MAIN PREDICTION:
ln(elevational barrier size) ~ Thermal niche breadth **(+)**

MODEL:
Ln(cost) ~ 1 + tas_breadth + tas_position + pcp_breadth + pcp_position + mtn_mass + water_buffering + dispersal_ability + pair_age + distance + boundary_length

SENSITIVITY ANALYSES PREVIOUSLY DISCUSSED:

- $pair_age :   all ages   *VS.*   ages < 8 mya   (8 mya coincides with the *end* of the uplift of the Andes)

- $distance :   all distances   *VS.*   distances < 1500km   (values in data frame are in METERS)

- $MAT_overlap: > 0%   VS.   > 75%   (more restrictive == less gradient speciation)

- $landgap: TRUE & FALSE   VS.   FALSE only   (remove pairs that crossed small bodies of
                                                                       water due to map resolution. All cases will
                                                                       be water crossings < 110 km.) (cases
                                                                       primarily in AA, IM but not exclusively).

SEE FOLLOWING PAGE FOR
DATAFRAME INFO AND METADATA

METADATA FOR ELEVATIONAL BARRIER MODEL

<u>'data.frame': 235 obs. of 21 variables:</u>

no migrants
*no paths across water**
must have > 0% in $MAT_overlap

$ uniquePairId: int   316 14 444 362 175 986 1011 260 292 405 ...
    IDENTIFIES PAIRS IN LARGER DATASET – do not include in models.

$ Species.1:   chr   "Tinamotis_pentlandii" "Apteryx_owenii" "Alectoris_barbara" "Polyplectron_bicalcaratum" ...
    IDENTIFIES SPECIES 1 NAME – omit from models. <u>MATCH THIS COLUMN TO THE PHYLOGENY TIP LABELS IF NEEDED (*I USED TREE 1*).</u>

$ Species.2:   chr   "Tinamotis_ingoufi" "Apteryx_haastii" "Alectoris_melanocephala" "Polyplectron_chalcurum" ...
    IDENTIFIES SPECIES 2 NAME – omit from models.

$ Species.1bl: chr   "Tinamotis pentlandii" "Apteryx owenii" "Alectoris barbara" "Polyplectron bicalcaratum" ...
    IDENTIFIES SPECIES 1 NAME IN BIRDLIFE – omit from models.

$ Species.2bl: chr   "Tinamotis ingoufi" "Apteryx haastii" "Alectoris melanocephala" "Polyplectron chalcurum" ...
    IDENTIFIES SPECIES 2 NAME IN BIRDLIFE – omit from models.

$ cost: num   1585006425 18000435 236195896 226012026 34532482 ...
    ELEVATIONAL BARRIER COST or MAGNITUDE – <u>response variable in model.</u>

$ lat: num   -34.594 -41.167 24.853 9.778 0.893 ...
    LATITUDE FOR SIS PAIR CENTROID CONSIDERING ONLY OCCURRENCE POINTS THAT CONTRIBUTE TO PATHS INCLUDED IN $cost – omit from models. <u>USE FOR PLOTTING PAIRS ON WORLD MAP</u>

$ lon: num   -68.4 173.2 32.3 98.7 108.8 ...
    LONGITUDE FOR SIS PAIR CENTROID CONSIDERING ONLY OCCURRENCE POINTS THAT CONTRIBUTE TO PATHS INCLUDED IN $cost – omit from models. <u>USE FOR PLOTTING PAIRS ON WORLD MAP</u>

$ tas_breadth: num   8.29 8.59 15.35 6.42 1.08 ...
    MEAN ANNUAL TEMPERATURE *RANGE* FOR SISTER PAIR CONSIDERING ALL OCCURRENCE POINTS – <u>predictor in model</u>

$ tas_position: num   280 286 295 296 298 ...
    MEAN ANNUAL TEMPERATURE FOR SISTER PAIR CONSIDERING ALL OCCURRENCE POINTS – <u>predictor in model</u>

$ pcp_breadth: num   0.0000629 0.0000176 0.000025 0.0001097 0.0000852 ...
    MEAN ANNUAL PRECIPITATION *RANGE* FOR SISTER PAIR CONSIDERING ALL OCCURRENCE POINTS – <u>predictor in model</u>

$ pcp_position: num   0.00004245 0.00004798 0.00000801 0.00006525 0.00008998 ...
    MEAN ANNUAL PRECIPITATION FOR SISTER PAIR CONSIDERING ALL OCCURRENCE POINTS – <u>predictor in model</u>

$ mtn_mass :   num   0.1765 0.0378 0.0397 0.1261 0.0713 ...
    PROP CELLS W/IN LOCAL NEIGHBORHOOD OF $lon, $lat THAT ARE MOUNTAINS – <u>predictor in model*</u>**

$ water_buffering: num   0.265 0.874 0.14 0.649 0.616 ...
    PROP CELLS W/IN LOCAL NEIGHBORHOOD OF $lon, $lat THAT ARE WATER – <u>predictor in model*</u>**

$ dispersal_ability: num   34.5 0.1 26.8 17.7 16.9 ...
    HAND-WING INDEX (HWI) – <u>predictor in model.</u>

$ pair_age: num 34.9 2.16 5.18 0.79 2.62 0 3.81 0.07 0.01 3.42 ...
    AGE OF PAIR DIVERGENCE (MYA) – <u>predictor in model.</u> <u>USE FOR FILTERING FOR SENSITIVITY ANALYSES.</u>

$ distance : num 3261348 168859 3992797 2183075 1253912 ...
    CENTROID DISTANCE SP1---SP2 CONSIDERING ONLY POINTS THAT CONTRUIBUTE TO PATHS INCLUDED IN $cost – <u>predictor in model.</u> <u>USE FOR FILTERING FOR SENSITIVITY ANALYSES.</u>

$ boundary_length: num   438252 33340 811346 658712 266286 ...
    MEAN OF MEAN DISTANCES AMONG CELLS CONSIDERING ONLY SP1, SP2 PTS THAT CONTRUBTE TO PATHS INCLUDED IN $cost – <u>predictor in model</u>

$ MAT_overlap: num   0.882 0.348 0.395 0.936 0.983 ...
    % MEAN ANNUAL TEMPERATURE OVERLAP SP1, SP2 CONSIDERING ALL OCCURRENCE POINTS (% smaller in larger) – <u>POTENTIAL PREDICTOR – NOT CURRENTLY IN MODEL.</u>

$ realm: Factor "NTNT","AAAA",..: 1 2 6 7 7 14 14 14 7 1 ...
    REALM. TWO VALUES CONCATONATED FOR EACH B/C SOME PAIRS CROSS REALM LINES – <u>POTENTIAL PREDICTOR – NOT CURRENTLY IN MODEL.</u> <u>INCLUDED IN CASE THERE ARE REALM PATTERNS THAT ARE IMPORTANT DOWN THE LINE.</u>

$ landgap**   logi   FALSE FALSE FALSE TRUE TRUE FALSE ...
    TRUE IF PATH CROSSES WATER (<u>ALL WATER CROSSING < 110KM & DUE TO MAP RES ROUNDING WATER CELLS TO LAND</u>) – <u>POTENTIAL PREDICTOR – NOT CURRENTLY IN MODEL.</u> <u>USE FOR FILTERING FOR SENSITIVITY ANALYSES.</u>

***WILL WORK WITH J.B. TO IMPLEMENT IMPROVED METHOD FOR $mtn_mass AND $water.buffering. WE WERE UNABLE TO MEET ON FRIDAY (SCHEDULING CONFLICTS) AND I DID NOT FEEL IT WOULD BE APPROPRIATE TO PRESSURE J.B. TO MEET WITH ME OVER THE WEEKEND. WE ARE MEETING MONDAY FEB 22 TO HAMMER THIS METHOD OUT AND TRY TO GREATLY IMPROVE THESE TWO METRICS.
    REF: Kalmar & Currie 2006, **https://doi.org/10.1111/j.1466-822X.2006.00205.x**