It's Not Fair!
A simulation of the roles of mutation and chance in natural selection
Southwest Missouri State University

Rules of the Game
1. All players begin as the same organism, a salamander.
   a. Salamanders are small amphibians that live in water or in moist terrestrial habitats
   b. Does not hibernate
   c. Rests at night in holes in the ground, under logs, or wherever it can find some shelter
   d. They are mute and can not make any noise
   e. Low endurance - must rest after moving continuously for several minutes
   f. Weak swimmer - is carried away by a current flowing faster than half a mile per hour
   g. Moves slowly on land and cannot jump
   h. Body and eggs absorb salts from salt water so it cannot survive in a saltwater environment
   i. Lives in forested regions bordered by a large river.
   j. There are many other organisms living in the same area.
   k. Winters are not severe; snow rarely accumulates.

2. The game will be organized into rounds that represent periods of roughly 1 million years. These rounds will be organized as follows.
   a. At the beginning of each round each player picks up to 2 mutations from a list displayed at the front.
   b. Many mutations will appear in more than one round with new mutations added in each round.
   c. Each mutation is permanent to the player's species and will be effective in all the following rounds.
   d. Any new mutation replaces any contradicting traits which are indicated by brackets [ ] after the mutation.
   e. Some mutations require previous mutations. These prerequisites are listed in parentheses ( ) after the mutation.
   f. After mutations are chosen, an environmental change is randomly picked from the list. These environmental changes only have an effect in the round in which they are chosen and should not be used twice; no points will be gained or lost for past environmental change.

3. Scoring - Each student begins with 5 points. A score of zero (0) represents extinction and the player is out of the game. Players attempt to survive and increase their scores.
   a. If an environmental change is beneficial, +1 points
   b. If an environmental change is detrimental, -1 points
Lay out your lab sheet as follows:
Title: Its Not Fair
- Skin Color - red
- Skin Texture – moist and soft
- Size - 6 inches long
- Body temperature - cold blooded
- Diet - invertebrates
- Reproduction - Attracts mate by smell, mates on land, Lays eggs in shallow pools of water
- Young - Does not care for young in any way

<table>
<thead>
<tr>
<th>Round #</th>
<th>Mutation(s)</th>
<th>Mutation Description</th>
<th>Environmental Change</th>
<th>Points (start with 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Environmental Changes
1. Flies begin to be seen in the area [benefits those with mutation 20].
2. Temperatures drop where temperatures are now consistently below freezing and snow accumulates [Does not effect 4 or 21, hurts all others].
3. Drought: small pools dry up and the river level drops 2 feet [Does not effect those with 28, 31, or 32, hurts all others].
4. Rabbits begin to populate the region [benefits those with 18].
5. The population of songbirds in the region increases [benefits those with 36 and 37, all others no effect].
6. A population of freshwater carnivorous turtles moves into the river [Does
not effect those with 28 and 41, hurts all others].
7. A population of freshwater fish that eats eggs laid in the water moves into the river [Does not effect those with 28 or 30; helps those with 18, hurts all others].
8. A snake similar to a rattlesnake develops in the region; snakes locate their prey by warmer body temperatures [hurts those with 21 and 28, unless they have 40. No effect on anyone else].
9. Hawks migrate into the region, hunting during the day [hurts those without some form of coloring, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 22, 28, ].
10. A weasel moves into the region; weasels locate their prey by scent [hurts those without 13 or 33; helps those with 18 and 40 x2, no effect on anyone else].
11. A flood washes away regions near the river [hurts all without 24, 39 or 41].
12. Sewage dumped into the river contaminates the river [hurts all except those with 28 or 31, benefits those with 14].
13. An oil spill contaminates the saltwater sea [hurts those with 14, no effect on all others]
14. People begin to hunt species over 15 inches long [hurts those with 40 x2 or more].

Mutations

Round 1
1. Dryer skin
5. Develops brown pigment, producing reddish brown color
9. Develops green pigment, producing green spots
15. Develops toxic skin secretions that taste bad to predators
16. Develops bright orange coloration (15)
17. Adds small canines, develop teeth, allowing consumption of larger prey to diet (16)
21. Becomes warm blooded (1)
27. Develops a protective covering on eggs
28. Mates and Lays eggs on land (27)
34. Changes in circulation and muscle physiology increase endurance (21)
35. Develops webbed feet
40. Increases size 6, 12, 24, 48. Can be taken more than once. (34)

Round 2
7. Develops white pigment, producing spotted white coloration [cancels 6,10]
10. Increases green pigment, producing solid green color (9)
14. Skin becomes impermeable to salts found in salt water
15. Develops toxic skin secretions that taste bad to predators
16. Develops bright orange coloration (15)
19. Develops claws
21. Becomes warm blooded (1)
27. Develops a protective covering on eggs
29. Develops pigment in egg shell, which acts as a camouflage (27)
30. Cares for eggs and young
36. Leg length doubles, producing longer legs in proportion to body size, allowing organism to flee from some predators (34)
40. Increases size 6, 12, 24, 48. Can be taken more than once. (34)

Round 3
2. Develops tough skin and scales (1)
3. Develops toxic eggs
12. Changes in pigmentation allow rapid color changes, such as those occurring in chameleons (5,9) [cancels 11]
15. Develops toxic skin secretions that taste bad to predators
20. Develops a longer tongue, which allows the organism to catch flying insects
22. Becomes nocturnal
26. Burrows, nesting under ground (19)
28. Mates and Lays eggs on land (27)
30. Cares for young after eggs hatch
33. Uses voice to attract mates [replaces scent used to attract a
mate]
34. Changes in circulation and muscle physiology increase endurance (21)
39. Develops fins (35) [cancels 37, 38]

Round 4
6. Increases brown pigment, producing solid brown color (5)
8. Increases white pigment, producing solid white color (7)
11. Seasonal color changes (5, 7, or 9) [cancels 12]
18. Develops larger canines, allowing consumption of larger prey
19. Develops claws
23. Builds a den/nest
29. Develops pigment in egg shell, which acts as a camouflage (27)
31. Becomes a marsupial, has live young (30) [cancels 28]
36. Leg length doubles, producing longer legs in proportion to body size, and allowing organism to flee from some predators (34)
38. Loses limbs [cancels 35, 36, 37, 39]
39. Develops fins (35) [cancels 37, 38]
41. Lives in water continually (35)

Round 5
1. Dryer skin
3. Develops toxic eggs
4. Develops cryoprotectant chemicals (helps with freezing temperatures)
5. Develops brown pigment, producing reddish brown color [cancels 8, 10]
13. Variety in pigment so that mates are attracted by coloring (5, 7, or 9) [replaces use of scent to attract a mate so scent is lost]
15. Develops toxic skin secretions that taste bad to predators
16. Develops bright orange coloration (15)
24. Spends part of its waking hours in trees (19)
32. Carries young to term (30)
34. Changes in circulation and muscle physiology increase
endurance (21)
35. Develops webbed feet
36. Leg length doubles, producing longer legs in proportion to body size, allowing organism to flee from some predators (34)

Round 6
2. Develops tough skin and scales (1)
14. Skin becomes impermeable to salts found in salt water
17. Adds small canines, develop teeth, allowing consumption of larger prey to diet (16)
19. Develops claws
20. Develops a longer tongue, which allows the organism to catch flying insects
21. Becomes warm blooded (1)
26. Burrows, nesting under ground (19)
28. Mates and Lays eggs on land (27)
30. Cares for eggs and young
33. Uses voice to attract mates [replaces scent used to attract a mate]
37. Develops stronger leg muscles
39. Develops fins (35) [cancels 37, 38]
40. Increases size 6, 12, 24, 48. Can be taken more than once. (34)

Round 7
6. Increases brown pigment, producing solid brown (5)
7. Develops white pigment, producing spotted white coloration [cancels 6, 10]
10. Increases green pigment, producing solid green color (9)
11. Seasonal color changes (5, 7, or 9) [cancels 12]
17. Adds small canines, develop teeth, allowing consumption of larger prey to diet (16)
18. Develops larger canines, allowing the organism to eat larger prey (17)
22. Becomes nocturnal
23. Builds a den/nest
24. Spends part of its waking hours in trees (19)
32. Carries young to term (30) [cancels 31]
36. Leg length doubles, producing longer legs in proportion to body size, and allowing for swifter running--twice as fast as before
38. Loses limbs [cancels 35, 36, 37, 39]
40. Increases size 6, 12, 24, 48. Can be taken more than once. (34)

Round 8
4. Develops cryoprotectant chemicals (helps with freezing temperatures)
8. Increases white pigment, producing spotted white [cancels 6, 10]
9. Develops green pigment, producing spotted green [cancels 6, 8]
19. Develops claws
29. Develops pigment in egg shell, which acts as a camouflage (27)
31. Becomes a marsupial, has live young (30) [cancels 28]
34. Changes in circulatory system increase endurance
36. Leg length doubles, producing longer legs in proportion to body size, and allowing for swifter running--twice as fast as before
37. Develops stronger leg muscles
39. Develops fins (35) [cancels 37, 38]
40. Increases size 6, 12, 24, 48. Can be taken more than once. (34)
41. Lives in water continually (34, 35)

Round 9
2. Develops tough skin and scales (1)
3. Develops toxic eggs
5. Develops brown pigment, producing reddish brown color [cancels 8, 10]
13. Variety in pigment so that mates are attracted by coloring (5, 7, or 9) [replaces use of scent to attract a mate so scent is lost]
21. Becomes warm blooded (1)  
22. Becomes nocturnal  
28. Mates and Lays eggs on land (27)  
33. Uses voice to attract mates [replaces scent used to attract a mate]  
40. Increases size 6, 12, 24, 48. Can be taken more than once. (34)  

Round 10  
13. Variety in pigment so that mates are attracted by coloring (5, 7, or 9) [replaces use of scent to attract a mate so scent is lost]  
14. Skin becomes impermeable to salts found in salt water  
17. Adds small canines, develop teeth, allowing consumption of larger prey to diet (16)  
20. Develops a longer tongue, which allows the organism to catch flying insects  
35. Develops webbed feet  
36. Leg length doubles, producing longer legs in proportion to body size, allowing the organism to flee from some predators (34)  
39. Develops fins (35) [cancels 37, 38]  
40. Increases size 6, 12, 24, 48. Can be taken more than once. (34)
Answer the following questions after completing the exercise.

1. Did your organism survive or go extinct?
2. Describe your Ending organism, or describe when it went extinct and what it looked like.
   i. Skin Color - ??
   ii. Skin Texture – ??
   iii. Size - ?? inches long
   iv. Body temperature - ??
   v. Diet - ??
   vi. Reproduction - Attracts mate by smell, mates on land, Lays eggs in shallow pools of water
   vii. Young - Does not care for young in any way

3. Can your organism survive in Indiana?
4. Explain the perfect environment for your creature to live.
5. Pick a mutation you would like to change in your organism for its better success in random environment we came up with in class.