Ventura College Sabbatical Leave Report
PROJECT SKYWATER
Submitted by Roxanne Forde
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Background of Sabbatical Project

My undergraduate work was in Environmental Microbiology and my graduate work was in Environmental Engineering. I have spent more than 30 years in the Water Industry:
(1) Water Research Scientist in the laboratory,
(2) Consulting Engineer for more than 1000 water projects in 33 countries and 46 states,
(3) Professor of Environmental Engineering at Brandenburg Technical University,
(4) Professor of Water Science at Ventura College.

My project work included NASA, Lawrence Livermore Labs, Lockheed-Martin, the United Nations, the European Union, every major food processor and every major oil company.

Water is the very essence of life itself. Humans can live only three days without water. Worldwide four million people die each year due to water-borne diseases. Can you imagine never having a drink of clean water for your whole life, never able to wash your hands or your food in clean water? Water in Western Europe and the USA continues to become more polluted from industry or simply less available due to severe droughts. This project develops a new source of fresh, clean water, water that can be used all over the world to improve the quality of human life.

Components of Sabbatical Project

PROJECT SKYWATER will be conducted on the Ventura College campus, and involves the design and construction of two structures that take water directly from the atmosphere. That water will be used to water green plants. The two structures will both functional and artistic enough to be sculptures. Life consists of water & carbon along with some trace elements. Therefore these structures will be based upon the carbon tetrahedron as the central unit with water molecules attached to it. There will be a wind-driven compressor on top of each unit that will extract additional water.

The mathematics for determining water extraction from humidity involve relative humidity is at all temperatures and pressures defined as the ratio of the water vapor pressure to the saturation water vapor pressure (over water) at the gas temperature:
$RH = P_w/P_{ws} \cdot 100\%$
The total pressure does not enter the definition. Above 100°C the same definition is valid.
But as the saturation vapor pressure P_{ws} is greater than 1 013 hPa (normal ambient pressure) the RH can't reach 100% in an unpressurised system. Below 0°C the definition is also valid. Here 100%R is also impossible because condensation will occur at a lower humidity than 100% (when the vapor is saturated against ice).

Parts per million values are usually given vs. the amount of dry air:

I: Volume/volume PPM_v(dry):

$$PPM_v = \frac{P_w}{P_{tot} - P_w} 10^6$$

Where

P_w = Water vapour pressure

P_{tot} = Total pressure

II: Mass/mass PPM_m(dry)

$$PPM_m = \frac{M_w P_w}{M_d (P_{tot} - P_w)} 10^6$$

$$\frac{M_w}{M_d} = 0.62199$$

Where

P_w = Water vapour pressure

P_{tot} = Total pressure

M_w = Molecular mass of water

M_d = Molecular mass of dry air

From wet air:

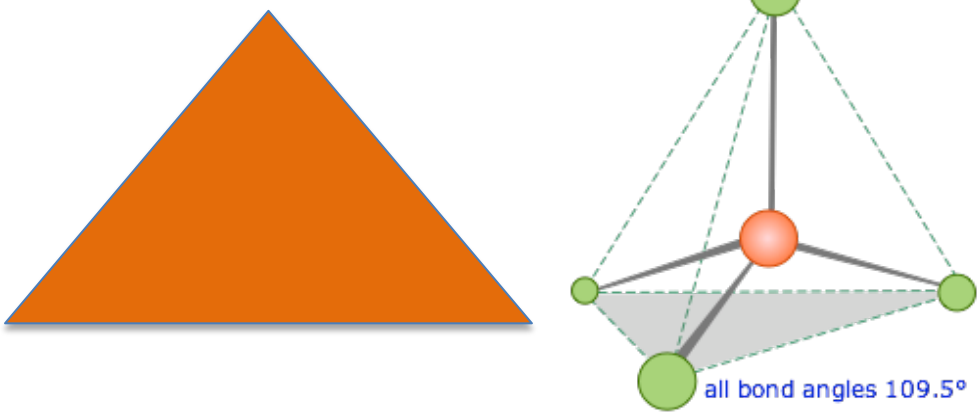
III: Volume/volume PPM_v(wet):

$$PPM_v = \frac{P_w}{P_{tot}} 10^6$$

We are expecting a water delivery of 25 – 100 gallons per day/unit.

One side of each pyramid will hold the water extraction material, in the shape of a triangle, and will be

orange in color. As one views a unit it will appear to be a sailboat with an orange sail. There will be a solar panel located on another side to provide electricity to the small pump needed to distribute the water. The third side will normally be open to the air but available to the Art Dept. for displaying large



Most of the funding for this project has already been identified and purchasing will begin this semester.

Purpose of Sabbatical Project

The purpose of this sabbatical project is to allow students an opportunity to have real-world, hands-on experience with water projects. It also demonstrates that solutions to this devastating drought do exist.

Value of Sabbatical Project to VCCCD

Because this project scope is so large, it will require collaboration between Ventura College and Moorpark College. This will build bonds and friendships through teamwork on a common goal, in turn enhancing the District. Another benefit of this project involves the positive public exposure from local newspapers and television during the opening ceremony.

Value of Sabbatical Project to Ventura College

The collaboration between administrators, faculty programs and classified workers to work together will enhance the entire campus and inter-college sense of oneness. Students will learn new methodology, and faculty will find new ways of incorporating material into the classroom setting. In addition, there will be an air of creativity and accomplishment for the entire campus. Departments involved in the project will include; Water Science, Construction, Architecture, Manufacturing, Welding, Automotive, ESRM, Child Development, Art, M&O, and Moorpark Solar.

Value of Sabbatical Project to Ventura College Students

- **Water Science Students –** participating in a lead role in an actual project
- **Construction Students –** leading actual hands-on construction
- **Architecture Students –** creating the Computer Aided Design work & confirmation of materials of construction
- **Manufacturing Students –** creation of the 3-D model from 3-D printers
- **Welding Students –** building the tetrahedron framework

Value of Sabbatical Project to the Instructor

I will be the principal designer and project manager. This project will allow me to practice my field of engineering and teach simultaneously. It will also bring awareness from all parts of the District and the surrounding communities with the potential of dramatically increasing Water Science enrollment.

Project Skywater was prematurely erected on Feb. 5 – 12 to celebrate the VC Innovates Conference at Ventura College because the Water Science Dept. was featured as the center of sustainability.

The Welding Dept. is continuing to expand the length of the legs and the completed unit will be permanently placed on campus by the end of the Spring 2019 Semester.

Thank you,

Roxanne Forde, Ph.D.
Water Science Professor