Hippocampi Reef (solution)

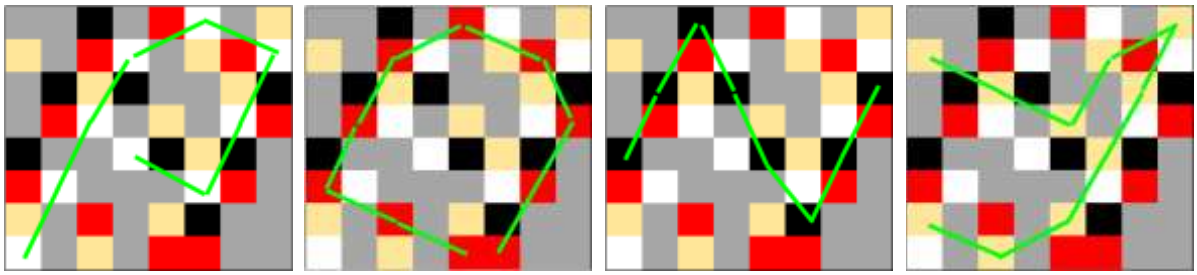
by Ong Kah Kien

As hinted by the flavortext, the four hippocampi (representing chess knights) each do a (partial) Knight's Tour of the given reef squares within the 8 x 8 grid. So, each blue reef square is only visited exactly once by one of the hippocampi along its path, and with the additional given constraint that each hippocampus does not cross over its own path. The given positions of the four hippocampi could be taken as either their starting or ending positions (does not affect the solution) along each of their paths, with the number on its position being the total length of its path (the four numbers sum to 37, which is the total number of blue reef squares).

Using the following logical analysis, it is possible to determine the four unique paths taken by each hippocampus:

- For the purposes of this solution, we use the chessboard grid notation, and take the four given positions as the known start points.
- The first step is to try to determine the four unknown end points.
- Observing the remaining reef squares, two of them (a2 and f1, via c1 and g3 respectively) have only a single connection path to another reef square, so they must be two of these end points.
- Therefore, there are still another two unknown end points:
    - One of them must be either h8 or h6;
        - And h6 must connect to g4, otherwise both h8 and h6 are end points
    - Other end point must be either a1 or a3;
        - And a3 must connect to b5
        - Also, c1 cannot connect to b3 (otherwise a1 will be left stranded by the non-crossing path rule), and must connect to e2
- The second step is to connect all the squares that only have two other connection points.
- So, a partial path is along e4-f2-g4-h6.
- This then forces g3 to connect to h5, so another partial path is along a3-b5-c7-e8-g7-h5-g3-f1 (end point).
    - As this partial path already has an end point (f1), so a3 is not an end point;
    - Therefore, a1 is an end point which connects to b3-c5-d7, while a3 connects to c2, then to start point e1 (instead of d4) because the length-10 path matches the red hippocampus
    - So, the complete path of the red hippocampus is **e1-c2-a3-b5-c7-e8-g7-h5-g3-f1**
- Separately, a4 can only connect to b6-c8-d6
    - a7 can only connect to c6-e5
        - d7 crosses if connect to e5, so d7 must connect to f8-h7-g5
        - And g5 must connect to f3, then to start point d4 (instead of e1) because the length-9 path matches the white hippocampus
        - So, the complete path of the white hippocampus is **d4-f3-g5-h7-f8-d7-c5-b3-a1**
            - e4 can only join to d6; so, the complete length-8 path of the black hippocampus is **a4-b6-c8-d6-e4-f2-g4-h6**
- Therefore, the final complete length-10 path of the pale hippocampus is **a7-c6-e5-f7-h8-g6-f4-e2-c1-a2**

Each of the paths taken by a hippocampus traces out the shape of a letter. The colors of the four hippocampi reference the colors of the horses that the Four Horsemen of the Apocalypse ride, with the canonical ordering of white, red, black, pale (yellow). Ordering the four letters in this manner (or by forming a unique word with them) yields the thematic answer to this puzzle **PONY**. The images below show the paths for each of the four hippocampi in order, and the letters traced out:



Constructor's notes:

This particular puzzle's answer led me to a chess theme, because of the iconic knight in chess. And eventually the Knight's Tour, with letter tracing using the paths being the most thematic and intuitive extraction method. Although this meant that not the entire chessboard grid would be used, it was still okay in the context of the hippocampi reef only partially filling the area, and helped with the logic solving of the paths. Originally, the paths and extracted letters were not ordered, as I wanted to avoid solvers guessing the thematic answer without solving all four paths completely. But eventually, I realized that it was not easy to figure out the answer even with two of the letters in the right positions, and requiring a transposal for last step was not so elegant. So, I added in the colors related to the Four Horsemen of the Apocalypse, which would provide a clue for the required ordering of the hippocampi paths and extracted letters.