



"Dead Sea Lake Level Variations: Implications to Late Holocene Regional Climates and Historical Cultures"

Presented by Dr. Revital Bookman

November 18, 2004

Abstract: The late Holocene Dead Sea lake levels were reconstructed based on direct level indicators, depositional environments, and radiocarbon ages from exposures along the shores of the lake. In these exposures, buried shore ridges, sand, and aragonite crusts recorded absolute past shores in the last ~4 ka.

The lake fluctuated within an elevation range of 390 to 415 m below sea level (mbsl). Most of the time the lake was confined to the deeper northern sub-basin and did not rise above the topographic sill (~402 mbsl) separating the northern and southern sub-basins of the lake. Level rises occurred in the 1st century BC and the 4th century AD (the Roman and early Byzantine periods), in the 11th-12th century AD (the crusader period) and at the end of the 19th century AD. The curve also indicates drastic drops that exposed the sediments to erosion. The oldest and probably deepest drop in the lake culminated during the 15th-14th century BC after a retreat from a higher lake stand. Another significant drop occurred after the Byzantine period and continued until the 10th century AD.

Since the Dead Sea is a terminal lake, it is very sensitive to hydrological variations in its catchment. Its level fluctuations represent the regional climate variability. A quantitative analysis using the modern (last 150 years) instrumentally measured record of natural lake levels and the annual precipitation in Jerusalem were used to estimate that rising levels are associated with 648 mm/yr of precipitation, drops with 445 mm/yr, and stable levels with 553 mm/yr – all with a uniform standard deviation of ~120 mm/yr. As Jerusalem rainfall is highly correlated with many rain stations in northern Israel these conclusions can be extended to larger areas in the Levant, which are under the same weather systems.

These results indicate that lake level rises mark a significant positive change in the annual rainfall in the

region that may be related to the flourishing in demography and agriculture during the Roman and Byzantine periods, and to the Frankish farm development during the Crusader period. The water level drops point to prolonged droughts with occurrences of annual precipitation less than 400 mm/yr in Jerusalem. The arid conditions pointed by the low stands around the 7th century AD coincide in time with the invasion of Moslem-Arab tribes into the area. Although other historical factors could have been connected, the coincidence with the arid conditions is noteworthy.

October's presentation is by Dr. Revital Bookman of Syracuse University. She holds a Ph.D. in geology from the Hebrew University of Jerusalem. Her dissertation was on "Late Holocene lake levels and paleoseismology in the Dead Sea Basin." She is now a post-doctoral researcher studying the limnological characteristics of and contaminants in central New York lakes. Additionally, she is setting up a Pb-210 dating laboratory for reconstructing lake sediment chronology in the Seneca River system.

Meeting logistics: The meeting will take place on Thursday, November 18 at the Ramada Inn (1305 Buckley Road, North Syracuse). A social hour will be held at the hotel from 5:30 p.m. to 6:30 p.m., followed by a buffet dinner. The dinner will start at 6:30 p.m. and our featured speaker, Dr. Revital Bookman of Syracuse University will begin her presentation at 7:30 p.m. The cost of dinner is \$20 for members, \$22 for non-members, and \$15 for student members. People may also attend only the presentation for a nominal fee of \$3. Please RSVP by Monday, November 8, 2004 to Bonnie at Parratt-Wolff via e-mail at bolney@pwinc.com or 437-1429.