SUGGESTED REFERENCES

- *Nymphea Water – The Wonders of Sub-Marine Springs*
  http://www.nympheawater.com/

- *USGS The Water Cycle: Springs*
  http://ga.water.usgs.gov/edu/watercyclesprings.html

- *Florida Department of Environmental Protection - The site is an in-depth interactive presentation about Florida's Wakulla Spring, one of the world's largest freshwater spring systems.*
  http://www.floridasprings.org/exploration/featured/wakulla/

NATIONAL SCIENCE EDUCATION STANDARDS

Grades 5-8:

Life Science
Life Science
Populations and Ecosystems

Grades 9-12

Science and Technology
Abilities of Technological Design
Understandings about Science and Technology

Science in Personal and Social Perspectives
Natural Resources

**Source: National Science Education Standards, 1996, National Academy Press*

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SCIENCE SCREEN REPORT®

VOLUME 37 ISSUE 3

A FRESH WATER SPRING IN SALT WATER

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SYNOPSIS

Thousands of years ago, Phoenicians and Greeks were able to extract drinking water from the sea. Today, highly trained engineers, geologists, and divers are isolating underwater fresh water springs from the seabed. Underwater springs can be identified by the thermal differences they create on the surface. Fresh water is lighter than sea water, and naturally rises through the salt water.

In this issue, we will see the technology scientists developed to isolate a fresh water spring from the salt water of the sea. The project is called Nymphea Water. If it is successful, it could prove to be the solution to the number one problem for many countries in the world - a shortage of drinking water.

CURRICULUM UNITS	RUNNING TIME
■ DIVER ■ ENGINEER ■ GEOLOGIST ■ OCEANOGRAPHER	16:44

BACKGROUND

There are problems all over the world with shortages of clean freshwater. However, in some unique locations there are springs where freshwater flows continuously. Some scientists see this as a potential solution to the shortage of drinking water. One such spring, the Mortola spring, is located just off the coast of France in the Mediterranean Sea, 36 meters down to the sea floor. The fresh water moves through an aquifer in the subsoil of the shore and travels along channels beneath the sea bed, resurfacing out in the depths of the sea.

But how did the fresh drinking water from the spring get transported to dry land without coming into contact with the surrounding salt water? It seemed inevitable that the two water types would become mixed, and that is precisely why it has not been tried before. The crew of scientists developed a process which allowed them to separate the fresh water for consumption.

The scientists constructed an eight-meter long pillar device which was mounted to a concrete foundation created on the seafloor surrounding the spring. It is jokingly referred to as the “Tulip" by the engineers. The fresh water flows up the "stem" of the pillar and into the "bell". The "bell" is the heart, and works like a huge excess pressure valve. If the spring suddenly begins to produce too much water and the pressure becomes too great, the fresh water can spill from openings in the stem inside the bell. The fresh water then flows back out of the construction via an opening in the bottom of the bell. Simultaneously, air pumped into the construction prevents salt water from rising and coming into contact with the fresh water. Through the natural pressure of the spring, the fresh water continues to flow up through a pipeline to a swimming fountain on the surface of the sea. The fountain was later removed and the spring water is now sent to dry land through a pipeline. The first measurements at the spring were large and powerful with up to 240 cubic meters of water flowing out every hour.

CRITICAL THINKING EXERCISES

1. Discuss how water shortages could affect our way of living.
2. Discuss why fresh water is not as dense as salt water and how the fresh water rises to the surface.
3. Discuss the cycle of water from its origins to when it is expelled at the spring.
4. Discuss possible environmental concerns that are involved with extracting fresh water from the springs shown in the program.

ADVANCED ORGANIZERS

Prior to showing this program, students should have some understanding of the following benchmarks for Science Literacy, Oxford University Press which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 3: The Nature of Technology
Section A - Technology and Science

Know by Grade 12

- Technological problems often create a demand for new scientific knowledge, and new technologies make it possible for scientists to extend their research in new ways or to undertake entirely new lines of research. The very availability of new technology itself often sparks scientific advances.

- Technology usually affects society more directly than science because it solves practical problems and serves human needs (and may create new problems and needs). In contrast, science affects society mainly by stimulating and satisfying people's curiosity and occasionally by enlarging or challenging their views of what the world is like.

Section B - Design and Systems

Know by Grade 12

- In designing a device or process, thought should be given to how it will be manufactured, operated, maintained, replaced, and disposed of and who will sell, operate, and take care of it. The costs associated with these functions may introduce yet more constraints on the design.

**Benchmarks can be found at www.project2061.org/tools/benchol/bolintro.htm*

VOCABULARY

Aquifer

Fresh water spring

Hydrologists

Infrared cameras

Satellite positioning

Thermal

CAREER POSSIBILITIES

- DIVER
- ENGINEER
- GEOLOGIST
- OCEANOGRAPHER