

MOSS INTERMEDIATE VERSION

1. Forests are dominated by large plants that crowd one another in their competition for light.	BUSH: Moss tape, 01:07 - 07:15 Pan across top of bush, down to stream below..... <u>Reel 2 04 03:20 - 03:42</u> (sun out, pan ends up in stream below)	LJ002 - 04:03:42:13- 04:03:36:17
2. But far below, on the forest floor a group of tiny plants is commonly found. With over 10,000 species, these plants thrive in many habitats.	Bush: stream valley scene at Cascades. Camera moves down stream	LJ008 9sec 20:23:10- 20:23:19 or 20:23:53- 20:24:03
3.		
4. They reproduce by forming gametes known as sperm and eggs. These are the mosses.	BUSH: Cascades, continue along stream.	
	The Gamete Plant	
5. The familiar moss is known as a gamete plant, and its cells contain only one set of chromosomes.	BUSH:Cascades, continue along stream. BEGIN ANIMATION: Moss clump.	
6. The small and compact form of most mosses enable the delicate stems to stay upright, while small filaments anchor them to the soil.	BUSH: 07:26 - 07:36 Moving into moss stems	LJ008- 20:25:40- 20:25:50
	01:43 - 01: 53 Rain shower, camera moving down into a clump of moss.	Moss Anim Master 00:11:54- 00:12:39
	01:54 to 01:59 Filaments at the base of stems.	
7. Moisture easily accumulates around the densely spaced stems.	01:59 to 02:06 'Fog' inbetween spaces	
8. This often leaves a film of water on the leaves and on the stem tip.	02:07 to 02:12 Moving up stems to see the leaves.	

9.		
10. Some stem tips are male and contain finger like reproductive structures.	Animation: 02:15 - 02:25 Fade-in to scene where camera is moving up the stem and inside water drop to see antheridia group.	Moss Anim Master 00:12:25- 00:12:35 water cross 00:14:05 00:14:10
11. These are complex organs consisting of many cells.	Animation: 02:47 - 02:55 Cut to a closer view of antheridia ending up on a single antheridium.	MOSS ANIMATION MASTER 00:14:28- 00:14:57
12. Each is supported by a stalk.	Animation: 02:56 - 02:59 Cut to a closer view of antheridia ending up on a single antheridium. Only the stalk showing at the end.	
13. The upper portion consists of an outer protective jacket that surrounds a group of sperm cells.	Animation 03:04 to 03:09 Only jacket cells showing.	
14.	Animation: 03:10- 03:15 internal view of fertile cells.	
15. At the tip of a female plant..... there are numerous reproductive structures or egg cases	Animation	LJ005 05:27:52.17 05:28:02:20
16.	Animation: 02:14 - 02:20 moving inside water drop.	MOSS ANIMATION MASTER 00:12:25- 00:12:35
17. The top of each consists of a slender neck.	Animation: 04:41 - 04:45 cross fade: group of archegonia; single	MASTER 00:17:47 00: MOSS ANIMATION 18:31
18.	Animation: 04:45 - 04:48: Neck	
19. The middle region contains a large chamber.	Animation: 04:50 - 04:53:Venter	
20. And at the base, a stalk attaches it to the moss stem.	Animation: 04:54 - 04:58 Stalk	
21. An egg cell is formed inside the chamber.	Animation: 04:59 - 05:07f egg	

22. A column of cells is found inside the neck. These soon break down, filling the neck canal with a chemical that attracts sperm.	Animation: 05:08 - 05:26	
SUMMARY	02:10 - 02:17 ?	Moss Anim Master 00:11:59- 00:12:04
• Moss obtain support and retain moisture by growing in dense clumps.		
• Small basal filaments anchor stems to the soil	01:54- 01:59 Rhizoids shown.	Moss Anim Master 00:12:09 00:12:14
• Sperm are formed within sacs located at the tips of male plants	Animation 02:45 - 02:52	
• Eggs and a sperm attractant are formed within sacs located at the tips of female plants.	04:38 - 04:44	

	Fertilisation	
	IMAGE	REEL
23.	GREENHOUSE Reel 5a, 26:26 to 26:34 Moss stem tips	LJ005 05:26:25:24- 05:26:45:01
24. A rain shower provides the ideal conditions for sperm release and their transfer to a female plant.	GREENHOUSE Reel 5a, 26:34 to 26:45 Moss stem tips; then rain falling	
24a. Droplets of rain water collect at the tips of the moss stems.	02:13 to 02:18 Animation: Stem tip with water drop on male stem. OR Greenhouse: close up of tip with water drop.	
25. Inside the drop of water at the tip of the male stem, the reproductive structures open.	Animation: 03:21 - 03:35 Camera moving up the antheridium to the top which then opens up.	MOSS ANIMATION MASTER 00:16:32 00:16:58

26. This releases cells containing sperm,which float up to the surface.	Animation: 03:36 - 03:45 Sperm -containing cells emerging and separating off individually into the water	
27	Animation: 03:46 - 03:53 Sperm-containing cells floating upwards in water	
28. Rain drops splash some of this water out of the male plant.	Animation: 03:54 - 04:04 Rain storm, drops striking tip of male plant	MOSS ANIMATION MASTER 00:11:58- 00:12:01
29. Some splash drops contain sperm cells and fall onto the tip of a female stem.	Animation: 04:05 - 04:11 Splash drops upwards into the air. <u>Hold</u> on drop showing sperm. Drop moves down onto female shoot	MOSS ANIMATION MASTER 00:17:00- 00:17:33
30. The sperm now escape from their surrounding membraneand use their flagella to move about in search of an egg.	Animation: 04:12 - 04:22 Membrane around sperm breaks down.	
31.	Animation: 04:23 - 04:29 Sperm begin swimming movement.	
32.		
33. The egg case now opens and releases the sperm attractant.	Animation: 05:24 - 05:44 Camera moving up neck. (up close) Tip cells open, releasing attractant.	MOSS ANIMATION MASTER 00:18:32 00:19:24
34. The sperm swim towards the source of the attractant and into the opening.	Animation: 05:45 - 05:58 Sperm swimming towards the opening of the archegonium	
35. Once inside, they are guided down to the egg.	Animation: 05:59 - 06:08 Sperm swimming down inside the archegonium to the egg	
36. The first sperm to arrive enters the egg cell.	Animation: 06:09 - 06:20 Fertilisation	
37. Fertilisation is completed when the sperm and egg nuclei fuse, creating a cell with two sets of chromosomes.	Animation: 06:21 - 06:31 Sperm and egg nucleus fusing.	MOSS ANIMATION MASTER 00:19:50 00:20:01

SUMMARY		
<ul style="list-style-type: none"> Water stimulates the male structure to open and release sperm. 		
<ul style="list-style-type: none"> Splash drops carry sperm cells to the female stem . 	Splash drops: 04:05 - 04:11	MOSS ANIMATION MASTER 00:17:11 00:17:18
<ul style="list-style-type: none"> Water stimulates the egg case to open, releasing a sperm attractant. 	Archegonium opening	MOSS ANIMATION MASTER 00:18:46 00:18:49
<ul style="list-style-type: none"> Sperm move down the neck and fertilise the egg. 	Fertilisation. 06:09-	MOSS ANIMATION MASTER 00:19:10 00:19:22

	The Embryo	
VOICE	IMAGE	REEL
38. After fertilisation, many changes take place on the female stem tip .	GREENHOUSE: Real stem tip Reel 5a, 26:14 to 26:25 move in close up to real stem tip .	LJ005 05:26:14:15- 05:26:21:16
39. At first, the fertilised egg remains within its protective chamberwhere it forms an embryo.	Animation 04:40 - 04:46 Repeat view of entire female shoot tip; then a single archegonium	MOSS ANIMATION MASTER 00:17:47- 00:17:55 slow to half?
40.	Animation NEW Match the size of above frame and fade away external skin to show zygote inside; zygote swelling in size. Zoom in to match next frame.	MOSS ANIMATION Master 11:57:59- 11:58:09
41. One end of the embryo grows down, firmly attaching itself to the female stem.	Animation 06:52 - 07:11 Embryo growing down through the base of the archegonium and into the shoot tip	MOSS ANIMATION MASTER 00:19:42- 00:19:50

42. This allows it to obtain water and nutrients from the female plant.	Animation 07:12 - 07:18 Molecules entering the embryo foot.	MOSS ANIMATION MASTER 00:20:02-00:20:35
43. Meanwhile, the other end of the embryo grows upward.	Animation 07:19 - 07:23 Cut-away view of archegonium: embryo growing upwards.	
44. The egg chamber expands to accomodate this growth..... but eventually it is split in half.	Animation 07:24 - 07:28 Archegonium enlarging	
45	Animation 07:30 - 07:37 Archegonium breaking in half	MOSS ANIM MASTER 00:20:30-00:20:37
46. The embryo now forms a very long stalk that lifts the top half of the egg chamber up into the air.	Animation 07:39 - 07:45 The top half is lifted upwards	MOSS ANIM MASTER 00:20:52-00:20:58
	Animation 07:45 and hold View upward into sky of the elongating seta.	
47. This creates a small plant attached to the tip of the female stem.	Greenhouse Group of Minium wilth sporophytes attached.	
SUMMARY	Embryo growing down.	
<ul style="list-style-type: none"> Part of the embryo grows down, into the female stem tip. 		
<ul style="list-style-type: none"> Part of the embryo grows up, eventually breaking the egg chamber in half. 	Animation 07:30-\ Archegonium breaking in half.	MOSS ANIM Master 00:20:32-
FINALE: Using both gametes and spores, these unassuming members of the plant kingdom quietly proceed to thrive and multiply. They have successfully spread from polar regions to the tropics, and are equally at home in our cities or in the countryside. Perhaps a key to their success is their small size. Perhaps it is due to their ancient lineage, going back more than 400 million years to a time when plants were first colonising the land. Whatever the reason, these tough, yet attractive opportunists hold many surprises for the interested observer.		