Go With the Flow
Autorun Script

Summary
This program uses two stories to model how scientific data can be used to build explanations of events. The first is true story of the spill of a container of Nike shoes into the Pacific Ocean. The program sets up the story of the shoe spill and encourage initial predictions. Next the concept of wind-driven ocean currents will be explored. Using the wind-driven ocean currents dataset on the SOS, visitors will refine their predictions. Finally, the actually locations where shoes were found will be revealed.

The second story is the fictional, but not impossible, story of a penguin feather being found by a beach clean up crew in San Francisco. The concept of thermally driven ocean currents is explored. Using the ocean conveyor belt data set, and the wind-driven currents data set, visitors are encouraged to refine their predictions. An actual possible path for the penguin feather will be revealed. Finally, visitors will view a simulation of a particle moving around the ocean over hundreds of years and learn that there is really only one ocean.

Learning Objectives
- Visitors will understand that some ocean currents are caused by wind
- Visitors will use wind-driven ocean currents datasets on the SOS to make predictions about where the Nike shoes will end up.
- Visitors will understand that some ocean currents are caused by temperature differences
- Visitors will use thermal and wind-driven ocean currents datasets on the SOS to determine whether or not the penguin feather could have reached California.
- Visitors will understand that all of Earth's oceans are interconnected and water circulates throughout the system over long time scales.

Playlist
This presentation is not a single MP4 file, but rather a playlist that needs to be played using the autorun setting. Timing cues and audio tracks are all included in the gowithflow_autorun.sos playlist.

Here is the full list of datasets for the autorun version.
- *Hansa Carrier Shoe Spill: Title Screen*
- *Hansa Carrier Shoe Spill: Introduction PIP*
- *Hansa Carrier Shoe Spill: Blank map with ship*
- *Hansa Carrier Shoe Spill: Hands On Demonstration*
- *Hansa Carrier Shoe Spill: Summer Trade Winds*
- *Hansa Carrier Shoe Spill: Trade Winds over NASA Sea Currents*

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- *Hansa Carrier Shoe Spill: NASA Sea Currents*
- *Hansa Carrier Shoe Spill: Animated Wind Driven Currents*
- *Hansa Carrier Shoe Spill: Results*
- *Penguin Feather: Title*
- *Penguin Feather: Introduction PIP*
- *Penguin Feather: Surface Currents*
- *Penguin Feather: Hands On Demonstration*
- *Penguin Feather: Convection Currents*
- *Penguin Feather: All Currents*
- *Penguin Feather: Feathers and Both Currents*
- *Global Circulation*
- *Go With the Flow: Credits*

Acknowledgement

Adpated from material originally appearing in Halverson, C., Beals, K. and Strang, C. (2001) *Ocean Currents: Marine Science Activities for Grades 5-8.* The Lawrence Hall of Scence, University of California, Berkeley.

AutoRun Script

1. **Introduction**
    a. **Visual**: *Hansa Carrier Shoe Spill: Title Screen*
    b. **Narration**: Nearly three quarters of the Earth's surface is covered by ocean. Oceans allow life to exist, make our climate habitable and provide much of our oxygen and food. Oceans are also an important part of human cultural history. We use them for transport, we vacation on their shores. We read books and watch movies that feature exciting adventures like 'sailing the seven seas' and mysterious messages in bottles that show up thousands of miles from where they were dropped into the sea. But are there really seven seas? What happens to objects that are dropped into the ocean? Where do they end up? Join us as we explore these questions and more in "Go with the Flow: Ocean Current Mysteries"

2. **Introduction Shoe Spill**
    a. **Visual:** *Hansa Carrier Shoe Spill: Introduction PIP*
    b. **Narration:** Ocean Current Mysteries Part 1, the story of the Hansa Carrier's lost shoes. In 1990, over 4 billion tons of cargo was moved by container ships worldwide. This figure is now closer to 7 billion. The ships that carry this cargo are huge, some longer than the height of the Empire State Building. Most cargo is packed in standard-sized shipping containers that measure 20 ft long by 8 ft wide. There are 5-6 million of these in transit over the sea in any given moment. Not all of these containers make it to their destination. This is the story of four that were

lost. In the spring of 1990, a South Korean carrier called the Hansa left port bound for the US. On May 27, in the North Central Pacific, the Hansa Carrier was over taken by a huge storm. A large wave knocked four containers overboard. These containers broke open in the seas and released 60 thousand Nike tennis shoes held within.

3. **Encouraging Viewer Prediction**
    a. **Visual:** *Hansa Carrier Shoe Spill: Blank map with ship*
    b. **Narration:** What do you think? Where did the shoes end up?

4. **Introduce Wind Driven Currents**
    a. **Visual:** *Hansa Carrier Shoe Spill: Hands On Demonstration*
    b. **Narration**: One important factor that impacts what will happen to the shoes is the wind blowing over the surface of the ocean. The friction of wind blowing over the surface of water, in this case wind from a straw over the surface of water in a pan, sets the water and anything floating in the water in motion. Objects in the water circulate around the pan, and occasionally wash up on the shores of the two rocks.

5. **Trade Winds**
    a. **Visual:** *Hansa Carrier Shoe Spill: Summer Trade Winds*
    b. **Narration:** Wind blowing over the surface of the ocean has a similar effect. The Trade Winds, illustrated here, are a primary factor driving the motion of the ocean's surface.

6. **Trade Winds to Surface Currents**
    a. **Visual:** *Hansa Carrier Shoe Spill: Trade Winds over NASA Sea Current*.
    b. **Narration:** Wind does not actually bulldoze the ocean along in the way that the straw and the pan of water suggested. The wind-ocean connection is more complicated. A combination of four major factors – the Sun's heat, winds, the rotation of the Earth, and gravity – cause the ocean surface to circulate

7. **Sea Surface Currents**
    a. **Visual:** *Hansa Carrier Shoe Spill: NASA Sea Currents*
    b. **Narration:** You are looking at model of wind-driven ocean currents. The yellow and green sections are places where the water is moving faster than the surrounding water. These faster-moving streams of water within the ocean are known as currents. As you examine this model, you can see that the current pattern is more complicated than the trade winds would suggest. Some of the most interesting effects happen where currents run into continents, and curl back in on themselves to form eddies, circular currents that rotate around a central point while continuing to travel across the ocean.

8. **Simplified Sea Surface Currents Animation**
    a. **Visual:** *Hansa Carrier Shoe Spill: Animated Wind Driven Currents*
    b. **Narration:** Let's return to the question of what happened to our spilled shoes. This map shows the major surface currents of the Pacific Ocean, and the location of the spill. Where do you think the shoes ended up? Turn to the person next to you and lock in your predictions. You have 20 seconds to make your prediction.

9. **Results Reveal**
    a. **Visual:** *Hansa Carrier Shoe Spill: Results*
    b. **Narration:** 5,4,3,2,1, Okay, let's see where those shoes ended up
        Dec 1990 Cape Flattery -200 shoes
        Feb 1991 Vancouver Island -100 shoes
        March 1991 Washington Coast – 200 shoes
        April 1991 Columbia River – 350 shoes
        March 1991 Queen Charlotte Island 250 shoes
        May 1991 North Vancouver Island 200 shoes
        May 1991Oregon California Coast 200 shoes
        February 1993, North Coast of Hawaii, 4 shoes

        Was your prediction correct? While the 1990 spill is among the best known, spills of cargo into the ocean are actually not all that uncommon. In fact, scientists have refined maps of ocean currents by tracking the movement of man-made items that have been accidentally spilled in the ocean.

10. **Introduction Penguin Feather Mystery**:
    a. **Visuals:** *Penguin Feather: Title, Penguin Feather: Introduction PIP*
    b. **Narration:** Go with the flow part 2: The Mystery of the Penguin Feather
        Voice 1: Ewww! Look at that shoe! I wonder how long it's been floating around out there!
        Voice 2: Okay everyone, thanks for all your help out there today. Let's all bring the bags back up to the picnic and sort the trash from the recyclables.
        Voice 1: Hey, I found these feathers on the beach. You study birds. Can you tell me what species of birds these feathers are from?
        Voice 2: Hmmm... well most of these are sea gull feathers, but this one is kind of interesting. It looks to me like an emperor penguin feather.
        Voice 1: A penguin feather on a California beach? How could that be?

11. **Wind-driven Currents & Penguins:**
    a. **Visual:** *Penguin Feather: Surface Currents*
    b. **Narration:** Could a penguin feather reach California from Antarctica using the wind driven surface currents? *Pause* Maybe not, but wind is not the only factor that can cause ocean water to move.

12. **Convection current hands-on activity:**
    a. **Visual:** *Penguin Feather: Hands On Demonstration*
    b. **Narration:** Watch what happens when ice is added to a pan of water. The food color is added to the water to make it easier to see how the water is moving. Before the ice is added, there is not a lot of motion. When ice when the ice is added, cold melted water from the ice cube is denser than the warmer water in the pan. It sinks and moves along the bottom where it eventually warms up and rises to the surface.

13. **Ocean Conveyor Belt:**
    a. **Visuals:** *Penguin Feathers: Convection Currents*
    b. **Narration:** Just like the pan of water, the oceans of the earth are not evenly heated. The poles are colder than the equator. The cold water of the poles is denser, and sinks to the bottom of the ocean and starts to move towards the equator, warms up, and begins to rise. This creates large-scale deep currents known as the 'ocean conveyor belt'. These currents are responsible for moving large amounts of water from one part of the world to another.

14. **Making a Prediction**
    a. **Visuals:** *Penguin Feathers: All Currents*
    b. **Narrative:** Looking now at both the deep ocean thermal currents and the surface wind driven currents, do you think it is possible for a penguin feather to travel from Antarctica to California?

15. **Mystery End:**
    a. **Visuals:** *Penguin Feather: Feather Plus All Currents*
    b. **Narrative:** Working in combination, it might be possible for a feather sinking in the Antarctic to be moved to a beach in California by a combination of deep thermal and surface wind-driven currents. However, these deep currents move slowly. It might take over 2000 years for a penguin feather to make that journey.

16. **Global Circulation**:
    a. **Visual**: *Global Circulation*
    b. **Narration:** If spilled shoes can make it to Honolulu and a penguin feather can travel from Antarctica to California, then are the Earth's oceans really

separate seven seas? Can environmental impacts like pollution be contained to one area? You are looking at model of what happens a sample particle, like a message in a bottle, is added to the ocean off the coast of Australia.

Feel free to get up and follow the particle on its journey. If we let the simulation run long enough, our particle moves around the world.

There is only one, interconnected ocean. This has allowed man to circumnavigate the globe. It also means that what is put into one "sea" may very well end up on a beach of another halfway around the world.

17. **Credits**
    a. **Visual:** *Go With the Flow: Credits*
    b. **No narration**