**Primary Data**

* **TP-DB.accdb:** The Hariri center consulted on the design of this database.

The primary Places table has one entry for each natural or constructed cultic place identified in the Argolid and Messenia. Each place (natural or constructed) has geographic coordinates for its centroid. The constructed and natural places are classified by type (these types are described in the attached excel table).

Constructed places are related to one another via containment relationships defined in the “Links” table. For example, the Epidaurus Sanctuary has an individual entry (identified by its Places\_ID). The individual cultic structures found within the sanctuary are “grouped” to it.

Natural features are included in the database to situate the constructed places. The “Links” table relates each Natural features relate to the constructed places by the “Linked” table. Possible relationships include being “located on” or “proximity.”

The Access database has several other tables, used to record attributes like date of construction/use, ancient references, and original survey ID numbers. There is a table which lists every piece of collected data (photograph, video, scans, etc.) and gives it a unique ID (GNCP\_OID). An additional table uses each Place ID and relates it to the data ID.

* **2016\_2017\_Waypoints:** The feature class of points recording GPS coordinates where videos or photographs were taken. Each waypoint lists the image numbers or video numbers, its GNCP\_OID, storage location, places included, etc. I tried to be as consistent as possible in the ways each place type was photographed (e.g. taking panoramic photos on all corners of the temples), but this was also limited by fences, topography etc.

**Definitions**

**Type\_Place\_Analyses.xls:** Excel document with the following sheets:

**PlaceTypes:** Shows the breakdown of place-types in the Access database. The Access database records these in a cascading table.

**Analyses:** Color-coded table showing place types and the analyses to be performed on each.

**Subsequent sheets:**each specifies the number and locations of non-random observers for each analysis type.

**Constructed Place:** A “constructed” cultic place is locale which has been altered by means of human intervention. Human intervention could range from large-scale building projects, the deposit of objects, to small-scale activities like burning.

**Natural Place:** Some natural places in this study were interfered with by human activities, and thus are not in their “natural” or “pristine” state, but, by in large, their physical condition is the result of naturally occurring processes.

**Cultic Place:** A place with known religious significance or activity for any period of time.

**Observer Points:** Observer points are random or non-random. Non-random point locations are described in the respective analysis sheets in PlaceType\_Analyses.xls. In all cases possible, these non-random locations should correspond to 2016\_2017\_Waypoints feature class.

**Special Interest Areas:** The survey covers the regions of the Argolid and Messenia. As described below, certain analyses will be run “per region”, meaning for all structures of a particular type within the Argolid or Messenia. A “special interest area” would be a subregion (in either area) for which a specific analyses should be run. For example, CVP will be run on all tholoi in the Argolid. CVP will also be run on the tholoi constructed at the Mycenae citadel; scholars have argued they were intentionally placed to create a visual boundary.

**Cumulative Viewshed:** Uses the Visibility tool in 3D Analyst, and the “Frequency” setting. The output is a frequency-based viewshed, which records the number of times each pixel is viewed within the DEM.

**Visual Prominence:** This methodology is based on Bernadini et al. (2013). He gave me written permission to use his custom python tools for the dissertation. The methodology uses the Skyline tool in ArcGIS, and converts it to a planar view. It then identifies the most prominent natural feature(s) on the horizon line, from a single observer point. When the tool is run on multiple observer locations across a study area, a single peak could be identified as prominent multiple times; an overall prominence score is therefore assigned to each peak. Prominent natural features are those which are isolated, steep, and elevated in comparison to their surroundings. By selecting multiple observer points, the user can understand whether cultural places dictated how natural features maintained, gained, or lost prominence. While the methodology will be used to identify the peaks which are prominent, cultic places which are located on these peaks will be considered prominent as a result.

This methodology is attached as a separate document for review.

**Cumulative Visual Prominence:** This methodology is based on De Reu et al. (2011). I will create a cumulative viewshed using the frequency setting (see above), based on 1) the locations of a particular type of structure (e.g. tholoi) and 2) random locations. Using statistical packages, I perform a Kolmogorov-Smirnov test, which will provide the P and DCrit values of location. The result specifies whether intervisibility of the non-random locations is statistically significant (and therefore intentional).

**General Methodology**

1. **Visibility and View**
   1. **Orientation of Structure**
      1. **Goal:** To determine any trends based on the orientation of structures, particularly based on structure type.
      2. **Procedure:** Record cardinal or ordinal direction of any entrances. Run queries based on structure type, region, and period.
      3. **Sample:** All constructed places with known entrances or orientations.

***Note:*** “If applicable” cases noted in PlaceType\_Analyses.xls are those where an entrance or front-facing side may or may not be known (e.g. an altar, tumulus, acropolis, sanctuary, temenos, platform, terrace, or shrine).

* + 1. **Results Recorded:**

***Per Constructed Place:***

* + - * **Orientation:** Cardinal or ordinal orientation
    1. **Statistics:**

***Per Constructed Place Type:***

* + - * Total number of each orientation type
      * Total number of each orientation type by region
      * Total number of each orientation type by period
  1. **Cumulative Viewshed (CVS):**
     1. **Goal:** To determine if the location of a cultic place was chosen to increase the view of the visitor (within its boundary) or an observer (looking at the landscape).
     2. **Procedure:** See “Method: Cumulative Viewshed (CVS)”.
  2. **Location Cumulative Viewshed (CVSL)**
     1. **Sample:** Create observers for each constructed place. Follow procedures for placement and number of observers (see PlaceType\_Analyses.xls).
     2. **Input Recorded (*CVSL*)**
        + **Cvsl\_num\_obs:** The number of observers applied
        + **Cvsl\_observer\_offet:** Offset of observer, if applied
        + **Cvsl\_max\_outer\_radius:** The total number of pixels within the study area, included in the 5k m buffer
        + **Cvsl\_totalpixels:** The total number of pixels within the study area, included in the 5k m buffer (the total number of pixels that could possibly be seen) -- use the clipped extent of the DEM
        + **Cvsl\_visible:** Total number of visible pixels
        + **Cvsl\_invisible:** Total number of invisible pixels
     3. **Results Recorded**

***Per Constructed Place (Place\_CVSL\_Summ)***

* + - * **Vis\_const\_tot:** Total number of constructed GNCP places identified within the visible area.
      * **Vis\_nat\_tot:** Total number of natural GNCP places identified within the visible area
      * **Vis\_const\_orient\_tot:** Total number of constructed places visible directly from the entrance (orientation)
      * **Vis\_nat\_orient\_tot:** Total number of natural places visible directly from the entrance (orientation)

***Per Constructed Place (Place\_CVSL\_Indiv)***

* + - * **Place\_id:** Place being analyzed
      * **Cvsl\_vis\_place\_id:** Place that is seen
      * **Cvsl\_type:** Indicates if it's a natural, constructed, oriented natural, or oriented constructed. Natural/Constructed means it was visible. Constructed.natural orientation means there was a linear field of view, and is recorded
    1. **Statistics:**

*Here, I am interested in discovering relationships between the place type and the degree of visibility (which is based on the number of visible constructed places) — from there, look at sub-relationships like the place type per period (for structures with long use-histories, like temples and tholoi) — and then comparing that regionally.*

* + 1. **Further Investigation:** Based on the per place results, investigate further any revealed trends related to place type, period, and region. Pay attention to any natural features (particularly those in the Elevated category) that are identified multiple times in the Oriented Towards and Visible Places field.
  1. **Observer Cumulative Viewshed (CVSO):**
     1. **Sample:** Create a polygon shapefile defining the basic user boundaries for each constructed place. Using a grid, create a random sample of observer points for both study areas.
     2. **Input Recorded *(CVSO)* Cvso\_num\_obs:** Number of observers
        + **Cvso\_observer\_offset:** Offset of observer
        + **Cvso\_max\_outer\_radius:** Size of the outer radius for OPs
        + **Cvso\_determination:** Number of observers per meter
        + **Cvso\_totalpixels:** Total number of possible visible pixels in the study area, included in the 5km buffer
     3. **Results Recorded:**

***Per Constructed Place* *(Place\_CVSO)***

* + - * **cvso\_timeseen:** Number of times that the place is seen (the gridcode of the CVSO analysis output)
      * **cvso\_visbyarea**: This is the average visible area for each place in relation to how much area it covers. cvso\_timeseen/cvso\_partialvis.
      * **cvso\_ \_deg\_vis:** Degree of visibility, or the number of times that place is seen based on the number of Observers within a 5k radius of the place [cvso\_timeseen]/ [cvso\_OP\_bounds].
      * **cvso\_AGL:** Output from the AGL raster calculation, which signifies the necessary height which would need to be added to the DEM for a pixel (place) to be visible.
    1. **Statistics:**

***Per Constructed Place***

* + - **Cvso\_deg\_vis**

***Per Constructed Place by Period***

* + - **Cvso\_deg\_vis**

***Per Constructed Place by Elevation (categorized)***

* + - **Cvso\_deg\_vis**
    1. **Further Investigation:** Based on the per place results, investigate further any revealed trends related to place type, period, and region.
  1. **Visual Prominence:** 
     1. **Goal:** To determine how prominent (noticeable) a particular place is in relation to its surroundings. The definition of “prominence” changes depending on the method applied (see below).

***VPL*** measures the visible horizon from the perspective of observers standing within the cultic place.

***VPO*** measures the visible horizon from the perspective of observers placed at (random or non-random) locations throughout an entire study area.

***CVP*** Calculates the number of times any cell can be seen by a series of observer points. CVP determines whether a group of features are visible and noticeable to one another (and therefore prominent).

* + 1. **Procedure:** See “Visual Prominence using Skyline”.

1. **Visual Prominence of the Location (VPL):** See “Visual Prominence using Skyline”.
   1. **Sample:** Create observers for all constructed places. Follow procedures for placement and number of observers.
   2. **Special Cases:** Particular viewing points could be selected on a case-by-case basis, determined by the place’s life history — for example, the visual prominence of a place from its affiliated settlement.
   3. **Input Recorded:**

**Vpl\_num\_obs:** Number of input observers

* 1. **Results Recorded:**

***Per Constructed Place (Place\_VPL\_Summ):***

* **Vpl\_prom\_id:** The place ID number of the place identified as prominent (record each as an individual record)
* **OP\_Tot:** Total number of observer points used.
* **Vpl\_prom\_Tot:** Total number of locations identified as prominent.
* **Vpl\_const\_Prom\_Tot:** Total number of constructed places (included in GNCP survey) that were identified as prominent.
* **Vpl\_nat\_Prom\_Tot:** Total number of natural places (included in GNCP survey) that were identified as prominent.
* **Vpl\_non\_GNCP\_Tot:** Total number of locations identified as prominent that are not in the GNCP survey (e.g. extending beyond the boundaries).
* **Vpl\_other\_cult\_tot:** Total number of non-GNCP locations (pixels) that are prominent but also cultically significant (beyond boundaries)
* **Vpl\_other\_cult\_name:** Names of any non-GNCP entries that are cultically significant

***Per Constructed Place (Place\_VPL\_Indiv):***

* **Vpl\_prom\_ID:** Provide the Place ID number for any places identified as prominent/significant.

**e. Statistics**

***Per Constructed Place Type:***

* **Vpl\_prom\_Tot:**

***Per Constructed Place Type by Elevation:***

* **Vpl\_prom\_Tot:**

***Per Natural Place Type:***

* **Vpl\_prom\_Tot:**

***Per Natural Place Type by Elevation:***

* **Vpl\_prom\_Tot:**

*I am interested in seeing how prominence relates to the type of constructed place where the OP is located — if, by place type (and place type by region and by period) shows trends in terms of the VPL\_prom statistic. Also, I should see how elevation and the natural place type (where it is located on) is related to the VPL\_prom\_tot.*

1. **Visual Prominence of the Observer (VPO):** See “Visual Prominence using Skyline”.
   1. **Sample:** Create observers for each constructed place. Follow procedures for placement and number of observers (see PlaceType\_Analyses.xls).
   2. **Input Recorded (*VPO)***

**Vpo\_op\_tot:** Total number of observer points.

* 1. **Results Recorded:**

***Per Constructed Place (VPO\_Summ):***

* **Vpo\_prom\_tot:** Total number of locations identified as prominent.
* **VPO\_GNCP\_Const\_Prom\_Tot:** Total number of constructed places (included in GNCP survey) that were identified as prominent.
* **VPO\_GNCP\_Nat\_Prom\_Tot:** Total number of natural places (included in GNCP survey) that were identified as prominent.
* **VPO\_Non\_GNCP\_Tot:** Total number of points identified as significant that are not in the GNCP survey
* **VPO\_Other\_Tot\_Cult:** If any Non\_GNCP\_Tot points are falling outside of the study area, assess whether these points are related to cultic activity and if so, record their names here.
* **VPO\_Other\_Cult\_Names:** Names of prominent non GNCP cult places.

***Per Constructed Place (VPO\_Indiv):***

* **VPO\_Prom\_ID:** Provide the Place ID number for any places identified as prominent.
  1. **Statistics**
     + Per place type: VPO\_prom\_tot
     + Per place type per region: VPO\_prom\_tot
     + Place type per period: VPO\_prom\_tot To determine whether the visibility provided per place type varies over time

1. **Cumulative Visual Prominence (CVP):** See “Method: Cumulative Visual Prominence.”
   1. **Sample:** This methodology compares random versus non-random locations. Non-random locations would be locations of constructed places, and include their maximum height. Random locations would be equal in number to these non-random locations.See the procedure outlined in PlaceType\_Analyses.xls.
   2. **Results Recorded:**

***Per Place Type (CVP)***

* **Cvp\_region\_area:** Size of the study area in square kilometers
* **Cvp\_gncp\_count**: Total number of GNCP places tested
* **Cvp\_rand\_count:** Total number of random points applied (should be equal to CVP\_gncp\_count)
* **Vis\_Radius:** The visibility radius applied. This should default to 5000 meters the majority of the time.
* **P\_Value:** The P Value result from the analyses, thus determining whether the cultic places were randomly placed or not.

***Per Special Interest Group (CVP)***

Repeat the above analyses and results for special interest groups, based on the results per place type.

* 1. **Statistics:**

***Per Place Type:***

P Value

***Per Place Type by Period:***

P Value

***Per Place Type by Region:***

P Value

1. **Natural Environment**
   1. **Natural Environment**
      1. **Goal:** To determine whether the topography (e.g. mountainous, plain, wetlands, etc.) of a cultic place demonstrates trends based on structure type, region, or period.
      2. **Procedure:** Run queries using the “located on” or “proximity to” designation in the Access database.
      3. **Sample:** All constructed places.
      4. **Statistics:**

***Per Natural Environment Type:***

* + - * Graph the number of occurrences of cultic places (open-air sanctuary, temple, etc.) per natural place type (elevated, river, lake, etc.)

***Per Region:***

* + - * Graph the number of occurrences of natural place types (elevated, river, lake, etc.)

***Per Period:***

* + - * Graph the number of occurrences of cultic places (open-air sanctuary, temple, etc.) per natural place type (elevated, river, lake, etc.)
  1. **Elevation:** 
     1. **Goal:** To determine whether the elevation of structures demonstrates trends based on structure type, region, or period.
     2. **Procedure:** Run queries using the elevation data associated with each constructed place.
     3. **Sample:** All constructed places.
     4. **Recorded:**
        + **Elevation\_mean:** Mean elevation size
        + **Elevation\_numpixels:** Number of pixels contributing to average elevation
        + **Elevation\_min:** Minimum elevation of the area
        + **Elevation\_max:** Maximum elevation of the area
     5. **Statistics:**

***Per Region:***

* + - Average elevation/type

***Per Region, Per Period:***

* + - Average elevation/type

1. **Cultural**
   1. **Literary References**
2. **Goal:** Whether the place has a known mythological or textual connection, unrelated to the dedication (see III.b).
3. **Procedure:** Run queries using the Ancient Sources table in Access.
4. **Sample:** All natural and constructed places.
5. **Statistics:**

***Per Place:***

* + - * Record A) None B) Yes (not related to nature) C) Yes (related to nature)

***Per Place Type:***

* + - * **Occ\_A:** Number of occurrences of A
      * **Occ\_B:** Number of occurrences of B
        + **Occ\_C:** Number of occurrences of C

***Per Natural Environment Type:***

* + - * **Occ\_A:** Number of occurrences of A
      * **Occ\_B:** Number of occurrences of B
      * **Occ\_C:** Number of occurrences of C

***Per Place Type per Period:***

* + - * **Occ\_A:** Number of occurrences of A
      * **Occ\_B:** Number of occurrences of B
      * **Occ\_C:** Number of occurrences of C

***Per Place Type per Natural Environment:***

* + - * **Occ\_A:** Number of occurrences of A
      * **Occ\_B:** Number of occurrences of B
      * **Occ\_C:** Number of occurrences of C

1. **Further Investigation:** Based on the results, determine whether trends (if any) are also unique to the two regions.

* 1. **Dedication**
     1. **Goal:** Whether the place has a known dedication to a deity.
     2. **Procedure:** Run queries using the Ancient Sources table in Access.
     3. **Sample:** All natural and constructed places.
     4. **Statistics:**

***Per Place:***

* + - * Record A) None B) Yes (not related to nature) C) Yes (related to nature)

***Per Place Type:***

* + - * **Occ\_A:** Number of occurrences of A
      * **Occ\_B:** Number of occurrences of B
      * **Occ\_C:** Number of occurrences of C

***Per Natural Environment Type:***

* + - * **Occ\_A:** Number of occurrences of A
      * **Occ\_B:** Number of occurrences of B
      * **Occ\_C:** Number of occurrences of C

***Per Place Type per Period:***

* + - * **Occ\_A:** Number of occurrences of A
      * **Occ\_B:** Number of occurrences of B
      * **Occ\_C:** Number of occurrences of C

***Per Place Type per Natural Environment:***

* + - * **Occ\_A:** Number of occurrences of A
      * **Occ\_B:** Number of occurrences of B
      * **Occ\_C:** Number of occurrences of C
    1. **Further Investigation:** Based on the results, determine whether trends (if any) are also unique to the two regions.