FIRST® LEGO® League Challenge BIOGLOW™ Building Instructions

Mission 11: Window to the Past

This build is 103 pieces, and 40 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.

Liftarms - A liftarm 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. liftarms come in a variety of lengths, including a 1x1 liftarm which looks like a cylinder. Thick liftarms are as wide as a LEGO brick, and thin liftarms are half as wide as a LEGO brick, but not the same thickness as a LEGO plate! The holes in a liftarm arm may accept axles or pins. They also come in a variety of shapes, including tees, ells 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 liftarms, 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 17 and some large pieces from bag 0. 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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Bag 17 (8 groups of bricks)
Main Build

Group 1 contains the pieces for steps 1-9. Include a brown 6x10 plate from bag 0.
Group 2 contains the pieces for steps 10-19. Include a brown 6x10 plate and four brown 2x4x6 rock panels from bag 0.
Group 3 contains the pieces for steps 20-23.
Group 4 contains the pieces for steps 24-31.
Group 5 contains the pieces for steps 32-34.
Group 6 contains the pieces for steps 35-38, not including the three yellow 1x1 cones and one yellow 1x1 round plate from step 38.
Group 7 contains the three yellow 1x1 cones and three yellow 1x1 round plates from step 38.
Group 8 contains the pieces for steps 39-40.

Building Instructions:

Group 1.

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Main Build

1.1. Let’s start by building the base and hinged door. First, we’ll build the door. Place a red 1x2 plate, horizontally, in front of you.

1.2. Place the right two studs of a red 1x4 tile, horizontally, on the previous piece so the left two studs overhang.

2. Place the right two studs of a red 1x12 plate, horizontally, under the left two overhanging studs of the previous piece.

3. Place the back row of a black 2x4 tile, horizontally, on the previous piece and to the left of the 1x4 tile. The front row will overhang.

4. Place the back row of a brown 6x10 plate, horizontally, under the front overhanging row of the previous piece so the right sides are even. The left side will be even with the left of the assembly.

5. Place a dark orange 1x3 tile, vertically, on the second column from the right on the previous piece and in front of a 2x4 tile.

6.1. Keeping the 1x4 tile on the right, flip the assembly upside down. Place a red 1x4 plate, upside down and horizontally, on the right four anti-studs on the front row.

6.2. Place the front stud of a brown 1x3 plate with rounded ends, upside down and vertically, to the left of the previous piece. Place another, upside down and vertically, on the leftmost column of the assembly so the front sides are even.

6.3. Next, we need to find one of the circular anti-studs on the 6x10 plate. Find the front row of circular anti-studs. Skip the first four circular anti-studs to the right of the left piece from the previous step and place a black 1x1 round plate with a clip on the bottom, upside down with the fingers of the clip at the front and back. There will be four free circular anti-studs behind this piece and three to the right of it.

7.1. Clip a dark gray shovel, horizontally with the head of the shovel on the left, into the clip of the previous piece.

7.2. Place a green 1x2 plate with rounded ends, upside down and horizontally, centered horizontally on the back row of the 6x10 plate.

8.1.1. Now we'll make a couple of hinges and then make the base. Place a light gray 2x4 plate with a pin hole sticking up from one end, vertically with the pin hole at the front right, in front of you.

8.1.2. Push a light gray 2L pin, from the left, into the left side of the hole of the previous piece. This piece does not have friction ridges and will spin freely.

8.2. Push the hole of a light gray 2x4 plate with a pin hole hanging down from one end, upside down and vertically with the pin hole at the back left, onto the left side of the previous piece.

8.3. Repeat steps 8.1.1-8.2.

8.4. Place the upside-down front half of one hinge assembly to the left of the 1x2 plate with rounded ends that's on the back row of the 6x10 plate so the pin holes are in line with the back of the 6x10 plate. Repeat symmetrically on the right side.

9.1. Place a brown 1x10 plate, horizontally, centered horizontally under the back row of the two hinge plates. It will extend two studs to the left of the left hinge plate and two studs to the right of the right hinge. This is the first part of the base.

9.2. Place a brown 2x10 plate, horizontally, in front of the previous piece.

Group 2.

10. Rotate the assembly 180 degrees so the previous two pieces are at the front. Place a green 1x2 slope tile, horizontally with the tall side at the front, on the back row of the previous piece so the left sides are even. Repeat symmetrically on the right side. There should be two free rows in front of these pieces.

11. Place a brown 2x6 plate, vertically and centered vertically, between the front halves of the two hinge plates so the back side is even with the back of the 2x10 plate from step 9.2.

12. Place the back three rows of a brown 6x10 plate, horizontally and centered horizontally, under the front three overhanging rows of the previous piece.

13. Find a brown 2x4x6 rock panel. This piece is molded on one side to look like a rock or cliff, and the other side is hollow. Place this, vertically with the hollow side on the right, on the front four rows of the previous piece so the left sides are even. Place another behind the first. Repeat these two pieces symmetrically on the right side. You'll place a total of four pieces in this step.

14.1. Place a transparent clear 1x1 brick on the front stud of each of the front two pieces from the previous step.

14.2. Place the front stud of a transparent 1x2 clear brick, vertically, on the back stud of each of the front two rock panels. The back studs will attach to the back 2x4x6 rock panels.

14.3. Place a transparent clear 1x1 brick on the back stud of each of the back two rock panels.

15.1. Next, we'll make a plant with a root. Set the base aside for now. Place a green 2x8 plate with holes between the studs, horizontally, in front of you.

15.2. Place a green 2x2 round plate on the second and third columns from the right on the previous piece.

16. Place a green 2x2x2 cone on the previous piece.

17.1. Now we'll add the root. Find a tan 45 degree tube. This looks like a bent tube, about 3L long. Place this piece, with the holes at the left and right, in front of you. The back right hole should point slightly to the back.

17.2. Push the left side of a yellow 3L axle, from the right, into the right side of the previous piece.

17.3. Push a red 2L axle, from the left, into the left side of the 45 degree tube.

17.4. Push the 3L axle, from the bottom, through the second hole from the right on the 2x8 plate. It will attach to the bottom anti-stud of the cone. The 2L axle should point down and to the left.

18.1.1. Place a brown 2x2 round brick with four points at the bottom in front of you.

18.1.2. Place a brown 2x2 round tile with a single stud on the previous piece.

18.2. Push the short bar of a tan bar with six stems on it, with the stems on top, from the top into the hollow stud of the previous piece.

18.3. Rotate the 2x2 round brick so the stems are at the bottom. Push the center anti-stud of the 2x2 brick with four points, from the bottom, onto the bottom side of the 2L axle on the bottom under the root.

19. Place the base, with the door at the back and the walls of the base at the left and right. Place the 2x8 plate with the root, horizontally with the 2x2 cone near the right end, on the back two studs of each of the walls.

Group 3.

20.1. Next, we'll make some more roots. Set the base aside for now. Place a green 4x8 plate, upside down and horizontally, in front of you.

20.2. Place a brown 2x2x2 inverted cone, upside down and centered vertically and horizontally, on the previous piece.

21.1.1. Next, we'll make some more roots. Place a brown 1x1 brick with studs on all four sides in front of you.

21.1.2. Place a tan 1x1 round plate with a hollow stud on the previous piece. Place another on the bottom of the previous piece.

21.2. Push the short bar of a short bar with three short stems into each of the four side studs of the 1x1 brick with side studs.

21.3. Rotate the roots 180 degrees so the anti-stud is on top. Push the short bar of a tan bar with six stems on it, with the stems on top, from the top into the hollow anti-stud on top of the roots.

21.4. Push a white 3L bar, from the bottom, through the hollow anti-stud on the bottom of the root assembly. Push it in as far as it will go.

21.5. Push the bottom side of the bar, from the top, into the hollow anti-stud on top of the 2x2x2 inverted cone. Push it all the way down.

22. Place the base, with the door at the back and the walls of the base at the left and right, in front of you. Rotate the 4x8 plate with a root assembly so it's horizontal with the studs on top and place it on the walls of the base in front of the 2x8 plate with a root.

23. Place a green 1x2 brick with an axle hole, vertically, on the rightmost column of the 4x8 plate with a root so the front sides are even.

Group 4.

24.1. Now we'll make another root assembly. Set the base aside for now. Place a green 2x8 plate with holes between the studs, horizontally, in front of you.

24.2. Place a white 1x2 plate with rounded ends, horizontally, on the front row of the previous piece so the right sides are even.

25.1. Place a green 2x2 round plate to the left of the previous piece so the front sides are even.

25.2. Place a brown 2x2 dome top on the previous piece.

26.1. Push a black 4L axle, upright, through the third hole from the right on the bottom of the 2x8 plate. This piece will extend up into the axle holes in the center of the previous two pieces.

26.2. Push the center anti-stud on a tan 2x2x2 cone, with the stud at the bottom, onto the bottom side of the previous piece. Push it all the way up until it touches the 2x8 plate.

27.1. Find a green flower petal piece. This looks like a dish with pointed corners that stick up. Place this, upside down, on the bottom stud of the previous piece.

27.2. Push the short bar of a green short bar with three stems on it, with the stems at the bottom, into the hollow stud of the previous piece. Push another, with the stems offset from the first, into the hollow stud of the first.

28. Place the base, with the door at the back and the walls of the base at the left and right, in front of you. Place the 2x8 plate with the root, horizontally with the 1x2 plate with rounded ends at the front right, on the front two studs of each of the walls in front of the other root assemblies.

29. Place a green 1x4 brick, vertically, behind the left stud of the 1x2 plate with rounded studs that's on the front row of the last root assembly.

30. Place the left column of a green 2x2 corner plate, with the corner at the back left so the studs form a braille letter F, on the front two studs of the previous piece. The right stud should attach to a 1x2 brick with a hole. Place another symmetrically behind the first.

31.1. Place a white 1x1 cone on the right stud of the 1x2 plate with rounded ends on the front row of the last root assembly.

31.2. Place the center anti-stud of a light blue 2x2 round tile, centered, on the previous piece.

Group 5.

32.1.1. Now we'll add a stump. Place a brown 2x2 round brick with four points at the bottom on the second and third columns from the left on top of the base so there's one free row in front of it.

32.1.2. Place a brown 2x2 round plate with a bar sticking up from all four sides on the previous piece.

32.2. Place a brown 2x2 round tile with a tree ring pattern on the previous piece.

33.1. Rotate the base 180 degrees so the door is vertically on the left. Place a green 1x1 round plate with three leaves on one side, with the leaves pointing to the left, on the fourth stud from the front on the rightmost column on top of the base.

33.2. Place a green 1x1 round plate with three leaves on one side, with the leaves pointing to the front, on the left stud of the back 2x2 corner plate that's on the left two columns on top of the base. This is in front of a 2x2 round tile.

34.1. Next, we'll add some leaves to the stump. Place a green 1x1 round plate with a long leaf on one side in front of you.

34.2. Place a green 1x1 round plate with a flower petal pattern on the previous piece.

34.3. Repeat steps 34.1-34.2.

34.4. Push the hollow anti-stud of one of the leaf assemblies, vertically with the leaf at the back, onto the back upright bar on the stump. Place the other, horizontally with the leaf on the right, onto the right upright bar on the stump.

Group 6.

35.1.1. Next, we'll build a plant. Place a dark green 1x2 plate with rounded ends and a jagged upright leaf on one side, with the leaf pointing to the right, in front of you.

35.1.2. Place another, with the leaves pointing to the left, on the first.

35.2.1. Place a dark green 1x1 round plate with a curly stem on top, with the curl at the front, on the front stud of the previous piece.

35.2.2. Place a pale yellow frog, with the head at the back, behind the previous piece.

35.3. Place the plate on the fourth column from the right on top of the base so there are two free studs in front of it. It will be to the left of a 1x1 round plate with three leaves on one side.

36.1. Place a green 1x1 round plate with three leaves on one side, with the leaves pointing to the left, on the second stud from the right on the second row from the front on top of the base.

36.2. Place a red 1x1 flower on the previous piece.

37.1.1. Next, we'll add a plant to one of the roots. Rotate the base 90 degrees counterclockwise so the door is vertically on the right. Find the 2x2 dome top that's on the left two columns on top of the base. It is on the second and third rows from the back. Place a pink 1x1 round plate with a hollow stud on the dome top.

37.1.2. Find a pink elephant trunk. This is a wavy cylinder, about 4L long, with a stud on one side and a short bar on the other. Push the short bar of the trunk into the hollow stud of the previous piece so the trunk points to the back right.

37.2.1. Find a light purple 6x5 plant leaves. This piece is shaped kind of like a triangle with fourteen studs, only five of which have anti-studs. Each of the points of the triangle has a stud with an anti-stud. Place the center stud of this piece, horizontally so it forms a triangle with the point at the back right, on the stud of the previous piece.

37.2.2. Place a pink 1x1 round plate with a hollow stud on the center stud of the previous piece.

Group 7 contains the yellow pieces for the next step.

38.1.1. Now we'll make another plant. Place a brown 1x1 cone in front of you.

38.1.2. Find a green seaweed. This piece has a short bar on one side and four wavy stems pointing up. Push the short bar, with the tallest of the center stems on the right, from the top into the hollow stud of the previous piece.

38.2.1. Make a small flower bud by placing the anti-stud of a yellow 1x1 cone from group 7 onto a pink 1x1 round plate with a hollow stud.

38.2.2. Repeat the previous step.

38.2.3 Rotate one bud so the anti-stud is on top. Push the hollow stud of the cone onto the leftmost stem of the seaweed. Repeat on the right stem of the seaweed.

38.3.1. Place a pink 1x1 round plate with a hollow stud in front of you.

38.3.2. Place a yellow 1x1 round plate with a hollow stud from group 7 on the previous piece.

38.3.3. Rotate the previous two pieces so the anti-stud is on top and push the hollow stud onto the second stem from the right.

38.4.1. Now we'll make a large flower. Place a dark pink 2x2 round plate with a rounded bottom in front of you.

38.4.2. Place an orange 2x2 round plate with four flower petals on the previous piece.

38.4.3. Place a yellow 1x1 cone in between the four studs on the previous piece.

38.4.4. Rotate the flower so the cone is at the bottom and push the hollow stud on the cone onto the free stem.

38.5. Find the 2x2x2 cone that's on the right two columns on top of the base. Rotate the plant 90 degrees counterclockwise so the large flower is on the second stem from the back and place it on the 2x2x2 cone.

Group 8.

39.1. Lift the right column of the door and rotate it up and to the left to close it.

39.2. Find the 1x2 brick with a hole that's on the front row on top of the base. It is the third and four studs from the left. Find a brown curved bar with a stud on one side. This piece has a 1L bar on one side, and an axle on the other, and it is about 8L. There is a stud near the bar. Push the axle of this piece, vertically with the stud at the back and the bar at the front pointing up, into this hole. The stud will face left and right.

40.1.1. Now we'll make a nut. Place a brown 1x1 cone in front of you.

40.1.2. Push a brown 2L bar with a stop ring in the middle, from the top, into the hollow stud of the previous piece.

40.2. Push the anti-stud of a brown 1x1 brick with studs on all four sides, from the top, onto the previous piece.

40.3. Place a tan 1x1 pyramid tile onto the previous piece.

40.4. Place a tan 1x1 plate with a triangle on one side, with the triangle at the bottom, on each of the four side studs of the 1x1 brick with side studs.

40.5.1. Push a red 2L axle, from the bottom, into the anti-stud of the 1x1 cone. This anti-stud is shaped like an axle hole.

40.5.2. Find a red axle and pin connector #1. This piece has a 1L axle connector on one side, and a perpendicular pin hole on the other. Push the axle connector of this piece, with the axle connector at the top and the pin hole facing front and back, from the bottom onto the previous piece.

40.6. Rotate the nut so the previous piece is on top with the holes facing front and back. Slide the hole onto the front side of the curved bar on the base.

Congratulations! Now this build is complete!