

FIRST® LEGO® League Challenge BIOGLOW™ Building Instructions

Mission 12: Forest Elder

This build is 103 pieces, and 24 building steps.

Welcome to text-based instructions from Bricks for the Blind. Before you start building, here are some terms we'll be using:

- In Front of/Front: towards you.
- Behind/Back: away from you.
- Up: towards the ceiling.
- Down: towards the floor.
- Stud: the bump on a LEGO brick. Example: A 2x1 brick has two studs on it.
- Vertically: going from front to behind.
- Horizontally: going from left to right.
- Upright: pointing up towards the ceiling.
- That one/ppp: previously placed piece.
- Plate: piece with studs.
- Tile: smooth piece without studs (unless otherwise specified)
- Symmetrically: a mirror image. Example: If you place a 2x1 brick with technic connector on the front wall at the right, connector to the front, and then place another such piece symmetrically on the back wall, at the right, the technic connector of the second piece should point to the back, since it will be placed symmetrically.
- Centered-vertically: even amount of space in front of and behind the piece
- Centered-horizontally: even amount of space left and right of the piece.
- Row: studs lined up horizontally (left to right/side to side).
- Column: studs lined up upright or vertically (top to bottom/back to front).
- Standing upright: the piece is perpendicular to the ground, like a wall.
- Lying flat: the piece is parallel to the ground, like a piece of toast which fell off the table.
- Anti-stud: the portion of a piece which accepts studs, like the bottom of a plate.
- Jumper plate: a 1x2 plate with a single stud on top, or a 1x3 plate with only two studs on top.

For builders with low vision, or a sighted building partner who may want to follow along with the printed visual instructions that come with each set. As low vision users may benefit from viewing the instructions on a personal device where they can zoom in on content and use assistive technologies to enhance the visuals.

A note on LEGO Technic™ part names. These parts are somewhat different from regular LEGO bricks. I'll include some definitions in case the builder or helper is not familiar with LEGO Technic™.

Axles - An axle is a connector which has an X shaped cross-section. Because their cross section is not round, anything connected to an axle using an axle-hole will rotate with that axle. Axles are longer than they are wide, and the length of an axle corresponds with how many bricks long it is. Aka a 3L axle is three bricks long. Axles come in a variety of lengths, with a 2L axle being the shortest available. They may be combined with pins, or have circular stops on them. A stop prevents the axle from sliding through an axle-hole at a specific point on the axle.

Pins - A pin is a connector which has a circular cross section and a flanged notch out of one or both ends. This flanged notch allows them to click into bricks with a pin-hole. Pins come with and without friction ridges, which are small bumps on the pin which prevent them from rotating freely. For standard pins, black is a high friction pin, and gray is a low friction pin. A standard length pin is two brick lengths long, with a stop in the middle. This prevents a brick from being pushed from one side of the pin to the other. A 1L pin is one brick long and still retains the stop, however it also includes a hollow stud at the other end. A 3L pin is three bricks long, and only contains a stop at one side, allowing two bricks to be pushed onto the other side of the pin. Pins may also have one side which is an axle.

Lifarms - A lifarm is a basic structural element, similar to a brick or a plate, but usually without any studs. It is a beam with rounded ends and with holes in it, with the same spacing as the studs on a LEGO brick. lifarms come in a variety of lengths, including a 1x1 lifarm which looks like a cylinder. Thick lifarms are as wide as a LEGO brick, and thin lifarms are half as wide as a LEGO brick, but not the same thickness as a LEGO plate! The holes in a lifarm arm may accept axles or pins. They also come in a variety of shapes, including tees, els and triangles.

Gears - A gear is a functional element. They are typically discs with teeth on the outside, there are also worm gears which look like a spiraling cylinder! Gears connected by axles transmit or even transform rotational motion!

Axle and Pin Connectors - These elements are typically smaller than lifarms, and are used to connect some combination of pins or axles. They might have pins or axles, as well as axle or pin-holes. They have a lot of different angle combinations! The simplest just connects two axles or pins together in a straight line.

Bushes/Bushings - LEGO Technic™ uses bushes largely as spacers, but they also can reduce friction between rotating parts, or can form useful elements such as handles. Bushes are typically light gray, generally cylindrical, and have an axle-hole running through the middle. They have a flange at the front and back to make them easier to pull on and off.

Sorting Instructions:

This LEGO set comes in the bag labeled 18. Sort the pieces into groups as described below. Note that where there are multiple colors of the same brick in a step, the colors will be split across two groups to make telling the difference easier for the builder! LEGO includes a few spare parts in case you lose something. Set these into their own group away from the rest, in case you need them later.

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Group A contains all of the black 2L pins from this bag. These pins have friction ridges.

Group B contains all of the blue 3L pins from this bag. These pins have friction ridges.

Group C contains all of the blue 2L axle/pin combos from this bag. These pins have friction ridges.

Bag 18 (5 groups of bricks)

Main Build: Base

Group 1 contains the pieces for steps 1-8.

Group 2 contains the pieces for steps 9-11

Group 3 contains the pieces for steps 12-20.

Group 4 contains the pieces for steps 21-23.

Sub-Build: Small Frame

Group 5 contains the pieces for step 24.

Building Instructions:

Groups A, B, C and 1. You will use the pins from groups A, B and C throughout the build.

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Main Build

1.1. Let's start building a base. Place a green 8x8 round plate in front of you.

1.2. Place a red 1x2 wall panel, horizontally with the wall at the back, centered horizontally on the back row of the previous piece.

2.1. Place a red 1x2 wall panel, horizontally with the wall at the front, in front of the previous piece.

2.2. Place a red 1x2 wall panel, horizontally with the wall at the front, to the left of the previous piece. Repeat symmetrically on the right side.

3.1. Place a green 1x2 brick with an axle hole, vertically and centered vertically, on the rightmost column of the 8x8 round plate.

3.2. Place a light gray 1x2 brick, vertically, to the left of the previous piece.

4.1.1. Now we'll make the mount for a tree. Set the base aside for now. Place a light gray 4x4 round brick with four pin holes, with the pin holes at the front and back and left and right, in front of you.

4.1.2. Push a blue 3L pin from group B, with the stop ring at the back, from the front into the front hole of the previous piece so it extends 2L to the front.

4.2. Push the hole of a dark gray 1x2 brick with a hole, horizontally, onto the front side of the previous piece. Push it all the way back until it touches the 4x4 round brick.

4.3. Find a dark gray 1x2 brick with two 1x2 thin liftarms on one side. This piece is shaped like a letter U. The brick has a pin hole on one side. Push the pin hole of this piece, with the liftarms at the front, from the front onto the 3L pin.

4.4. Place the base, with the two rows of 1x2 wall panels horizontally at the back, in front of you. Place the 4x4 round brick in front of the front row of wall panels and to the left of a 1x2 brick. There should be two free columns to the left of this piece.

5.1. Place a green 2x3 plate, vertically and centered vertically, on the front three rows of the base. This piece will attach to the 4x4 round brick and the two bricks in front of it.

5.2. Place the leftmost column of a green 2x3 plate, horizontally, on the rightmost column of the 4x4 round brick. The right two columns will attach to two 1x2 bricks.

6.1. Place a green 1x1 round plate with three leaves on one side, with the leaves pointing to the left, on the third stud from the front on the second column from the left on the 8x8 round plate. This piece will be to the left of the 4x4 round brick.

6.2. Place a dark pink frog, with the head at the back, on the previous piece.

7.1. Place a green 1x1 round plate with three leaves on one side, with the leaves pointing to the front right, on the back left corner of the front 2x3 plate.

7.2. Place a green 1x1 round plate with three leaves on one side, with the leaves pointing to the back right, on the front left corner of the right 2x3 plate.

8. Find the 1x2 brick with a hole that's on the right column of the base. Push the axle of a brown curved bar with a stud on one side, horizontally with the stud at the right and curving up to the right, from the left into this hole. The stud will face front and back.

Group 2.

9.1.1. Next, we'll start making the trunk of a tree. Set the base aside for now. Place a yellow 11L axle, horizontally, in front of you.

9.1.2. Find a tan 2x2 bent cylinder. This is a cylinder that's about 3L long and is curved. It has an axle hole on each flat end. Push the left axle hole of this piece, horizontally with the right axle hole pointing down, from the right onto the right end of the previous piece.

9.2.1. Place a tan 2x2 round brick in front of you.

9.2.2. Place a tan 2x2 round tile with a hole on the previous piece.

9.2.3. Rotate the previous two pieces so the tile is on the right and push the hole on the previous piece onto the left side of the axle. Push it all the way to the right so it touches the bent cylinder.

9.3.1. Push a tan 2x2 round plate, with the studs on the right, from the left onto the axle. Push it all the way to the right.

9.3.2. Push a sand green 2x2 round plate with four bars sticking up, with the studs on the right, from the left onto the axle. Push it all the way to the right.

9.4. Push a tan 2x2 round brick, with the studs on the right, from the left onto the axle. Push it all the way to the right. Repeat this four times until only about 2L of the axle is exposed.

9.5. Push the hollow stud of a green 1x1 round plate with three leaves on one side, with the stud on the right and the leaves at the front, from the right on the front bar on the trunk. Repeat symmetrically on the back side.

9.6. Place the base, with the curved bar on the right, in front of you. Rotate the trunk so it's upright with the bent cylinder at the top and the axle at the bottom. The flat face with the axle hole of the bent 2x2 cylinder should be at the front side pointing up. Place the trunk, centered, on the base. It will go on the 4x4 round brick and the axle at the bottom of the trunk will go into the center hole of the 4x4 round brick.

10.1.1 Now we'll build the top of the tree. Place a tan 2x2 round brick in front of you.

10.1.2. Place a sand green 2x2 round plate with four bars sticking up on the previous piece.

10.2. Place a tan 2x2 round tile with a hole on the previous piece.

10.3.1. Find a tan 2x2 bent horn. This piece looks like a segmented cone that is bent. It has axles on the top and bottom. Place this piece, with the widest part at the bottom and the top axle hole pointing to the front left, in front of you.

10.3.2. Push a black 4L axle, from the bottom, into the bottom axle hole of the previous piece.

10.3.3. Push the previous two pieces, from the top, into the hole on the 2x2 round tile with a hole. Push them all the way down until the axle extends about 1L below the 2x2 round brick at the bottom.

10.4. Push a red 2L axle into the top axle hole of the 2x2 bent horn.

10.5. Rotate the assembly we just made so the 2x2 brick is at the back and so the previous piece is at the front pointing down. Push the axle on the back side of the assembly into the axle hole on the top of the tree.

11.1.1. Now we'll add a branch to the top of the tree. Place a tan 1x1 round plate with a hollow stud in front of you.

11.1.2. Place a tan 1x1 cone on the previous piece.

11.2. Push the short bar of a green short bar with three leaves on one side, with the bar on top, from the bottom into the hollow anti-stud of the 1x1 round plate.

11.3. Rotate this assembly so the leaves are at the front and the cone is at the back. Push the hollow stud of the cone onto the left bar that's near the top of the tree trunk.

Group 3.

12.1.1. Next we'll build another branch. Find a tan 90 degree tube. This looks exactly like a macaroni noodle, except that it's green and it probably won't taste very good if you cook it! Place this, laying flat with the holes on the left and back, in front of you.

12.1.2. Push the stud of a tan 1x1 round plate with a hollow stud, with the stud at the front, into the back hole of the previous piece.

12.2.1. Push a red 2L axle, from the left, into the left hole of the 90 degree tube.

12.2.2. Push a green 3L bar, from the back, into the hollow anti-stud of the 1x1 round plate. Push it all the way in.

12.3.1. Push the hollow anti-stud of a tan 1x1 cone, with the stud at the back, from the back, onto the previous piece. Push it all the way forward until it touches the 1x1 round plate.

12.3.2. Push the hollow anti-stud of a tan 1x1 cone, with the stud on the left, from the left, onto the left side of the 2L axle on the left side of the 90 degree tube.

12.4. Push the bottom hollow anti-stud of a green 1x2 plate with rounded ends and medium leaves on one end, upright with the studs at the back and the leaves on top, from the back onto the 3L bar. Push it all the way forward until it attaches to a 1x1 cone.

12.5. Push the hollow anti-stud of a green 1x1 round plate with three leaves on one side, with the leaves pointing up and the stud at the back, onto the back side of the 3L bar. Push it all the way forward until it attaches to the previous piece. Repeat with another 1x1 round plate with three leaves.

12.6. Place the base, with the curved bar on the right, in front of you. Find the bar that's on top of the tree, a little ways behind the axle that's pointing to the front. Rotate the branch so the leaves are on top and so there is a cone pointing to the back. Push the hollow stud of the cone on the branch into the bar on top of the tree.

13.1. We'll build another branch now. Set the base and tree aside. Place a tan 90 degree tube, laying flat with the holes on the left and back, in front of you.

13.2. Push the stud of a tan 1x1 round plate with a hollow stud, with the stud at the front, into the back hole of the previous piece.

14. Push a green 3L bar, from the back, into the hollow anti-stud of the previous piece. Push it all the way in.

15. Push the hollow anti-stud of a tan 1x1 cone, with the stud at the back, from the back, onto the previous piece. Push it all the way forward until it touches the 1x1 round plate.

16. Push the left hollow anti-stud of a green 1x2 plate with rounded ends and medium leaves on one end, upright with the studs at the back and the leaves pointing to the right, from the back onto the 3L bar. Push it all the way forward until it attaches to the 1x1 cone.

17.1. Push the bottom hollow anti-stud of a green 1x2 plate with rounded ends and medium leaves on one end, upright with the studs at the back and the leaves pointing up, from the back onto the 3L bar. Push it all the way forward until it attaches to the previous piece.

17.2. Push the top hollow anti-stud of a green 1x2 plate with rounded ends and medium leaves on one end, upright with the studs at the back and the leaves pointing down, from the back onto the 3L bar. Push it all the way forward until it attaches to the previous piece.

18. Place an orange butterfly, with the wings at the top and bottom, on the bottom stud of the previous piece.

19. Place the base, with the curved bar at the back, in front of you. Find the axle that's near the top of the tree, pointing to the right. Rotate the branch so the leaves are on top and so the free hole of the 90 degree tube is at the bottom facing left. Push this axle hole onto the axle on the top of the tree.

20. Find the two 2L liftarms that are at the bottom of the base on the right side. Push a red 2L axle, from the front, into the front 2L liftarm. Only push it in until the back side of the axle is even with the back side of the front thin liftarm.

Group 4.

21.1.1. Next, we'll make a support for the tree. Place the base and tree aside for now. Find a green axle and pin connector #1. This piece has a 1L axle connector on one side, and a perpendicular pin hole on the other. Place this piece, with the axle connector on the left and the pin hole facing front and back, in front of you.

21.1.2. Push a red 2L axle, from the left, into the axle connector of the previous piece.

21.2.1. Push the right hole of a green 2L axle connector, from the left, onto the left side of the previous piece.

21.2.2. Push a red 2L axle, from the left, into the axle connector of the previous piece.

21.3.1. Push the right hole of a dark tan 3L axle connector, from the left, onto the left side of the previous piece.

21.3.2. Push a red 2L axle, from the left, into the axle connector of the previous piece.

21.4.1. Push the right hole of a dark tan 3L axle connector, from the left, onto the left side of the previous piece.

21.4.2. Find a black axle connector with three axles around it. Push the right axle of this piece, with the axle hole facing up and down and one axle pointing to the right and the others pointing towards the front and back, into the right axle hole of the previous piece.

21.5. Find a dark brown axle and pin connector #5. This piece has two 1L axle connectors which form an angle slightly greater than 90 degrees, and a perpendicular pin hole between them. Place the back right axle hole of this piece, with one axle connector facing front left and the other facing to the back right, on the front left axle of the previous piece. Repeat symmetrically on the back side.

21.6.1. Find the axle hole that faces up between the right ends of the previous two pieces. Push the axle side of a blue 2L axle/pin combo from group C, with the pin side on top, from the top into this hole.

21.6.2. Push a green 1L liftarm, from the top, onto the pin side of the previous piece.

21.7. Place the base, with the curved bar at the back, in front of you. Find the two 2L liftarms on the bottom of the base near the right. Rotate the support assembly so it's upright with a pin hole at the bottom and the pin with a 1L liftarm near the top on the right. Line up the hole on the bottom with the 2L axle in the front 2L liftarm on the base. Push the axle all the way in to attach the support. Rotate the support to the left so the two arms wrap around the tree.

22.1. Next, we'll make a ring! Set the base and tree aside for now. Place a red 1x4 plate with rounded ends, horizontally, in front of you.

22.2. Place the right two studs of the back row of a 4x4 corner plate with a rounded corner, with the rounded corner at the back left, on the left two studs of the previous piece. Place another symmetrically to the right of the first.

22.3.1. Place a red 1x4 plate with rounded ends, horizontally and centered horizontally, on the back row of the ring assembly.

22.3.2. Place a red 1x1 round tile on each of the four studs of the previous piece.

22.4. Place the back two studs of a red 1x4 plate with rounded ends, vertically, under the front two studs of the left column of the red 4x4 rounded corner plate. Repeat symmetrically on the right side.

22.5. Place the back two studs of the left column of a 4x4 corner plate with a rounded corner, with the rounded corner at the front left, on the front two studs of the left piece from the previous step. Place another symmetrically to the right of the first.

22.6. Place the front stud of a black 1x2 plate with rounded ends, vertically, on the back stud of each of the previous two pieces.

22.7. Place a red 1x4 plate with rounded ends, horizontally and centered horizontally, under the front row of the ring assembly.

22.8. Place a black 1x4 plate with a bar hanging down from one long side, horizontally and centered horizontally with the bar at the front, on the front row of the ring assembly.

22.9. Push one of the hollow studs of a light gray 21 link chain, from the bottom, onto the bar of the previous piece.

22.10. Place the base, with the curved bar on the left, in front of you. Find the upright bar that's about halfway up the trunk on the front side. Push the other hollow stud of the gray 21 link chain, from the top, onto this bar.

23.1.1. Let's build a root! Place a green 2x2 round plate in front of you.

23.1.2. Place a tan 2x2 round brick on the previous piece.

22.2. Place a tan 2x2x2 cone on the previous piece.

23.3.1. Find a sand green flower petal piece. This looks like a dish with pointed corners that stick up. Place this on the previous piece.

23.3.2. Push the bar of a dark gray 1L bar with a ball on one side, with the ball on top, through the hollow stud of the previous piece.

23.4.1. Place a red axle and pin connector #1, with the axle connector on the left and the pin hole facing front and back, in front of you.

23.4.2. Push a black 4L axle, from the left, into the axle hole of the previous piece.

23.4.3. Rotate the previous two pieces so the axle is at the top and push the axle, from the bottom, into the center anti-stud on the bottom of the root assembly.

23.5. Rotate the root so the #1 axle and pin connector is on top with the holes facing left and right. Slide the hole onto the left side of the curved bar on the base.

Sub-Build: Small Frame

24.1.1. Next, we'll build a small frame. Set the tree and base aside for now. Find a light gray 1x11.5 double bent liftarm. This piece looks like a 7L liftarm and a 3L liftarm connected by another small liftarm. The 3L liftarm is at a right angle to the 7L liftarm. It looks kind of like your finger if you bend each of the two joints at 45 degrees. Place this in front of you with the 7L liftarm horizontally at the bottom pointing to the right and the 3L liftarm upright on the left pointing up.

24.1.2. Push the axle side of a blue 2L axle/pin combo from group C, with the pin side at the front, from the front into the rightmost axle hole of the previous piece.

24.2.1. Skip one hole to the left of the previous piece and push a blue 3L pin from group B, with the stop ring at the front, from the front into the double bent liftarm. Push it all the way in so it extends 1L to the front and back.

24.2.2. Skip one hole to the left of the previous piece and push a black 2L pin from group A, from the back, into the double bent liftarm.

24.3.1. Push the left hole a dark grey 3L thick liftarm, horizontally with the holes facing front and back, from the back onto the previous piece. The right hole will attach to a 3L pin.

24.3.2. Push a dark gray 3L thick liftarm, horizontally with the holes facing front and back, on the two pins on the front side of the bent liftarm.

24.4. Push a yellow 3L axle, from the front, into the top left axle hole of the bent liftarm. Push it in until it extends 1L to the front and back.

24.5. Push the axle hole of a red 2L thick liftarm with one pin and one axle hole, horizontally with the axle hole on the left, from the front onto the front side of the previous piece. Repeat symmetrically on the back side.

24.6. Place the tree and base, with the curved bar on the left, in front of you. Place the small frame, horizontally with the longest side of the bent liftarm laying flat on the left, and the short side of the bent liftarm upright on the right, in front of the tree.

Congratulations! Now this build is complete!

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