EVERY LAST DROP: EXTRACTING WATER FROM FOG

PROFESSOR DANIEL M. FERNANDEZ, CSU MONTEREY BAY
A BEGINNING…

IS THE TIME FOR TAKING THE MOST DELICATE CARE THAT THE BALANCES ARE CORRECT

Dune, reflections by Princess Irulan, page 3
To Save California, Read “Dune”

Survival on a fictional desert planet has a lesson for the drought-stricken state.
OVERVIEW

- Realizing the importance of water... on earth and beyond.
- History of how I became involved in fog work.
- Background on fog water collection
- Current research efforts
- Parallels and synchronicities with Frank Herbert’s epic novel, *Dune*
- Final thoughts
Dune, p. 306, Paul Atreides reciting words from O.C. Bible.
Drought expected to continue, county pushes conservation

By Jim Johnson, Monterey Herald
POSTED: 01/27/15, 5:41 PM PST | UPDATED: ON 01/27/2015
2 COMMENTS

California water officials eye new restrictions in drought

By FENIT NIRAPILI, Associated Press
POSTED: 02/17/15, 4:10 PM PST | UPDATED: 02/17/2015

Drought-fueled fire we’ve been dreading is here

Jeff Chiu-Associated Press A vehicle burned in the Rocky Fire is shown near Lower Lake, Tuesday.
A Toast Among Outlaws
Oh, cup of spice
To carry me
Beyond my flesh,
To a distant star.
Melange, they call it-
Melange! Melange!

Courtesy: NASA,
http://mars.nasa.gov/msl/multimedia/images/?ImageID=7496
New report shows water on Saturn’s moon

April 6, 2014 at 6:40 PM EDT
HOW DID I GET INTERESTED IN PULLING WATER OUT OF FOG?
July 1-11, 2004: 10 Day Silent Sitting Meditation Retreat, Vipassana Meditation Center, North Fork, CA
...BUT THERE WENT UP A MIST FROM THE EARTH, AND WATERED THE WHOLE FACE OF THE GROUND...

Genesis, Chapter II, Verse 6
- HISTORY AND RATIONALE OF FOGNET PROJECT.
Passive Fog Sites Before Receiving External Funding (through 2013)
Passive Fog Sites After One Year of Receiving External Funding

Humboldt State University Marine Lab

Pepperwood Preserve
Bodega Marine Lab
Fairfield Osborne Reserve
Montara Lighthouse
UC Santa Cruz
Long Marine Lab
Fitzche Field
Schoonover Park
Glen Deven Ranch
Brazil Ranch
This is the amount of water recovered from Jamis, following Paul’s first victory in a fight to the death.
Brazil Ranch Grassland Fog Collector
Big Sur

August 25-28 2011

~35 liters
THEN HE SAW THE HUMAN FIGURES MOVING INTO THE FLOWER FIELDS, SWEEPING THEM WITH STRANGE SCYTHE-LIKE DEVICES—DEW GATHERERS. WATER SO PRECIOUS HERE THAT EVEN THE DEW MUST BE COLLECTED.

_Dune_, early in book, Paul Atreides’ observations.
FOG ≠ DEW
FOG ≠ RAIN
“The presence of moisture in the air helps prevent too-rapid evaporation from living bodies”

*Dune*, p. 268, Thoughts of Liet Kynes, Planetologist
Fog lowers the evaporative demand by lowering temperature and increasing humidity.
“THE GIFT IS THE BLESSING OF THE GIVER”

Statement of Paul Atriedes, *Dune*, p. 106
“WATER!” SHE SNAPPED.

“EVERYWHERE YOU TURN HERE, YOU ARE INVOLVED WITH THE LACK OF WATER.”

-The Lady Jessica, *Dune*, p. 60.
FACILITIES FOG COLLECTOR
CSU MONTEREY BAY CAMPUS
AUGUST 2009

The diagram shows the liters collected over the course of August 2009. The x-axis represents dates (8/1, 8/16, 8/31) and the y-axis represents liters. The graph indicates fluctuations in liters collected on those dates.
FACILITIES FOG COLLECTOR
CSU MONTEREY BAY CAMPUS
AUGUST 2011

The chart shows the liters of fog collected over three days in August 2011. The values range from 0.05 to 0.35 liters. The day with the highest collection is 8/16, with a peak of approximately 0.3 liters. The collections on 8/1 and 8/31 are very low, close to 0.05 liters, while 8/16 has a significant spike reaching near 0.3 liters.
Can fog water be used to grow edible plants?
(despite a fallen collector discovered Aug. 25)
Facilities Fog Collector
CSU Monterey Bay Campus
August 2014
Summary of total volume of water in liters collected from a 1.00 square meter passive fog collector in Marina, CA

![Bar chart showing the volume of water collected from August 2009 to August 2015. August 2011 has the highest volume at 46 liters, followed by August 2012 with 32 liters, August 2013 with 27 liters, August 2014 with 4 liters, and August 2015* with 4.7 liters.]

A different but nearby site was used in 2015.
BIOMIMICRY:
“IF YOU GET CAUGHT DOWN THERE, YOU IMITATE LIFE.... OR YOU DIE”

Reference to life on Arrakis, *Dune*. 
AND SHE (JESSICA) NOTED THAT THE WALLS OF THE METER TROUGH HELD NO TRACE OF MOISTURE AFTER THE WATER FLOWED OFF THE WALLS WITHOUT BINDING TENSION.
THE DESERT NAMIB BEETLE

From www.asknature.org
IMPETUS FOR CURRENT RESEARCH EFFORTS

\[
\text{CH}_3\text{Hg}^+
\]

From Wikipedia.org
Total and monomethyl mercury in fog water from the central California coast

Peter S. Weiss-Penzias,¹ Cruz Ortiz Jr.,¹ R. Paul Acosta,¹ Wesley Heim,² John P. Ryan,³ Daniel Fernandez,⁴ Jeffrey L. Collett Jr.,⁵ and A. Russell Flegal¹

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DISCUSSIONS BEYOND FOG COLLECTION
SOME PARALLELS...
CLASS STRUGGLES - POWER AND CONTROL OF RESOURCES

WE ARE ALL HUMAN WITH HUMAN FAILINGS

FRANK HERBERT ENGAGED WITH THESE REALITIES
...FOR THEY SHALL SUCK THE ABUNDANCE OF THE SEAS AND OF THE TREASURE OF THE SAND...

Ancient Religious Quotation
Often Quoted by Gurney Halleck,
*DUNE*
We toil all day, the Harkonnen way, Just workin' and workin' and workin' . . Hour after hour, we long for a shower, Just workin' and workin' and workin' . .

*Sung on Giedi Prime*
PLACE-BASED NATURAL RESOURCES AND THEIR EFFECTS ON HUMAN BEHAVIOR.

Oil ↔ Spice

Water ↔ Water
ACKNOWLEDGEMENT OF THE MULTIPLE SYSTEMS WITHIN WHICH WE LIVE:

SOCIAL
ECONOMIC
ENVIRONMENTAL
RELIGIOUS
POLITICAL

AND THEY WAYS IN WHICH THEY ARE ALL INTERCONNECTED: CULTURE
“THE MORE LIFE THERE IS WITHIN A SYSTEM, THE MORE NICHES THERE ARE FOR LIFE”

Liet Kynes’ delirious recollection of his father’s teachings, *Dune*, p. 267.
“YOU MUST CULTIVATE ECOLOGICAL LITERACY AMONG THE PEOPLE”

Liet Kynes’ delirious recollection of his father’s teachings, *Dune*, p. 268.
“YOU CANNOT GO ON FOREVER STEALING WHAT YOU NEED WITHOUT REGARD TO THOSE WHO COME AFTER.”

Liet Kynes’ delirious recollection of his father’s teachings, *Dune*, p. 268.
SOME DIFFERENCES BETWEEN DUNE AND OUR REALITIES
The Fremen use what resources they have on a global scale to slowly meet long-term goals of ecological change. They methodically, systematically, and patiently seek to create an ecological “tipping point” on Arrakis in favor of a planetary paradise.
“The Fremen were supreme in the quality of the self-imposed delay between desire for a thing and the act of reaching out to grasp that thing.”

_Dune_, p. 283 from the Wisdom of Muad’Dib by the Princess Irulan
A MAJOR DIFFERENCE

We create rapid and unintentional ecological change by seeking short-term profits and material gratification through the rapid consumption of our natural resources. The tipping point we are carelessly approaching increases desertification, clean water scarcity and unexpected and extreme weather patterns.
“HOW MUCH IS THE PROPHET SHAPING THE FUTURE TO FIT THE PROPHESY?”

*Dune*, p. 272, Private Reflections on Muad’Dib by the Princess Irulan.
CLOSING THOUGHT –
FOG COLLECTION AS A TOOL TO PROMOTE
RESOURCE AWARENESS