**Lesson 10 Exercises**

1. Read through part of Haak et al. (2015) SI 9 (p. 94-97). While we pick and chose which populations to put as source and test, based on our prior knowledge, sometimes it is good to check all possible cases. What is the ‘algorithm’ they use to test for admixture into any of the ancient sets?
2. What are their major findings (use the main Haak et al. paper to guide you) using qpAdm? (Write at least two, pointing to specific qpAdm combinations or methodology).
3. For the ancient sets in Figure 3, see if you can recalculate the mixture proportions and find the same result. Recreate the bottom half of the figure using R, Python, or Excel?
4. Looking at Table 1 below, can you:
   1. Explain what you think **rank1**, **00\_p**, **f\_S2**, and **pnest** refer to, and name the conditions that make a mixture model in qpAdm possible.
   2. Determine whether each scenario is possible or not.
   3. Give a hypothesis for what is happening for the Daur, Oroqen, and Xibo in Scenario 1.
   4. Name any problems with the model we set up that might affect whether we are actually testing Scenario 1 and Scenario 2.
5. **ADVANCED, BONUS**: Can you write a python function to parse through the qpAdm log file and grab all the important information you might need? That is, to reformat the information into one row of a table easy to open in Excel? Presumably, you could then put several log files into a single table to easily compare to each other.

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| **Table 1. *qpWave* and *qpAdm* results testing gene flow into East and Southeast Asians from Malta1 (Scenario 1) and from East and Southeast Asians into Malta1 (Scenario 2).** Results are using all sites. Out: Mbuti, Mota, UstIshim, Kostenki14, Papuan, Tianyuan | | | | | | | | | | | | | | | |
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| **Scenario 1** | | | | | | | | **Scenario 2** | | | | | | | |
| **S1** | **S2** | **Target** | **rank1** | **00\_p** | **f\_S2** | **se\_S2** | **pnest** | **S1** | **S2** | **Target** | **rank1** | **00\_p** | **f\_S2** | **se\_S2** | **pnest** |
| **Han** | **Malta1** | **Ami** | 0.1 | \* | \* | 0.027 | 0.6 | **Vestonice16** | **Ami** | **Malta1** | 0.5 | 0.5 | 0.3 | 0.033 | 3.20E-17 |
| **Han** | **Malta1** | **Dai** | 0.5 | 0.5 | 0 | 0.02 | 1 | **Vestonice16** | **Dai** | **Malta1** | 0.7 | 0.7 | 0.3 | 0.034 | 1.80E-17 |
| **Han** | **Malta1** | **Daur** | 0.1 | 0.1 | 0.08 | 0.032 | 0.01 | **Vestonice16** | **Daur** | **Malta1** | 0.8 | 0.8 | 0.4 | 0.036 | 1.40E-17 |
| **Han** | **Malta1** | **Hezhen** | 0.7 | 0.7 | 0.02 | 0.026 | 0.4 | **Vestonice16** | **Hezhen** | **Malta1** | 0.8 | 0.8 | 0.3 | 0.034 | 1.30E-17 |
| **Han** | **Malta1** | **Japanese** | 0.9 | \* | \* | 0.023 | 0.8 | **Vestonice16** | **Japanese** | **Malta1** | 0.7 | 0.7 | 0.3 | 0.034 | 1.80E-17 |
| **Han** | **Malta1** | **Kinh** | 0.2 | 0.2 | 0.006 | 0.024 | 0.8 | **Vestonice16** | **Kinh** | **Malta1** | 0.7 | 0.7 | 0.3 | 0.033 | 1.80E-17 |
| **Han** | **Malta1** | **Korean** | 0.9 | 0.9 | 0.04 | 0.024 | 0.08 | **Vestonice16** | **Korean** | **Malta1** | 0.7 | 0.7 | 0.4 | 0.035 | 1.80E-17 |
| **Han** | **Malta1** | **Lahu** | 0.3 | \* | \* | 0.027 | 0.01 | **Vestonice16** | **Lahu** | **Malta1** | 0.8 | 0.8 | 0.3 | 0.032 | 1.50E-17 |
| **Han** | **Malta1** | **Miao** | 0.9 | \* | \* | 0.025 | 0.2 | **Vestonice16** | **Miao** | **Malta1** | 0.6 | 0.6 | 0.3 | 0.033 | 2.20E-17 |
| **Han** | **Malta1** | **Naxi** | 0.8 | \* | \* | 0.024 | 0.4 | **Vestonice16** | **Naxi** | **Malta1** | 0.7 | 0.7 | 0.3 | 0.034 | 1.90E-17 |
| **Han** | **Malta1** | **Oroqen** | 0.7 | 0.7 | 0.07 | 0.028 | 0.008 | **Vestonice16** | **Oroqen** | **Malta1** | 0.6 | 0.6 | 0.4 | 0.035 | 2.00E-17 |
| **Han** | **Malta1** | **She** | 0.5 | 0.5 | 0.007 | 0.027 | 0.8 | **Vestonice16** | **She** | **Malta1** | 0.6 | 0.6 | 0.3 | 0.034 | 2.00E-17 |
| **Han** | **Malta1** | **Tujia** | 0.5 | \* | \* | 0.025 | 0.3 | **Vestonice16** | **Tujia** | **Malta1** | 0.7 | 0.7 | 0.3 | 0.034 | 1.70E-17 |
| **Han** | **Malta1** | **Xibo** | 0.1 | 0.1 | 0.08 | 0.026 | 0.003 | **Vestonice16** | **Xibo** | **Malta1** | 0.9 | 0.9 | 0.4 | 0.035 | 1.10E-17 |
| **Han** | **Malta1** | **Yi** | 0.8 | \* | \* | 0.026 | 0.4 | **Vestonice16** | **Yi** | **Malta1** | 0.6 | 0.6 | 0.3 | 0.033 | 2.40E-17 |
| **\*Mixture model is infeasible.** | | |  |  |  |  |  |  |  |  |  |  |  |  |  |