the total cost of coastal-protection (USA2001$1 million/lineal kilometer) results in a financial burden to the Basin's tax-paying residents of approximately USA2001$13 trillion! Is it really, then, so difficult for extra-Basin human populations to fathom that geographically important region's *weltanschauung* of *weltschmerz*? To accommodate this expected 1 meter rise, Greek experts have proposed a 4.5 kilometer solid causeway-barrier dam be emplaced to isolate the Inner and Outer Thessaloniki Bays at an enormous, yet uncalculated, monetary and environmental cost.[1] Such ugly local constructions—emergency "techno-fixes"—may not be undertaken if the Earth-ocean sea-level rise is excluded from affecting all Mediterranean Sea Basin nations (at a modest local or global cost of less than USA2001$10 billion).[2]

The ultimate form of "landscape architecture", a term coined *circa* 1858, is Macro-engineering. To honor the first century of the profession's formal existence, the American Society of Landscape Architects (organized 1899) designated the year 1964-65, beginning June 28, the Centennial Year of Landscape Architecture. However, it was not until *circa* 1964 that "macro-engineering" was neologized and found widespread professional acceptance. The American Society for Macro-Engineering was established in 1982.[3]

Francois Charles Marie Fourier (1772-1837), in 1808, remarked that human armies of industrial tool-armed persons would boldly subjugate the Sahara: "They will execute works the mere thought of which would freeze our mercenary souls with horror. For instance, the combined order will undertake the conquest of the great desert of Sahara; they will attack it at various points by ten and twenty million hands if necessary; and by dint of transporting earth, cultivating the soil and planting trees everywhere, they will succeed in rendering the land moist, the sand firm…. They will construct canals navigable by vessels, where we cannot even make ditches for irrigation, and great ships will sail [on them]…."[4] (A narrow and shallow Suez Canal was first opened to high-seas ship traffic in 1869.) By 1877, Donald Mackenzie (? - ?) published The Flooding of the Sahara, a geographical fiasco-tome proposing an excavation from North Africa's Atlantic Ocean strand to the "below sea-level central Sahara" permitting an (impossible) submersion of a large area of that hostile hot desert![5] Before Mackenzie, however, heroic French macro-engineers had contemplated a similar plan, but for another locale; their speculated artificial "la mer interieure" was to be situated entirely within modern-day Tunisia-Algeria and was promoted by Francois Elie Roudaire (1836-85).[6]

Currently, there's no finer mapping of the ancient Old World than the cartographically standardized Barrington Atlas of the Greek and Roman World (2001) edited by Richard Talbot; most of the Mediterranean Sea Basin is topographically illustrated by 1/500,000 scale maps, although there is no detailed plan of infamous Carthage. The landscape, as far as it can be known today through painstaking geographical and historical "intellectual reconstruction", including changing sea-levels, is shown as it was during that historical period, not as it is nowadays. The Myth of Atlantis still fascinates our world's public, as the 28 December 1998 issue of Der Spiegel clearly indicates; of the many sites proposed for the location of legendary Atlantis that are loosely documented therein, only the sketchy *circa* 1930 *Tritonis Palus* ["Triton Lake"] scenario devised by Robert Ranke Graves (1895-1985) comes close to the believability of Robert F. Schmalz's geo-marine theory.

In 1992, Schmalz retired as Professor Emeritus of Geoscience, having served 32 years as a faculty member of The Pennsylvania State University's Department of Geology and Geophysics.[7] In the February 1976 issue of the College of Earth & Mineral Sciences' <u>Earth and Mineral Sciences</u> (Volume 45, No. 5) Schmalz postulated with "In Search of Atlantis" that a fabled lost civilization, antecedent to all other Mediterranean Sea Basin societies, once actually existed in the region northwest of the extant city of Gabes in southern Tunisia. He presented a good circumstantial case, not subsequently further documented, that Atlantis' shallow sea and its seaports became isolated by a localized neotectonic Earth-crust movement (the emergence of a sill near Gabes), resulting in Lake Triton's subsequent disappearance—its conversion by common coastal geomorphic transformation (natural shoaling) as well as evaporation into the Chott el Djerid, a 15-31 meter ASL elevation intermittent salt lake wasteland—with the highest land elevation closest to Gabes, Tunisia.[8] Might not his theory be investigated more thoroughly when 21st Century Eurafricans eventually erect a Sahara Tent Greenbelt covering a part of this dry land[9], as proposed by Viorel Badescu and R.B. Cathcart?[10] To date, our world's most spacious greenhouse is situated in an abandoned clay pit in southwest England.[11] Rigorous experiments by agriculturalists have proved seawater can be successfully employed to grow commercially valuable food and fiber crops.[12]

Disregarding the ultimate cause of a sea-level rise, a subject of great geoscientific controversy, one prospect is clear: marine inundation of the Mediterranean Sea Basin's littoral poses a major threat to the long-term welfare of its permanent human populace. Even a well-regarded science-fiction novelist, James Graham Ballard, has imagined the Mediterranean Sea Basin's northern strand as "The Largest Theme Park in the World", in War Fever (1990, pages 73-80). What might stimulate large numbers of rambling northern Europeans to migrate to the Mediterranean Sea's strand? Gradual development of a killing mega-Greenhouse Effect, foreseen for *circa* A.D. 2200-2400, could become an entirely sufficient cause.[13] Ballard's over-crowded so-called theme park is a Euro-Disneyesque "Land for the Dying"! Can a "New Atlantis" be imagined for the Mediterranean Sea Basin's southern strand? Yes!

Besides freshwater (0.2-4% salts) reservoir storage, it is practicable to channel large quantities of seawater (34.72% salinity) into some of our world's great interior drainage basins that lie below present-day sea-level in order to dynamically control our world-ocean's volume. A natural potential sink adjacent to the Mediterranean Sea is Egypt's Qattara Depression.[14] An artificial potential sink is envisioned as a now low-elevation region, the most eastern part of the Zone of Chotts, which extends westward from Tunisia into Algeria.[15] During the period from 1957 until about 1988, nuclear energy researchers in both the USA and USSR considered the mundane purposes achievable using mundane tools—peaceful nuclear explosives (PNEs).[16] Founded in 1956-57, Tunisia's land covers 155,350 square kilometers and is homeland to ~9.5 million living persons (of our Earth-biosphere's 6 billions).

Sometime before 1962, Tunisian scientists comprehensively proposed a "Chotts Depression Scheme" to serially blast huge craters in the Chott el Fedjadj and Chott el Djerid and subsequently inundate the resulting depression with 37.5-38.5% salinity seawater channeled from the Mediterranean Sea. Minimally, ~4,920-5,360 square kilometers—around 1/30 of Tunisia's national territory located 25 kilometers west of the seaport City of Gabes—plus the -23 meter Chott el Gharsa was planned for future unnatural ocean water inundation. It was foreseen and contemplated that Algeria's –31 meter Chott el Melrir could eventually be connected too. Planted along the 34^0 North parallel of latitude, ideally, the colossal channel-depression was to have been formed *via* inexpensive multiple PNEs and the Chotts Depression Scheme was to result in a recreated Lake Triton! Of course, old and buried Atlantis' archaeological site would be jumbled (rapid stratigraphic displacement and extreme artifact mixing) or destroyed (instantaneously vaporized) by nasty PNE use—literally, a treasure vault violently sprung open and its prized contents highly disrupted and lost. Because of the dry climate regime, the shallow water body therein would evaporate rapidly, increasing its salinity to ~200+% salts, thus producing a continuous flow of sea-water through the channel; Tunisian macro-engineers naturally visualize that cheap and reliable hydro-electricity would thereby be produced as a direct result of this constant current (steady inflow). (The Quaternary history of the salt flats and hypersaline lakes of southern Tunisia is being investigated by Dr. Nick A. Drake.)[17]

How best to produce hydro-electricity? First, a man-made channel (100 meters wide by 175,000 meters long by 5 meters deep) must be excavated by a floating dredge capable of swiftly and economically removing ~85,500,000-100,000,000 cubic meters of rock and loose Quaternary sediments to join Gabes (population: 250,000+) with Algeria's Chott el Melrir. The cost for the macroproject's initial digging phase oughtn't to exceed USA2001$1 billion. Spoils from the mining, heaped in useful mounds (artificial earth sculpture)[18] by design, form gigantic geometrical berm-bordered ponds wherein seawater might be deposited temporarily (pumped-storage power plant)[19] or calcium hydroxide emplaced to absorb carbon dioxide gas from Earth's atmosphere.[20] A single floating excavator can move 50,000 cubic meters of material per day; the first-phase could be finished in less than five and one-half years; the trickiest working moments will come when the automated dredge arrives at the two places where the Canal enters the below-sea-level chotts. Second, several prefabricated floating road-rail bridges[21] with pre-installed "tidal stream energy machines"[22] ought to be towed into their proper final installation sites, and thereafter sunk to form a ship-passable pierced land transportation causeway.[23] Rotation of the energy-generation mechanisms within this permeable barrier will thereby produce an interminable electricity supply that Tunisia may wish to sell out-of-country, use itself and share with Algeria. There is a Mediterranean Sea Basin precedent—although not fully comparable—at Italy's Quaternary resurgent caldera located in the Bay of Naples, Ischia Island.[24] A small harbor, Port d'Ishia, was dug during the 1850s by macroengineers who flooded a land-locked volcanic crater that could be connected to the Tyrrhenian Sea. Italian workers spent two years digging the very short channel with hand tools, pony carts and wheelbarrows; luckily, they followed the trace of an eruptive fracture <10,000 years old that made their efforts easier.

Excavation and submersion of Chott el Fedjadj-Chott el Djerid and Chott Melrir facilitates profitable commercial coastal and high-seas shippers, encouraging them to serve new ports built along the new strand, perhaps mineral and agricultural exportation would flourish. And, barge-mounted deep-drilling oilrigs could float from exploration site to site rather easily. Tunisia's climate regimes will change, perhaps somewhat unpredictably.[25] Too, it is possible there may be some worries over potential future hydro-seismology owing to seawater loading of the depression's crust surface since sea-water is less dense than the materials that have been forcefully removed and redistributed. One unique import would be rich, fertile silt obtained at and carried from the freshwater reservoir created by the Aswan Dam; large-scale reservoir desiltation serves two interests because it could prolong the operational period of the Aswan Dam[26] and mineral-rich silt, especially if widely spread, could provide suitable soil base material for a barren, arid salt flat in Tunisia-Algeria.[27] Ships that now use ballast water, and once used stones, can be adapted to use an appropriately formulated thick mud slurry consisting of Nile River freshwater and Aswan Dam Reservoir sediment. Fourier's "hands" can be supplemented with robust solar-powered robots, off-spring of those NASA R&D has devised and roughly constructed for use in the near-term future exploration of Mars.

Realistically, this inland oceanographic creation won't be easily predictable in its hydraulic behavior, as the Japanese have discovered with their pre-modification computer models of the Seto Inland Sea.[28] A flooded Chott el Fedjadj-Chott el Djerid-Chott el Gharsa-Chott el Melrir will have many of the distinguishing oceanographic characteristics of the USA's Great Salt Lake[29] in Utah and the Salton Sea of California.[30] Tunisia's Gulf of Gabes is the major marine region of energy dissipation for present-day Mediterranean Sea tides.[31] (Local tides in the Mediterranean Sea generally have a small range.) Strand conditions have changed greatly from those of ancient times.[32] Today's Mediterranean Sea level, higher than in olden times, masks a rubbish-strewn (underwater) seascape and a badly contaminated volume of seawater.[33] As J.M. Coe elucidated, in Marine Debris: Sources, Impact, and Solutions (1997, pages 7-14), and to our species' almost everlasting shame, vast regions of the Mediterranean Sea Basin's continental shelf is burdened with rotting man-made marine debris! A strong ocean current moving towards a re-connected Chott el Milrir will, of course, redistribute this junk, garbage and other unidentified stuff! Also, ships balanced using ballast water, and entering the completed Chotts Depression Scheme, can be expected to transfer and deposit plants and animals from around our planet![34] Consequently, there are likely to be algal blooms and exotic mineral interactions producing, in effect, a horizontal bubbly lamp [a la the popular Lava Lite] effect; this unique graduated coloration effect ought to be quite noticeable in Earth-orbiting satellite images of North Africa! Every vessel passing through the Gabes-Chott el Melrir Canal will generate ship waves and return currents that hit the bank of the Canal.[35] As a result, bank erosion and damage to bank protection structures will doubtlessly occur; unstabilized bank material settles on the bottom of the Canal and makes maintenance dredging necessary. Like the Suez Canal, time-tabled ship and barge convoys will traverse the Canal one-way, with the Chott el Melrir serving as a safe turning basin.

Geopolitical disputes are bound to arise with the inundation of this large watery region! Since it will be a very artificial sea, lengthening Tunisia's present-day 1,148 kilometer-long shoreline and increasing its offshore 8,250 square kilometer sub-Mediterranean Sea area, how ought it to be apprehended by international law? And, Algeria's new inland sea coast must be contiguous with Tunisia's, subject to foreign control of trade just like Africa's landlocked states! Nowadays, there are strong arguments over the Caspian Sea's divided geopolitical status![36] Tunisia shares a 965 kilometer-long border with Algeria. Logically, there must be a strong international agreement (bi-lateral treaty) and binding UNO-brokered international legal accords before a grossly revamped Chotts Depression Scheme ever becomes a new Lake Triton!

---

[1] C. Perissoratis and D. Georgas, "The role of the earth scientist in assessing the impacts of climatic changes due to the greenhouse effect: two case studies of 'prognostic geology'", Terra Nova: The European Journal of Geosciences 6: 306-312 (May/June 1994).
[2] See: R.B. Cathcart, "Installation of a Tensioned-Fabric Sea Change Screen at Gibraltar Strait: Creation of a 'Mediterranean Sea Oceanarium'".
[3] See: www.tasme.org .
[4] Charles Gide, Design for Utopia: Selected Writings of Charles Fourier (1970), page 180.
[5] Grove Koger, "The Great Sahara Sea: An Idea whose time has come?", Mercator's World 4: 18-23 (March/April 1999).
[6] Michael J. Heffernan, "Bringing the desert to bloom: French ambitions in the Sahara desert during the late nineteenth century—the strange case of 'la mer interieure'", Chapter 6, pages 94-114, ***in*** Denis Cosgrove and Geoff Petts (Eds.), Water, Engineering and Landscape: Water control and landscape transformation in the modern period (1990).
[7] See: http://www.kcl.ac.uk/kis/schools/hums/geog/nd.htm .
[8] B. Damnati, "Holocene lake records in the Northern Hemisphere of Africa", Journal of African Earth Sciences 31: 253-262 (August 2000).
[9] Ping Liu et al., "Historical and future trends of the Sahara Desert", Geophysical Research Letters 28: 2683-2686 (15 July 2001). See also: Manfred Geb, "Factors favouring precipitation in North Africa: seen from the viewpoint of present-day climatology", Global and Planetary Change 26: 85-96 (November 2000).
[10] See: Viorel Badescu and R.B. Cathcart, "'Big Tent' SciFi Architecture: A 21st Century Sahara Tapestry", (November 2001) viewable at www.wdf.org .
[11] See: www.edenproject.org.uk/ .
[12] See: http://members.home.net/waterplusfood/index.htm .
[13] E.P. Borisenkov and Yu. A. Pichugin, "Possible Negative Scenarios of Biosphere Dynamics as a Result of Anthropogenic Activity", Doklady Earth Sciences 379: 581-583 (June-July 2001).
[14] Walter S. Newman and Rhodes W. Fairbridge, "The management of sea-level rise", Nature 320: 319-321 (27 March 1986).
[15] Robert G. Bryant et al., "Marine-like potash evaporite formation on a continental playa: case study from Chott el Djerid, southern Tunisia", Sedimentary Geology 90: 269-291 (May 1994).
[16] Trevor Findlay, Nuclear Dynamite: The Peaceful Nuclear Explosions Fiasco (1990), 339 pages.
[17] See: www.kcl.ac.uk/kis/schools/hums/geog/nd.htm .
[18] W.N. Blair, "Artificial earth sculpture", Zealandia 1: 474-481 (February 1890).
[19] Akitaka Hiratsuka, T. Arai and T. Yoshimura, "Seawater pumped-storage power plant in Okinawa island, Japan", Engineering Geology 35: 237-246 (October 1993).
[20] Eugenie Samuel, "Scrub the planet clean", New Scientist 169: 14 (31 March 2001).
[21] Richard F. Post, "Maglev: A New Approach", Scientific American 282: 82-87 (January 2000).
[22] D.J. Bullen, "Tidal Stream Energy", Water Power & Dam Construction 46: 12-14 (February 1994).
[23] See: http://news.excite.com/news/bw/010702/pa-ja-jones .
[24] A. Tibaldi and L. Vezzoli, "The space problem of caldera resurgence: an example from Ischia Island, Italy", Geologische Rundschau 87: 53-66 (1997).

[25] Leif Enger, "Estimating the Effects on Regional Precipitation Climate in a Semiarid Region Caused by an Artificial Lake Using a Mesoscale Model", Journal of Applied Meteorology 30: 227-249 (February 1991).
[26] Andrew K. Gabriel, R.M. Goldstein and R.G. Bloom, "ERS Radar Interferometry: Absence of Recent Surface Deformation Near the Aswan Dam", Environmental & Engineering Geoscience VII: 205-210 (May 2001).
[27] D. Anders Brandt, "A Review of Reservoir Desiltation", International Journal of Sediment Research 15: 321-342 (September 2000).
[28] Hideki Ueshima and Moriyasu Takarada, "Tidal Flow Control as a Means of Marine Environmental Conservation and Enhancement", Marine Technology Society Journal 29: 67-73 (Fall 1995).
[29] See: http://www.sunspot.net/cgi-bin/editorial/printversion.cgi?storyid=1150490216354&breadcru .
[30] Kim A. O'Connell, "The Forgotten Sea", Landscape Architecture (February 2001) pages 50-54.
[31] M.N. Tsimplis, "A Two-dimensional tidal model for the Mediterranean Sea", Journal of Geophysical Research 100: 16223-16239 (1995)
[32] R.P. Paskoff, "Modifications of Coastal Conditions in the Gulf of Gabes (Southern Tunisia) since Classical Antiquity", Zeitschrift fur Geomorphologie SB81: 149-163 (1991).
[33] B. Guillaumont, "Pollution Impact Study in Gabes Gulf (Tunisia) Using Remote Sensing Data", Marine Technology Society Journal 29: 46-58 (1995).
[34] See: http://invasions.si.edu/ballast.htm ; http://www.invasivespecies.gov and http://www.globallast.imo.org .
[35] A primary wave system is built up in the form of a pressure maximum at the bow and the stern of a moving ship, and a pressure minimum develops along the hull of the vessel. This distribution of pressure will cause a water level elevation at the bow and a drop midships. As a consequence of the pressure distribution of the primary wave system, a secondary wave system builds up with shorter wave periods compared with the long wave periods of the primary system. The whole process results from the complex interaction of both wave systems.
[36] Steve LeVine, "Sea or Lake? Hunt for Caspian Oil Stokes Border Feuds And Arcane Theories", The Wall Street Journal CCXXXVIII: A1-A2 (3 August 2001).