PORT ORANGE CITY COUNCIL WORKSHOP

Council Chambers

Tuesday, October 27, 2015 @ 6:30 PM

WORKSHOP AGENDA

Pursuant to Section 3.06 of the Charter of the City of Port Orange, the Mayor has called a **Workshop** of the City Council to be held for the following purposes:

OPENING

1. Pledge of Allegiance
2. Silent Invocation
3. Roll Call

DISCUSSION ITEMS

4. City Center Landscaping
5. Fluoride Treatment Discussion
6. 2016 Legislative Priority List
7. Legislative update and discussion of proposed action regarding transportation right of way expenses and the relocation of utilities in the right of way

ADJOURNMENT

ANY PERSON WHO DECIDES TO APPEAL ANY DECISION MADE BY THE CITY COUNCIL WILL NEED A RECORD OF THE PROCEEDINGS, AND FOR SUCH PURPOSE HE OR SHE MAY NEED TO ENSURE AT HIS OR HER OWN EXPENSE FOR THE TAKING AND PREPARATION OF A VERBATIM RECORD OF ALL TESTIMONY AND EVIDENCE OF THE PROCEEDINGS UPON WHICH THE APPEAL IS TO BE BASED.

NOTE: IF YOU ARE A PERSON WITH A DISABILITY WHO NEEDS ANY ACCOMMODATION IN ORDER TO PARTICIPATE IN THIS PROCEEDING, YOU ARE ENTITLED, AT NO COST TO YOU, TO THE PROVISION OF CERTAIN ASSISTANCE. PLEASE CONTACT THE CITY CLERK FOR THE CITY OF PORT ORANGE, 1000 CITY CENTER CIRCLE, PORT ORANGE, FLORIDA 32129, TELEPHONE NUMBER 386-506-5563, WITHIN 2 WORKING DAYS OF YOUR RECEIPT OF THIS NOTICE OR 5 DAYS PRIOR TO THE MEETING DATE; IF YOU ARE HEARING OR VOICE IMPAIRED, CONTACT THE RELAY OPERATOR AT 1-800-955-8771.

CITY COUNCIL AGENDA ITEM

REQUESTED COUNCIL MEETING DATE 10/27/2015

Consent item: No

SUBJECT: City Center Landscaping

DEPARTMENT: Public Works

GOAL:

OBJECTIVE:

RECOMMENDED MOTION: Discussion only.

SUMMARY:

The following are the topics for discussion regarding landscape and tree maintenance at City Hall:

1. Expected level of service
2. Landscape architecture and plan
3. Irrigation system
4. Weed control
5. Leave sweeping
5. Tree protection
6. Implementation schedule
6. Other

Project No.:	Funding Account No.:

ATTACHMENTS:

Fenwick, Robin	Created/Initiated - 10/08/2015
Adumuah, Branford	Approved - 10/22/2015
Johansson, M. Jake	Final Approval - 10/22/2015

CITY COUNCIL AGENDA ITEM

REQUESTED COUNCIL MEETING DATE 10/27/2015

Consent item: No

SUBJECT: Fluoride Treatment Discussion

DEPARTMENT: Public Utilities

GOAL:

OBJECTIVE:

RECOMMENDED MOTION:

SUMMARY: Dr. Duranceau, P.E., Associate Professor of Environmental Engineering, UCF College of Engineering and Computer Science, will provide factual information concerning the application of fluoride in community water systems. Dr. Duranceau is a published expert in water treatment and his credentials are attached.

The application of fluoride is a community decision; it is not regulatory driven. Fluoride has been introduced into the City's water system since 1982 under Resolution 82-15. Since fluoridation is a community choice, the decision to end the addition of fluoride can be accomplished either by majority vote by City Council or by public referendum.

To aid in the Council discussion Dr, Duranceau prepared the attached Fluoride Fact Sheet.

The Public Utilities Department will comply with the decision made to either to continue fluoridation or cease it's use.

Project No.:	Funding Account No.:

ATTACHMENTS:

1.	Resolution 82-15	Res. 82-15.pdf
2.	Dr. Duranceau Credentials	CV-SJD UCF (01Jan2015).pdf
3.	Flouride Fact Sheet	1. Fact Figures Fluoridation-Duranceau.pdf
4.	Fluoride Article	Fluoride.pdf

Fenwick, Robin	Created/Initiated - 10/06/2015
Neff, Andrew	Approved - 10/21/2015
Johansson, M. Jake	Final Approval - 10/22/2015

RESOLUTION NO. 82-15

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF PORT ORANGE, VOLUSIA COUNTY, FLORIDA AUTHORIZING INSTALLATION AND ACTIVATION OF FLUORIDATION OF THE CITY'S WATER SUPPLY; AUTHORIZING THE MAYOR TO EXECUTE ALL DOCUMENTS WITH REGARD TO FLUORIDATION OF THE CITY'S WATER SUPPLY; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, it has been determined that the introduction of fluoride into water supplies intended for human consumption is necessary for the protection of the dental health and safety of citizens, and

WHEREAS, the Florida Department of Environmental Regulation permits the addition of fluoride into public water supplies as authorized by Chapter 17-22 of the Florida Administrative Code, and

WHEREAS, the Volusia County Dental Association and the Volusia County Health Department encourage the addition of fluoride to the City of Port Orange water supply for reasons of dental health.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PORT ORANGE, VOLUSIA COUNTY, FLORIDA THAT:

SECTION 1: The City Manager is hereby authorized to install and activate equipment for the purpose of applying fluoride to the public water supply of the City of Port Orange, in accordance with the regulations set forth in the Florida Administrative Code.

SECTION 2: The Mayor is hereby authorized to execute all necessary documents with regard to implementation of the City's fluoridation program.

SECTION 3: This Resolution shall become effective immediately upon adoption.

MAYOR JAMES R. FISHER

ATTEST:

Marion J. Zeller, City Clerk

Adopted this 5th day of April, 1982

Reviewed and Approved: City Attorney

BIOGRAPHICAL DATA

Dr. Steven J. Duranceau, P.E., Associate Professor of Environmental Engineering
Director, Environmental Systems Engineering Institute
University of Central Florida College of Engineering and Computer Sciences
Civil, Environmental and Construction Engineering Department
4000 Central Florida Blvd., P.O. Box 162450, Orlando, FL 32816-2450
Phone: 407.823.1440; Email: steven.duranceau@ucf.edu; Phone: 407.823.1440

EDUCATION

Doctor of Philosophy (Ph.D.)
Environmental Engineering; University of Central Florida, Orlando, Florida **[1990]**
Dissertation Title: *Modeling of Mass Transfer and Synthetic Organic Compound Removal in a Membrane Softening Process*; Advisor: Dr. James S. Taylor, P.E.

Masters of Science (M.S.)
Industrial Chemistry: University of Central Florida, Orlando, Florida **[1987]**
Thesis Title: *The Reaction of 2-Arylprop-1-en-3-yltrimethyl Ammonium Iodides with Sulfur Nucleophiles and Useful Synthetic Applications of These Adducts;* Advisor: Dr. John T. Gupton

Bachelor of Science (B.S.)
Chemistry [American Chemical Society Approved] Florida State University, Tallahassee, Florida **[1983]**

Associate of Arts (A.A.)
Manatee Junior College, Bradenton, Florida **[1981]**

PROFESSIONAL POSITIONS

July 2007 – Present	Associate Professor Environmental Engineering Director, Environmental Systems Engineering Institute University of Central Florida, Orlando, Florida
October 2006 – July 2007	President, Duranceau Consulting Services, LLC 3820 Lake Mirage Blvd., Orlando, Florida 32817
October 1992 – Sept. 2006	Vice-President and National Director, Water Quality & Treatment Boyle Engineering Corp., 320 E. South St., Orlando, FL 32801
Sept. 1990 – Sept. 1992	Associate Engineer, Howard Needles Tammen & Bergendoff 5900 Lake Ellenore Drive, Orlando, Florida, 32809
August 1987 – August 1990	Graduate Research Assistant; College of Engineering, Civil and Environmental Engineering; UCF, Orlando, FL 32816
August 1985 – August 1987	Graduate Teaching Assistant; College of Arts and Sciences, Department of Chemistry; UCF, Orlando, Florida 32816
May 1984 – August 1985	Chemist I, Food Laboratory; Florida Department of Agriculture and Consumer Services; 3125 Conner Boulevard, Bldg. 10 Tallahassee, FL 32399-1650
August 1980	Honorable Discharge, United States Navy [Midshipman]

TEACHING (Research Supervision)

GRADUATE STUDENT RESEARCH SUPERVISION (Since July 2007)

DOCTORAL DEGREES – AWARDED

Date	Name*	Dissertation Title	Funding Source(s)	Current Position	CC**
2013 (Summer)	Ms. Yuming Fang	*Modeling Short-Circuit Diffusion and Study of the Effect of Submicron Particles on the Fouling of Reverse Osmosis Membrane Processes*	UCF Research Foundation Jones Edmunds Fund, (Orlando, FL)	Membrane Scientist; Pure Blue Tech.; Seattle, WA	100%
2013 (Spring)	Dr. Chris C. Boyd, E.I.	*Improvement of Ultrafiltration Performance and Contaminant Removal Capabilities by Pre-deposition of Adsorbent and Exchange Materials.*	Harn R/O Systems Inc. (Venice FL) for Manatee County Utilities; (Bradenton, FL).	Project Engineer, Alan Plummer & Associates, Ft. Worth, TX	100%
2012 (Fall)	Dr. Jayapregasham Tharamapalan	*Application and Optimization of Membrane Processes Treating Brackish and Surficial Groundwater for Potable Water Production*	City of Sarasota Public Works-Utilities; (Sarasota, FL)	Principal, JTSR Solutions LLC, Oviedo, FL	100%
2008 (Fall)	*Dr. Phillip Lintereur	*Effects of Source Water Blending Following Treatment with Sodium Silicate as a Corrosion Inhibitor on Metal Release within a Water Distribution System*	Water Research Foundation TC (Denver CO): Tampa Bay Water (Tampa FL)	Project Engineer, Alan Plummer & Associates, Ft. Worth, TX	50%
2008 (Fall)	*Dr. Erica Stone	*Effects of Orthophosphate Corrosion Inhibitor in Blended Water Quality Environments.*	Water Research Foundation TC (Denver CO): Tampa Bay Water (Tampa FL)	Project Engineer, Carollo Engineers, Orlando, FL	50%
2008 (Summer)	*Dr. Abdulrahman A. Alsheri	*Impact of Corrosion Inhibitor Blended Orthophosphate on Water Quality in Water Distribution Systems*	Water Research Foundation TC (Denver CO): Tampa Bay Water (Tampa FL)	Engineer; Jeddah Water System; Saudi Arabia.	50%

*Note 1: For these 2008 students, Dr. Duranceau served as Co-Chair upon retirement of Dr. J.S. Taylor in 2007; Dr. Duranceau was responsible for the following: supervising technical development, data analysis (reviews), modeling review, dissertation production of dissertation, review and format check, defense process, and graduation process (Turn-it-in.com used for vetting).

**Note 2: CC is Committee Chair student credit (co-Chair = 50%).

DOCTORAL STUDENTS – CURRENT/ACTIVE

Estimated Year (term)	Name	Dissertation Title	Funding Source(s)	Status	CC*
2015 (Spring)	Ms. Andrea C. Cumming, E.I.	*Implementation of Integrated Surface Water Treatment Systems for Disinfection Byproduct Control*	Water Research Foundation (Denver CO) and County of Maui (Kahului, HI)	Ph.D. Candidate	100%
2015 (Fall)	Mr. David T. Yonge, E.I.	*Application of Hollow-Fiber Nanofiltration & Anion Exchange for an Aerated Florida Groundwater Supply*	City of Sarasota Public Works-Utilities; (Sarasota, FL)	Ph.D. Qualified	100%
2015 (Fall)	Mr. Paul Biscardi, E.I.	*Ozone Pretreatment for Conventional Coagulation and Ultrafiltration Processes for Surface Water Treatment*	Harn R/O System, Inc. (Venice FL) for Alameda County Water District (CA)	Passed Ph.D. Qualified	100%
2015 (Fall)	Ms. Samantha Jeffery, E.I.	*Effectiveness of Nanofiltration for Removal of Emerging Contaminants*	Kimley-Horn (West Palm Beach FL) Jupiter Water (FL)	Passed Ph.D. Qualified	100%
2016 (Fall)	Ms. Erin Reed	*To Be Determined*	Graduate Teaching Assistant	Student	---
2016 (Fall)	Mr. Ben Yoakum	*To Be Determined*	Polk County Utilities	Student	---

*Note 1: CC is Committee Chair student credit (Chair = 100%).

MASTER'S DEGREES – AWARDED

Date	Name*	Thesis Title	Funding Source(s)	Current Position	CC*
2014 (Fall)	Ms. Erica R. LaBerge, E.I.	*Study of the Formation and Control of Disinfection By-Products Originating from a Tropical Volcanic Surface Water Supply on the Island of Guam*	Brown & Caldwell (Honolulu, HI) on behalf of the U.S. Navy (Guam)	Native English Teacher in the Korean public school system (EPIK), Daejeon, South Korea	100%
2014 (Spring)	Ms. Christine Hall, E.I.	*Study and Control of Iron and Manganese Originating from a Tropical Volcanic Water Supply on the Island of Guam*	Brown & Caldwell (Honolulu, HI) on behalf of the U.S. Navy (Guam)	Engineer, Nelson Engineers, Merritt Island, FL	100%
2013 (Fall)	Ms. Samantha Jeffery, E.I.	*In-Plant and Distribution System Corrosion Control for RO, NF and Anion Exchange Process Blends*	RosTek Associates, Inc. (Tampa, FL) on behalf of the Town of Jupiter Water Utilities (Jupiter FL)	Ph.D. Student, UCF CECE, (Orlando, FL)	100%
2013 (Spring)	Ms. Tara Lamoureaux	*"Ozone and GAC Treatment of a Central Florida Groundwater for Sulfide and DBP Control"*	City of Sanford FL (Sanford, FL)	Operations Engineer, City of (Sanford, FL)	100%
2012 (Fall)	Mr. David T. Yonge, E.I.	*"A Comparison of Aluminum and Iron Based Coagulants for Treatment of Surface Water in Sarasota County, Florida"*	Carollo Engineers (Sarasota, FL) on behalf of Sarasota County Government (Sarasota, FL)	Graduate Student in PhD Program at UCF (Orlando, FL)	100%
2012 (Summer)	Mrs. Rebecca Wilder, E.I.	*"Evaluating Corrosion Control Alternatives for a Reverse Osmosis, Nanofiltration and Anion-Exchange Blended Water Supply"*	RosTek Associates, Inc. (Tampa FL) on behalf of the Town of Jupiter Water Utilities (Jupiter, FL)	Water Quality and Compliance Specialist, Jupiter Water Utilities (Jupiter, FL)	100%
2012 (Summer)	Ms. Jennifer Roque, E.I.	*"Evaluation of an On-line Device to Monitor Scale Formation in a Brackish Water Reverse Osmosis Membrane Process"*	City of Sarasota Public Works-Utilities; (Sarasota, FL)	Assistant Engineer, TetraTech (Orlando, FL)	100%
2011 (Summer)	Mr. Chris C. Boyd, E.I.	*"Effect of Acetic or Citric Acid Ultrafiltration Recycle Streams on Coagulation Processes"*	Harn R/O Systems, Inc. (Venice, FL); for Manatee County Utilities (Bradenton, FL).	Project Engineer, Alan Plummer & Associates, Ft. Worth, TX	100%
2010 (Fall)	Ms. Jumoke Faborode	*"Hydrogen Sulfide Removal and Modeling in Tray Aerators"*	UCF Research Foundation Jones Edmunds Fund (Orlando, FL)	Project Engineer, PEER Consultants, Washington, D.C.	100%
2010 (Summer)	Mr. Vito Trupiano, E.I.	*"Evaluation of Oxidation and Filtration Treatment for Hydrogen Sulfide Removal from Groundwater"*	Polk County Utilities Division, Polk County Government, (Bartow, FL)	Process Engineer, Harn R/O Systems, Inc. (Venice FL)	100%
2009 (Summer)	Ms. Susaye Douglas	*"Post-Treatment Stabilization of Desalinated Permeate"*	Water Research Foundation (Denver CO); U.S. Dept. of Interior (Denver CO); California DWR (Sacramento, CA)	Asst. Engineer, Mckissack & Mckissack, (Washington DC)	100%

*Note 1: CC is Committee Chair student credit (Chair = 100%).

MASTER'S STUDENTS – CURRENT/ACTIVE

Target Date	Name*	Thesis Title	Funding Source(s)	CC*
2015 (Spring)	Ms. Cassandra T. Smith, E.I.	*Trihalomethane Removal and Re-Formation in Spray Aeration Processes*	Brown & Caldwell (Honolulu, HI) for the U.S. Navy (Guam)	100%
2016 (Spring)	Ms. Samantha Myers	*Pūlama Lana'i Manēle Bay and Lana'i City Corrosion Control Tuberculation Study*	Aqua Engineers (Lihui, HI) for Pulama Lanai (Honolulu, HI).	100%

*Note 1: CC is Committee Chair student credit (Chair = 100%).

COURSES TAUGHT AND STUDENT PERCEPTION TEACHING EFFECTIVENESS (Fall-2007 to Spring-2014)
UCF Civil, Environmental and Construction Engineering [Based on a scale of 5 points].

Year	Term	Course No.	Course Title	Credit	Class	Student Response Rate	Total Enrolled Students	Overall Effective Score
2014	Fall	ENV6015	Physical Chemical Treatment	3	Graduate	89%	9	4.38
	Spring	ENV6519	Aquatic Chemical Processes	3	Graduate	64%	14	3.89
	Spring	ENV4562C	Water Treatment Plant Design*	3	Senior UG	91%	11	3.90
2013	Fall	ENV6015	Physical Chemical Treatment	3	Graduate	62%	13	3.62
	Spring	ENV5410	Drinking Water Treatment	3	Graduate	75%	14	4.67
	Spring	ENV4562C	Water Treatment Plant Design*	3	Senior UG	62%	14	4.25
2012	Fall	ENV6015	Physical Chemical Treatment	3	Graduate	22%	9	4.00
	Spring	ENV4562C	Water Treatment Plant Design*	3	Graduate	64%	28	4.33
	Spring	ENV6519	Aquatic Chemical Processes	3	Senior	60%	10	2.83
2011	Fall	ENV6015	Physical Chemical Treatment	3	Graduate	39%	13	4.20
	Fall	ENV4202C	Chemical Process Control	4	Senior	50%	56	3.66
	Spring	ENV5410	Drinking Water Treatment	3	Graduate	53%	15	4.00
	Spring	ENV4562C	Water Treatment Plant Design*	3	Senior	69%	16	3.91
2010	Fall	ENV6015	Physical Chemical Treatment	3	Graduate	69%	16	3.36
	Fall	ENV4202C	Chemical Process Control	3	Senior	46%	46	3.57
	Spring	ENV6519	Aquatic Chemical Processes	3	Graduate	54%	15	4.15
	Spring	ENV4562C	Water Treatment Plant Design*	3	Senior	63%	19	4.25
2009	Fall	ENV6015	Physical Chemical Treatment	3	Graduate	80%	17	3.75
	Fall	EES4202C	Chemical Process Control	3	Senior	69%	35	4.40
	Spring	ENV4562C	Water Treatment Plant Design*	3	Senior	67%	15	4.50
	Spring	ENV3001	Intro to Environmental Eng.	3	Junior	61%	74	3.25
2008	Fall	ENV6015	Physical Chemical Treatment	3	Graduate	19%	16	3.00
	Fall	ENV4202C	Chemical Process Control	3	Senior	87%	23	4.45
	Sum.	ENV6519	Aquatic Chemical Processes	3	Graduate	31%	13	4.00
	Spring	ENV3001	Intro to Environmental Eng.	3	Junior	64%	36	3.93
2007	Fall	ENV3001	Intro to Environmental Eng.	3	Junior	90%	31	4.26

*****Capstone design course having full title: *Environmental Systems Engineering Water Treatment Design*.

MENTORING UNDERGRADUATE RESEARCH STUDENTS – SPECIAL HIGHLIGHTS AND RECOGNITIONS

Dates	*Group or Organization (Student Name)*	*Title/Description or Activity*
2013 Fall to date	Honors in the Major *(Ms. Angela Rodriguez)*	* *Topic: Laboratory-Scale Ozone and Chlorine Dioxide Oxidation of a Volcanic Surface Water Supply for Color and DBP Reduction (Committee Chair: Dr. Duranceau).*
2010-Date	Society of Environmental Engineering (SEE) Faculty Advisor *(30+ undergraduate/graduate students)*	* *Faculty advisor/liaison; UCF SEE conducted several association business meetings with guest speaker. Continued with the development of an outreach project entitled "Strategic Environmental Engineering Infrastructure Plan for the Bithlo Rural Community" as part of Florida Hospital's Community Wellness Program. Mentored a team of four students (undergraduates Erica LaBerge, Vincent Chiu, Alex Magliacane) and graduate student (Christine Hall) that participated in the Florida Water Environment Association's annual Senior Design Competition.*
2012-Date	NSF's STATESS (Students Actualizing Talent at Education's Subsequent Stages) *(Ms. Angela Rodriquez) (Ms. Danielle Barnhill)*	* *Served as a faculty mentor in support of STATESS, a program funded by the National Science Foundation (NSF) and administered by UCF, to provide opportunity and support to financially, needy students. Mentors help students develop a program of study and guide them to various opportunities in their fields of study.*
2012 - Date	Office of Undergraduate Research EXCEL Program Faculty Advisor *(Ms. Angela Rodriquez, Ms. Tiffany Miller and Ms. Carlyn Higgins)*	* *Served as Faculty Advisor to EXCEL, a program funded by the National Science Foundation to increase the number of U.S. citizens and permanent residents who pursue and are awarded a degree in Science, Technology, Engineering, and Mathematics.*
Summer 2012	Office of Undergraduate Research SURF Scholar Faculty Mentor *(Ms. Genesis Rios)*	* *Faculty mentor for undergraduate student Ms. Genesis Rios as a Summer Undergraduate Research Fellowship (SURF) scholar conducting research entitled "Reduction of Total Trihalomethane Precursors from Central Florida Surface Waters." Also participated in the 10th Annual Showcase of Undergraduate Research Excellence associated with the SURF mentoring.*
Summer 2012	Office of Undergraduate Research Summer Research Academy	* *Faculty participant in the 2012 Summer Research Academy conducted by UCF's Office of Undergraduate Research.*
Spring 2011	Office of Undergraduate Research YES Program RAMP Research and Mentoring Program BP Achievement Award *(Mr. Emanuel Ozuna Vargas)*	* *National Science Foundation STEM Scholarship (Grant No. 0806931), YES Program, Research and Mentoring Program (RAMP) and BP Achievement Award. Mr. Emanuel Ozuna Vargas. "A Study of the Effect of Bleach on Citric Acid's Anticoagulant Properties" April 1, 2011. (Served as Advisor/Mentor).*
2008 Spring to 2009 Fall	Honors in the Major *(Ms. Hilary R. Palmer)*	* *Topic: "Bottled Water Storage Location and its Impact on Microbiological Quality." Funding Agency: UCF Burnett Honors College and the UCF Research Foundation's Jones Edmunds Fund, Orlando, FL. Graduated – December 2009 (Committee Chair: Dr. Duranceau)*
Spring 2008 to Spring 2009	Office of Undergraduate Research; First Place Poster Award; Showcase of Undergraduate Research Excellence; *(Mr. Jeff K. Lochner)*	* *Showcase of Undergraduate Research Excellence. Orlando, FL. "Removal of Iron and Color from Industrial Wastewater with Coal-Derived Fly-Ash." April 2, 2009. (Served as Advisor/Mentor).*

EDUCATIONAL CONTRIBUTIONS: UCF CIVIL, ENVIRONMENTAL AND CONSTRUCTION ENGINEERING

- ✓ 2014. Curriculum Reform Committee (Fall). Discipline: Environmental Engineering
- ✓ 2014. Search Committee, Environmental Engineering (tenure track position)
- ✓ 2013. Development of Classes: ENV6908; ENV4906; ENV4903H; ENV4912
- ✓ 2012. Development of Classes: ENV6908; ENV4906; ENV4912
- ✓ 2011. Development of Classes: ENV5410; ENV6908; Revised updated ENV4202c
- ✓ 2010. Curriculum Reform Committee (Spring). Discipline: Environmental Engineering.
- ✓ 2010. Development of Classes: ENV4906; ENV6908
- ✓ 2009. Curriculum Reform Committee (Fall). Environmental Engineering.
- ✓ 2009. Development of Classes: ENV4906; ENV4907H
- ✓ 2008. Textbook Committee. Introduction to Environmental Engineering ENV3001.
- ✓ 2008. Textbook Committee. Physical Chemical Treatment Textbook Selection ENV6015.
- ✓ 2008. Development of Classes: ENV4562; ENV4202; ENV6519; ENV49062007.
- ✓ Development of Classes: ENV3001; ENV6015

DIRECTED INDEPENDENT STUDY COURSES TAUGHT (Fall 2007 – Spring 2013)

UCF Civil, Environmental and Construction Engineering

Year	Term	Course No.	Course Title	Credits	Class Rank	Enrollment
2014	Fall	ENV 4906	Independent Study	3	Undergraduate	1
	Spring	ENV 4912	Research	0	Undergraduate	4
2013	Fall	ENV 4906	Independent Study	1	Undergraduate	1
	Fall	ENV 4903H	Honors Direct RDG-1 (Ind.Study)	2	Undergraduate	1
	Fall	ENV 4912	Research	0	Undergraduate	4
	Summer	ENV 4906	Independent Study	1	Undergraduate	2
	Summer	ENV 4904H	Honors Directed Research	2	Undergraduate	1
	Spring	ENV 4906	Independent Study	1	Undergraduate	2
	Spring	ENV 4904H	Honors Directed Research	2	Undergraduate	1
2012	Fall	ENV 4906	Independent Study	1	Undergraduate	3
	Summer	ENV 4912	Directed Independent Research	2	Undergraduate	1
	Summer	ENV 6908	Independent Study	3	Graduate	1
	Spring	ENV 4912	Directed Independent Research	2	Undergraduate	1
	Spring	ENV 6908	Independent Study	3	Graduate	1
2011	Summer	ENV 6908	Independent Study	3	Graduate	3
2010	Fall	ENV6908	Independent Study	3	Graduate	1
	Summer	ENV6908	Independent Study	3	Graduate	2
	Spring	ENV6908	Independent Study	3	Graduate	2
	Spring	ENV4906	Independent Study	3	Undergraduate	1
2009	Fall	ENV4906	Independent Study	2	Undergraduate	1
	Fall	ENV4970H	Honors Directed Study	3	Undergraduate	1
	Summer	ENV4906	Independent Study	3	Undergraduate	2
	Summer	ENV4970H	Honors Directed Study	3	Undergraduate	1
	Spring	ENV4906	Independent Study	1	Undergraduate	1
	Spring	ENV4970H	Honors Directed Study	3	Undergraduate	1
2008	Fall	ENV4906	Independent Study	3	Undergraduate	1

PROFESSIONAL COURSES AND INSTRUCTOR EVALUATIONS

UNIVERSITY OF WISCONSIN, MADISON, WI - (FALL 2007 – SPRING 2013)

College of Engineering Department of Engineering Professional Development

Course Name: Fundamentals of Drinking Water Treatment; Improving Infrastructure [Scale of 5.0 points].

Short Course Dates	Course Component Name	Content	Presenting Skills	Handout	Slides (.ppt)	Total # Surveyed
June 23-25, 2014	Membrane Filtration Processes	4.33	4.37	4.15	4.22	
	Distribution System Water Quality	4.40	4.27	4.23	4.31	
June 24-26, 2013	Membrane Filtration Processes	4.13	4.50	4.32	4.39	24
	Distribution System Water Quality	4.33	4.58	4.23	4.38	23
June 26-28, 2012	Membrane Filtration Processes	4.45	4.55	4.47	4.60	20
	Distribution System Water Quality	4.50	4.55	4.47	4.40	20
May 17-19, 2011	Membrane Filtration Processes	4.72	4.67	4.83	4.31	15
	Distribution System Water Quality	4.49	4.23	4.25	4.79	17
October 19-20, 2010	Pipe Corrosion Processes	4.69	4.46	4.59	4.31	12
June 17-18, 2010	Corrosion and Pipe Integrity	4.50	4.50	4.57	6.63	9
June 14-16, 2010	Membrane Processes	4.67	4.64	4.46	4.38	13
	Adsorption Processes	4.23	4.23	4.54	4.25	13
	Distribution System Water Quality	4.55	4.67	4.23	4.83	13
May 12-14, 2009	Membrane Processes	4.83	4.67	4.83	4.33	6
	Adsorption Processes	4.50	4.67	4.67	4.67	6
	Distribution System Water Quality	4.33	4.67	4.67	4.83	6
May 5-6, 2008	Membrane Technologies Part I	4.67	4.79	4.57	4.54	17
	Membrane Technologies Part II	4.64	4.64	4.50	4.38	14
September 18-19, 2007	Membrane Filtration Systems	4.26	4.52	3.74	3.91	23
	Adsorption Processes	4.09	4.26	3.78	3.78	23
	Ion Exchange Processes	4.09	4.36	3.68	3.86	22
	Aeration Processes	4.05	4.33	3.57	3.62	21
June 13-14, 2007	Membrane Filtration Systems	4.82	4.55	4.09	4.40	11
	Adsorption Processes	4.45	4.27	3.73	3.80	11
	Ion Exchange Processes	4.36	4.36	4.10	4.20	10
	Aeration Processes	4.50	4.50	4.30	4.22	10
April 17-18, 2007	Membrane Technologies	4.53	4.72	4.22	4.18	18
October 11-12, 2006	Membrane Technologies	4.61	4.64	4.36	4.32	22

RESEARCH

KEY WORDS:

- Water quality chemistry and nanoscience applications thereof.
- Physico-chemical and microbiological processes and nanoscience applications thereof:
  - Aeration and oxidation,
  - Membranes,
  - Activated carbon,
  - Ion-exchange,
  - Disinfection,
  - Stabilization,
  - Corrosion control,
  - Distribution system water quality.
- Desalination process operation troubleshooting and analysis.
- Water distribution system infrastructure.
- Blending of alternative water supplies.

RESEARCH FUNDING AT THE UNIVERSITY OF CENTRAL FLORIDA

Funded Grants & Contracts PI Summary By Year (July 5, 2007 to February 1, 2014)

UCF Fiscal Year	External Award	Internal Award
2007-2008	$165,000	$3,750
2008-2009	$141,234	$0
2009-2010	$539,751	$0
2010-2011	$270,080	$0
2011-2012	$261,186	$2,455**
2012-2013	$882,075	$4,484**
2013-2014	$586,264	$15,792**
Total*	$2,856,692	$26,481

NOTE: * Thru December 31, 2014 (PARIS data); **Designates PI Balance Account Award

Funded Grants & Contracts PI Details: Research Projects (July 5, 2007 to October 1, 2014)

1	Sponsor: Title: Dates: Funding Value: Responsibility:	Polk County Utilities, Bartow, Florida. *Babson Park Water System Granular Activated Carbon Demonstration Study for Disinfection By-Product Precursor Matter* 12/02/2014 to 2/25/2016 **$69,335** 100%
2	Sponsor: Title: Dates: Funding Value: Responsibility:	Aqua Engineers, Inc., Kalaheo, Kauai (on behalf of Pulama Lanai Utilities, Lanai). *Pulama Lana'i Manele Bay and Lana'i City Corrosion Control and Tuberculation Study* 04/01/2014 to 05/05/2016 **$149,974** 100%
3	Sponsor: Title: Dates: Funding Value: Responsibility:	Polk County Utilities, Bartow, Florida. *Post-Construction Water Quality Evaluation of the Imperial Lakes Water Treatment Plant* 11/10/2014 to 04/24/2015 **$12,755** 60%
4	Sponsor: Title: Dates: Funding Value: Responsibility:	Aqua Engineers, Inc., Kalaheo, Kauai (on behalf of Pulama Lanai Utilities, Lanai). *Pulama Lana'i Manele Seawater Desalination Project:Reverse Osmosis Pilot Plant Process Operation Assistance, Concentrate Recovery Desk-Top Evaluation, Permeate Corrosion Control and Disinfection By-Products Evaluation* 04/01/2014 to 12/31/2014 **$138,728** 100%
5	Sponsor: Title: Dates: Funding Value: Responsibility:	Brown and Caldwell, Honolulu, HI (on behalf of the U.S. Navy PACDIV) *NAVFAC Marianas U.S. Navy Guam Public Water System Disinfection By-Product Control Study and Fena Lake Evaluation* 03/06/2013 to 05/04/2015 **$238,181 (includes a $29,484 travel line-item)** 100%
6	Sponsor: Title: Dates: Funding Value: Responsibility:	Kimley-Horn and Associates, Inc., West Palm Beach, FL *Drinking Water Quality, Treatment and Distribution Systems Operations Research and Environmental Engineering Studies* 10/01/2012 to 09/28/2015 **$237,000** 100%
7	Sponsor: Title: Dates: Funding Value: Responsibility:	St. John's River Water Management District, Palatka, FL *Systems Evaluation of the Cost and Effectiveness of Different Treatment Techniques for Removal of Total Phosphorus from Surface Waters in the Middle St. Johns River Basin, Florida* 09/24/2012 to 4/30/2014 **$241,197** 100%
8	Sponsor: Title: Dates: Funding Value: Responsibility:	Water Research Foundation, Denver, CO *Pretreatment of Low Alkalinity Organic-Laden Surface Water Prior to a Coagulation-Ultrafiltration Membrane Process* 09/12/2012 to 03/01/2015 **$150,000** 100%
9	Sponsor: Title: Dates: Funding Value: Responsibility:	Orlando Utilities Commission, Orlando, Florida *Orlando Utilities Commission Desk-Top Evaluation an Ideas Exchange Regarding Legionella in the Potable Water Systems of Health Care Facilities* 12/16/2011 to 08/19/2012 **$22,750** 100%

10	Sponsor: Title: Dates: Funding Value: Responsibility:	Carollo Engineers, Sarasota, FL (on behalf of Sarasota County Government) *Sarasota County Dona Bay Jar Testing Treatability Support* 9/14/2011 to 12/31/2013 **$77,270** 100%
11	Sponsor: Title: Dates: Funding Value: Responsibility:	Austin, Tsutsumi & Associates, Inc., Honolulu, HI (on behalf of County of Maui Water Supply) *County of Maui Department of Water Supply Pi'iholo Water Treatment Plant Miex® and Carbon Column Total Organic Carbon Reduction Pilot Plant Testing Assistance and Data Evaluation – Applied Research* 8/4/2011 to 12/31/2014 **$148,409** 100%
12	Sponsor: Title: Dates: Funding Value: Responsibility:	Harn R/O Systems, Inc., Venice, FL (on behalf of Toyobo Co., Osaka, Japan) *Ultrafiltration Membrane Process Research Pilot Testing at Alameda County Water District's Mission San Jose Surface Water Treatment Plant, Fremont, CA* 09/01/2010 to 12/31/2015 **$222,914** 100%
13	Sponsor: Title: Dates: Funding Value: Responsibility:	Envisors, LLC, Winter Haven, FL (on behalf of Town of Lake Hamilton, FL) *Determination of Total Sulfide Content of Lake Hamilton's Drinking Water Well* 04/02/2010 to 09/01/2010 **$1,300** 100%
14	Sponsor: Title: Dates: Funding Value: Responsibility:	Harn R/O Systems, Inc., Venice, FL (on behalf of Toyobo Co., Osaka, Japan) *Ultrafiltration Membrane Process Beta-Testing at Manatee County's Surface Water Treatment Plant, Bradenton, FL* 03/03/2010 to 5/5/2013 **$158, 600** 100%
15	Sponsor: Title: Dates: Funding Value: Responsibility:	RosTek Associates, Inc., Tampa, FL (on behalf of the Town of Jupiter, FL) *Nanofiltration Permeate Post-Treatment and Process Blending Impacts on Distribution System Water Quality* 01/25/2010 – 09/28/2012 **$149,952** 100%
16	Sponsor: Title: Dates: Funding Value: Responsibility:	City of Sarasota Public Works and Utilities, Sarasota, FL *Reverse Osmosis Process Assessment Study and Verna Nanofiltration Process Eval.* 10/26/2009 to 12/31/2014 **$566,534** 100%
17	Sponsor: Title: Dates: Funding Value: Responsibility:	Jones Edmunds & Associates, Inc., Gainesville, FL *East Putnam Reverse Osmosis Water Treatment Facility* 08/26/2009 to 07/31/2010 **$9,906** 100%
18	Sponsor: Title: Dates: Funding Value: Responsibility:	Polk County Government, Bartow, FL *Evaluation of Alternative Sulfide Treatment Processes for Polk County Utilities Imperial Lakes and Turner Road Water Supplies* 09/24/2008 – 09/30/2010 **$124,749** 100%
19	Sponsor: Title: Dates: Funding Value: Responsibility:	UCF-Office of Research and Commercialization (Internal Award) *I.H: Effects of Stray Current on the Corrosion of Rebars* 05/01/2008 to 09/01/2009 **$3,750 as co-PI (Total Project $7,500)** 50%

20	Sponsor: Title: Dates: Funding Value: Responsibility:	City of Sarasota Public Works and Utilities, Sarasota, FL *Water Quality Laboratory Testing* 04/01/2008 to 09/15/2008 **$1,485** 100%
21	Sponsor: Title: Dates: Funding Value: Responsibility:	Water Research Foundation (former Awwa Research Foundation), Denver, CO Post-Treatment Stabilization of Desalinated Water (RFP 4079) 11/01/2007 to 05/01/2010 **$141,367** 100%
22	Sponsor: Title: Dates: Funding Value: Responsibility:	UCF Research Foundation: Jones Edmunds & Associates, Inc., Gainesville, FL Jones Edmunds Research Fund – Basic Research 06/12/2007 to 04/153/2016 **$75,000** 100%
	Total*	**$2,883,179**

NOTE: *Approximate total does not include PI Balance Account (Internal) and is without any co-PI splits.

LIST OF PUBLICATIONS

[Note: "†" denotes graduate student co-author; "¥" denotes undergraduate student co-author]

Refereed Chapters in Edited Books

1. **Duranceau**, S.J. and J.S Taylor, "*Chapter 11 Membrane Processes*" in Water Quality and Treatment, 6th Edition. Ed. J. K. Edzwald. New York: McGraw-Hill; pages 11-1 to 11-106 (**2010**).
2. **Duranceau**, S.J. "*Principles and Practice for Upgrading Older Desalting Facilities*" in Desalination of Seawater and Brackish Water. Ed. W.C. Lauer. Denver: AWWA; pages 503-513 (**2006**).
3. Taylor, J.S. and S.J. **Duranceau**. "*Membrane Case Studies: Past, Present and Future*" in Membrane Technology in Water and Wastewater Treatment. Ed. P. Hillis. Published by the Royal Society of Chemistry, Cambridge UK; Bound by MPG Books Ltd, Bodmin, Cornwall; pages 1-24 (2000).

Refereed Books Assigned ISBN Numbers

1. **Duranceau** S.J.; R.J. Pfeiffer-Wilder†, S.A. Douglas†, N. Peña-Holt¥; I.C. Watson. Post Treatment Stabilization of Desalted Permeate. Denver CO: Water Research Foundation (**2011**). 201 pages.
2. Ellison, D., F. Sever, P. Oram, W. Lovins, A. Romer, S.J. **Duranceau**, and G.E.C. Bell. Global Review of Spray-On Structural Lining Technologies. Denver CO: Water Research Foundation and U.S. Environmental Protection Agency. (**2010**). 157 pages.
3. **Duranceau, S.J.**, D. Townley and G.E.C. Bell. Optimizing Corrosion Control in Water Distribution Systems. Denver, CO: Awwa Research Foundation and AWWA (2004). 271 pages.
4. Rommelmann, D., S.J. **Duranceau** et.al. Industrial Water Quality Requirements for Reclaimed Water. Denver, CO: Awwa Research Foundation and AWWA (2004). 99 pages.
5. Romer, A.E., G.E.C. Bell, S.J. **Duranceau** and S. Forman. External Corrosion Control for Buried Water Mains. Denver, CO: Awwa Research Foundation and AWWA (2004). 143 pages.
6. **Duranceau**, S.J. Membrane Practices for Water Treatment. AWWA Trends in Water Series. Denver, CO: AWWA (2001). 589 pages.
7. Ellison, D., with S.J. **Duranceau** et. al. Investigation of Pipe Cleaning Methods. Denver, CO: Awwa Research Foundation and American Water Works Association (2003). 140 pages.

8. **Duranceau,** S.J., J.V. Foster, J. Poole. Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality. Denver, CO: American Water Works Association (1998). 392 pages.
9. Taylor, J.S., C.R. Reiss[†], P.S. Jones[†], K.E. Morris[†], T.L. Lyn[†], D.K. Smith, L.A. Mulford, and S.J. **Duranceau.** Reduction of Disinfection By-Product Precursors by Nanofiltration. EPA/600/SR-92/023. Cincinnati, OH: USEPA-RREL, April (1992).
10. **Duranceau,** S.J.; G.E.C. Bell; and M.J. Schiff. Effects of Electrical Grounding on Pipe Integrity and Shock Hazard. Denver, CO: American Water Works Association (1996). 220 pages.
11. Taylor, J.S., S.J. **Duranceau**, L.A. Mulford, D.K. Smith, W.M. Barrett[†]. Synthetic Organic Compound Rejection by Nanofiltration. EPA/600/S2-89/023. Cincinnati, OH: USEPA-RREL., January (1990).
12. Taylor, J.S., L.A. Mulford, W.M. Barrett[†], S.J. **Duranceau**, and D.K. Smith. Cost and Performance of Membranes for Organic Control in Small Systems: Flagler Beach and Punta Gorda, FL. EPA/600/S-2/89/022. Cincinnati, OH: USEPA-RREL, January (1990).
13. **Duranceau**, S.J. Modeling of Mass Transfer and Synthetic Organic Compound Removal in a Membrane Softening Process. Doctoral Dissertation, University of Central Florida, Orlando (1990).
14. Taylor, J.S., S.J. **Duranceau,** W.M. Barrett[†], and J.F. Goigel[†]. Assessment of Potable Water Membrane Applications and Research Needs. Denver, CO: WRF. Dec. (1989). 164 pages.

Refereed Journal Publications

1. Yonge[ǂ], D.T., **Duranceau**, S.J. and P.G. Biscardi[ǂ]. "Comparing adsorptive media use for the direct treatment of phosphorous-impaired surface water." Journal of Environmental Engineering. (In Review)
2. **Duranceau**, S.J. and P.G. Biscardi[ǂ]. "*Comparing adsorptive media use for the direct treatment of phosphorous-impaired surface water.*" Journal of Environmental Engineering. (In Press)
3. **Duranceau**, S.J., P.G. Biscardi[ǂ], D.K. Barnhill[¥]. "*Screening the Toxicity of Phosphorous-removal Adsorbents Using a Bioluminescence Inhibition Test*." Environmental Toxicology. DOI: 10.1002/tox.22062. October 4. (2014)
4. Tharamapalan[ǂ], J. and S.J. **Duranceau**. "*Canary in a Membrane-A Sentinel Against Membrane Scaling*." J. American Water Works Association. 106 (2): E66-E75 (2014).
5. Heider, E.C.; K. Trieu; V.M. Diaz; K.Y. Chumbimuni-Torres; A.D. Campiglia; S.J. **Duranceau**. *An Indium Tin Oxide Electrode Modified with Gold Nanorods for Use in Potenital-Controlled Surface Plasmon Resonance Studies*. Microchimica Acta. 180: 1013-1020 (2013).
6. Fang[ǂ], Y. and S.J. **Duranceau**. "*Study of the Effect of Surface Morphology on Reverse Osmosis and Nanofiltration Membrane Fouling Behavior*." Membranes. 3: 196-225 (2013).
7. Fang[ǂ], Y. and S.J. **Duranceau**. "*Comparison of Non-Homogeneous and Homogeneous Mass Transfer in Reverse Osmosis Membrane Processes*." Desalination and Water Treatment. 51 (34-36): 6444-6458 (2013).
8. Fang[ǂ], Y. and S.J. **Duranceau**. "*Modeling Mass Transfer Using Surface Morphology in Full-Scale Reverse Osmosis Membrane Processes.*" Desalination & Water Treatment. 51 (34-36): 6459-6471 (2013).
9. Boyd[ǂ], C. and S.J. **Duranceau**. "*Membrane Filtration System Fouling Evaluation Using A Novel Transmembrane Pressure (TMP) Balance Approach*." J. Membrane Science. 446: 456-464 (2013).
10. Tharamapalan, J.[ǂ]; C.C. Boyd[ǂ]; and S.J. **Duranceau**. "*3-Step Approach Towards Evaluation and*

Elimination of Acid Use in Pre-Treatment for a Brackish Water Reverse Osmosis Process." Journal of Environmental Management. 124: 115-120 (2013).

11. Boyd[†], C.; S.J. **Duranceau**; and J. Tharamapalan[†]. "*Impact of Carboxylic Acid Ultrafiltration Recycle Streams on Coagulation*." Journal of Water Supply: Research and Technology.-AQUA. doi: 10.2166/aqua.2012.005 (2012).

12. **Duranceau**, S.J.; R.J. Wilder[†]; and S. Douglas[†]. "*Guidance and Recommendations for Post-Treatment of Desalted Water*." J. American Water Works Association. Doi:10.2166/wpt.2012.041. Vol. 104, No. 9. September; E510-E520 (2012).

13. Boyd[†], C. and S.J. **Duranceau**. "*Assessing and Maintaining Membrane Performance in a Post-Sedimentation Ultrafiltration Process*." Water Practice and Treatment. 7 (2): 1-8 (2012).

14. **Duranceau**, S.J., H.R. Palmer[¥] and R.J. Wilder[†]. "*Bottled Water Storage Location and Its Impact on Bacteriological Quality.*" International Journal of Environmental Health Research. doi:10.1080/09603123.2012.677999 on-line May 22, 2012; 22(6):543-59 (2012).

15. **Duranceau,** S.J. and J.O. Faborode[†]. "*Predictive Modeling of Sulfide Removal in Tray Aerators*." Journal American Water Works Association. Vol. 104, No. 2; E127-E135 (2012).

16. **Duranceau**, S.J.; R.J. Pfeiffer-Wilder[¥]; and S. Douglas[†]. "*A Survey of Desalted Permeate Post-Treatment Strategies*." Desalination and Water Treatment. Vol. 37; 185-199 (2012).

17. **Duranceau**, S.J.; W.J. Johnson[¥] and R.J. Pfeiffer-Wilder[¥]. "*Test Method for Studying the Effects of Stray Current on the Integrity of Continuous & Discontinuous Rebars.*" Experimental Techniques. Vol. 135; 53-58 (2011).

18. Lintereur[†], P.A.; S.J. **Duranceau**; and J.S. Taylor. "*Sodium Silicate Impacts on Copper Release in a Potable Water Comprised of Ground, Surface and Desalted Sea Water Supplies*." Desalination and Water Treatment. Vol. 30; 348-360 (2011).

19. **Duranceau,** S.J. and V.M. Trupiano[†]. "*Evaluation of Oxidized Media Filtration for Removing Sulfides from Groundwater.*" Desalination and Water Treatment. Vol. 28; 366-377 (2011).

20. **Duranceau,** S.J. "*Determination of Total Iodide in Seawater Permeate*." Desalination. 261; 251-254 (2010).

21. Lintereur[†], P.A.; S.J. **Duranceau**; J.S. Taylor. "*Sodium Silicate Impacts on Lead Release in a Blended Potable Water Distribution System*" Desalination and Water Treatment. Vol. 16, 427-438 (2010).

22. Stone[†], E.D., S.J. **Duranceau**, P. Lintereur[†] and J.S. Taylor. *"Effects of Orthophosphate Corrosion Inhibitor on Lead in Blended Water Quality Environments*." Desalination and Water Treatment. Vol. 13, 348-355 (2010)

23. Alshehri[†], A.A., S.J. **Duranceau**, J.S. Taylor and E.D. Stone[†]. "*Investigating Iron Release in Distribution Systems with Blend Variations of Source Waters and Phosphate Inhibitors*." Desalination and Water Treatment. Vol. 8, 211-220 (2009).

24. Stone, E.D.[†], S.J. **Duranceau,** J.S. Taylor. "*Effect of Orthophosphate Corrosion Inhibitor on Copper in Blended Water Quality Environment*." Desalination and Water Treatment. Vol. 8, 154-162 (2009).

25. **Duranceau**, S.J. "*Modeling the Permeate Transient Response to Perturbations from Steady-State in a Nanofiltration Process*." Desalination and Water Treatment. Vol. 1: 7-16 (2009).

26. Gilreath, J.P., B.M. Santos and S.J. **Duranceau**. *Seasonal Variation of Paraquat Photodegradation Rate on Polyethylene Mulch.* Weed Technology. Vol. 20:315-318 (2006).

27. Lovins, W.A.; S.J. **Duranceau**, R.M. Gonzalez and J.S. Taylor. "*Optimized Coagulation Assessment for a Highly Organic Surface Water Supply.*" J. Amer. Water Works Assoc. 95(10): 99-108 (2003).

28. **Duranceau,** S.J., W.A. Lovins, J.V. Foster, D. Taylor, J. Morton and C. Morton. "*Scale Inhibitor and Recovery Optimization for a Brackish Water Supply: Pilot Test Results and Full-Scale Experiences*." Water Science and Technology: Water Supply. 3(5): 139-145 (2003).

29. Bell, G.E.C. and S.J. **Duranceau**. "*Effects of Electrical Grounding and Electrical Properties on Water Quality*." J. American Water Works Association. 94(5), 113-125 (2002).

30. Townley, D. W., S.J. **Duranceau**, and D. F. Wilson. "*On-Line Electrochemical Noise Monitoring in Potable Water Systems*." Corrosion 2002, Paper 02328. Houston, TX: NACE International (2002).

31. **Duranceau,** S.J. "*Dawning of a New Age*." J. American Water Works Association, 93(4):122-24 (2001).

32. Townley, D. and **S.J. Duranceau**. "*Instrumentation Considerations for Electrochemical Noise Corrosion Monitoring in the Field*." Corrosion 2001, Paper 01287. Houston, TX: NACE International, Inc. (2001).

33. **Duranceau**, S.J. "*Membrane Replacement in Desalting Facilities*." Desalination, L'Aquila, Italy, Vol. 132, pp. 243-248 (2000).

34. **Duranceau**, S.J. "*The Future of Membranes*." J. American Water Works Association, 92(2), 70 (2000).

35. **Duranceau**, S.J. J. Foster, J. Poole. "*Wet-Pipe Fire Sprinkler Systems and Drinking Water Quality*." J. of the American Water Works Association, 91 (7), 78-86 (1999).

36. **Duranceau**, S.J., R.K. Anderson, R.D. Teegarden. "*Comparison of Mineral Acid Pretreatments for Hydrogen Sulfide Removal in Packed Towers*." J. American Water Works Association, 91 (5), 85-96 (1999).

37. **Duranceau**, S.J., M.J. Schiff, G.E.C. Bell. "*Electrical Grounding, Pipe Integrity, and Shock Hazard*." J. American Water Works Association. 90(7), 40-52 (1998).

38. Bell, G.E.C., M.J. Schiff and **S.J. Duranceau**. "*Review of the Effects of Electrical Grounding on Water Piping*." Corrosion 95, Paper 603. Houston, TX: NACE International, Inc. (1995)

39. Taylor, J.S., J.A.M.H. Hofman, S.J. **Duranceau**, J.C. Kruithof, and J.C. Schippers. "*Simplified Modeling of Diffusion Controlled Membrane Systems*." AQUA-Journal Water Supply and Research, 43(5) 238-245 (1994).

40. **Duranceau**, S.J., J.S. Taylor, and L.A. Mulford. "*SOC Removal in a Membrane Softening Process*." J. American Water Works Association, 84 (1), 68-78 (1992).

41. Gupton, J.T., D.A. Krolikowski[†], R.H. Yu[†], K.J. Barr[†], and S.J. **Duranceau**. "*New Reactions of Quaternary Ammonium Salts Derived from Vinamidinium Salt Reduction Products and a Reassignment of Structure*." Synthetic Communications. 22 (7), 1067-1076 (1992).

42. Taylor, J.S., L.A. Mulford, S.J. **Duranceau**, W.M. Barrett[†]. "*Cost and Performance of a Membrane Pilot Plant*." J. American Water Works Association. 81 (11), 52-60 (1990).

43. Gupton, J.T., S.J. **Duranceau,** J.F. Miller[†], M.L. Kosiba. "*The reaction of alpha-Methylstyrene Analogs & Related Compounds with Sodium Perborate in Acetic Acid*." Synthetic Communications. 18 (9), 937-942 (1988).

44. Gilreath, J.P., and S.J. **Duranceau**. "*Photodegradation of Paraquat Applied to Polyethylene Film Mulch*." HortScience. 21 (5), 1145-1148 (1986).

45. **Duranceau**, S.J., et. al. "*It's a Sinh, Problem No. 158*." The Two-Year College Mathematics Journal. Washington, D.C.: The Mathematical Association of America. 12(3), 215-216 (1981).

Non-Refereed Journal Publications

1. **Duranceau**, S.J. "*Treatment of Organic-Laden Surface Water for Total Organic Carbon*." Florida Water Resources Journal. 66(11); 46-52 (2014).

2. Yonge[†], D.T. and S.J. **Duranceau**. "*Comparing Aluminum and Iron Coagulants to Remove Organic Carbon, Color, and Turbidity from a Florida Slough*." Florida Water Resources Journal. 65 (11); 4-9 (2013).

3. Boyd[†], C. and S.J. **Duranceau**. "*Dynamic Operation of Ultrafiltration Membranes for Potable Water Production*." Florida Water Resources Journal. 65(11); 38-43 (2013).

4. **Duranceau**, S.J. and J. Tharamapalan[†]. "*Optimizing a Community's Fresh and Brackish Water Supplies with an Aeration, Ion-Exchange and Reverse Osmosis Treatment Portfolio*." Florida Water Resources Journal. 65(9); 24-30 (2013).

5. Roque[†], J.C, J. Tharamapalan[†] and SJ. **Duranceau**. "*The Canary in a Membrane Process: An Alternative for Scale Monitoring*." Florida Water Resources Journal. 64(11); 10-16 (2012).

6. Wilder[†], R.J. and S.J. **Duranceau**. "*Evaluating In-Plant Infrastructure Corrosion After Replacing Lime Softening With Nanofiltration and Blending with Reverse Osmosis and Ion-Exchange Process Water*." Florida Water Resources Journal. 64(10); 42-55 (2012).

7. **Duranceau, S.J.** *"Emergence of Forward Osmosis and Pressure-Retarded Osmotic Processes for Drinking Water Treatment."* Florida Water Resources Journal. 64(7); 32-36 (2012).

8. Boyd[†], C.C., S.J. **Duranceau,** J. Nemeth-Harn, and J. Harn. "*Pilot Testing of a New Ultrafiltration Membrane For Treatment of Manatee County's Surface Water Supply*." Florida Water Resources Journal. 63(11); 12-20 (2011).

9. **Duranceau,** S.J., V.M. Trupiano[†], M. Lowenstine, S. Whidden, and J. Hopp. "*Innovative Hydrogen Sulfide Treatment Methods: Moving Beyond Packed Tower Aeration*." Florida Water Resources Journal. 62(7); 4-14 (2010).

10. **Duranceau**, S.J. "*Desalination Post-Treatment Considerations*." Florida Water Resources Journal. 61(11): 29-33 (2009).

11. **Duranceau**, S.J., W.A. Lovins and R.M. Powell. "*Chloramines and Coliform: Should You Be Concerned?*" Florida Water Resources Journal. 58(7): 52-57 (2006).

12. Lovins, W.A.; S.J. **Duranceau**, R. Powell, J. Voorhees. "*Experiences with Blending Multiple Source Waters into a Common Distribution System."* Florida Water Resources Journal. 57(3): 31-35 (2005).

13. **Duranceau**, S.J. and L.R. Henthorne. "*Membrane Pretreatment for Seawater Reverse Osmosis Desalination*." Florida Water Resources Journal. 56(11): 33-37 (2004).

14. Lovins, W.A.; S.J. **Duranceau**, T. King and S. Medeiros. "*Trumping Hydrogen Sulfide*." Water Environment & Technology. 16(3): 37-41 (2004)

15. Lovins, W.A.; S.J. **Duranceau**, R.M. Gonzalez and J.S. Taylor. "*Optimization of the Peace River/Manasota Conventional Coagulation Water Supply Facility.*" Florida Water Resources Journal. 54(11), 20-27 (2002).

16. **Duranceau,** S.J., et. al. "*Comparison of Hollow-Fiber and Spiral-Wound Technologies on a Brackish Ground Water."* Florida Water Resources Journal, 52 (1), 26-33 (2000).

17. **Duranceau,** S.J., et. al. "*Interstage Turbine: Innovative Use for Energy Recovery and Enhanced*

Water Production at a Membrane Desalting Facility." International Desalination & Water Reuse Quarterly, 8(4), 34-40 (1999).

18. **Duranceau,** S.J., et. al. "*Grounding Can Affect Water Quality."* Florida Water Resources Journal, 49(2), 34-46 (1997).
19. **Duranceau**, S.J. "*Mathematics for Membrane Processes*." Florida Water Resources Journal. 46(9), 26-28 (1994).
20. **Duranceau**, S.J., and E. Melear. "*Balancing Multiple Water Quality Requirements of the Safe Drinking Water Act*." Florida Water Resources Journal. 46(7), 22-25 (1994).

Refereed Publications in Conference Proceedings – National and International

1. **Duranceau**, S.J., R.J. Wilder and P.A. Jurzcak. "*Post Treatment Challenges of Replacing Lime Softening with Nanofiltration*." 2014 Membrane Technology Conference and Exposition, American Water Works Association and American Membrane Technology Association. Las Vegas, NV (March 10-March 14, 2014).
2. Boyd, C. and S.J. **Duranceau**. "*Utilizing a Novel TMP Balance Approach to Analyze Process Data and Investigate Ultrafiltration Membrane Fouling During Surface Water Treatment*." 2014 Membrane Technology Conference and Exposition, American Water Works Association and American Membrane Technology Association. Las Vegas, NV (March 10-March 14, 2014).
3. **Duranceau**, S.J. and C.C. Boyd[†]. "*Applying Green Chemistry to Resolve Membrane Backwash Recycle Stream Interferences with Conventional Coagulation Processes and the Replacement of Traditional Membrane Cleaning Solutions*." Proceedings of the American Water Works Association and the American Membrane Technology Association Membrane Technology Conference and Exposition. Glendale, AZ (February 27 – March 1, 2012)
4. **Duranceau**, S.J. "*Integrating Ultrafiltration within Conventional Coagulation Facilities and the Unintended Consequence of Membrane Maintenance Chemical Entering Conventional Recycle Streams*" Proceedings of the 2011 American Membrane Technology Association/Southeast Desalting Association 2011 Joint Conference and Exposition, "Membranes are the Solution." Miami Beach, FL (July 17-21, 2011). **Received Best Professional Paper Award**.
5. Boyd[†], C.; **Duranceau**, S.J. "*Post-Sedimentation Ultrafiltration Membrane Performance for a Florida Surface Water Supply."* Proceedings of the 2011 American Membrane Technology Association/Southeast Desalting Association 2011 Joint Conference and Exposition, "Membranes are the Solution." Miami Beach, FL (July 17-21, 2011). **Received Best Student Paper Award**.
6. Tharamapalan[†], J. and S.J. **Duranceau**. "*Demonstration of Sulfuric Acid Elimination in a Brackish Water Reverse Osmosis Membrane Process.*" Proceedings of the 2011 American Membrane Technology Association/Southeast Desalting Association 2011 Joint Conference and Exposition, "Membranes are the Solution." Miami Beach, FL (July 17-21, 2011).
7. S.J. **Duranceau**. "*Determination of Total Iodide in Seawater Permeate*." Proceedings of 2010 American Membrane Technology Conference and Exposition. San Diego, CA (July 12-15, 2010).
8. Lovins, W.A.; **Duranceau,** S.J.; Weiss, R; Vargas, J. "*Chemical Pretreatment Optimization for NF and RO Processes: Pilot and Full-Scale Experiences*." 2008 Joint Conference and Exposition Membrane Week. American Membrane Technology Association and Southeast Desalting Association: Naples, Florida (July 14-17, 2008).
9. **Duranceau,** S.J. "*Considerations for Blending Permeate into Water Distribution Systems*." 2008 Joint American Membrane Technology Assoc. and Southeast Desalting Association Conference and Exposition Membrane Week. Naples Grand Resort and Club, Naples, Florida (July 13-16, 2008).

10. **Duranceau**, S.J. "*Industry Advancements: Membranes, Pressure Vessels and Floating Seawater Desalting Facilities*." 2008 Joint American Membrane Technology Association and Southeast Desalting Association Conference and Exposition Membrane Week. Naples Grand Resort and Club, Naples, Florida (July 13-16, 2008).

11. **Duranceau**, S.J. "*Use of Membrane Forensics for Solving Operational Problems in Desalting Facilities*." Proceedings of the International Desalination Association World Congress on Desalination and Water Reuse – Desalination: Quenching a Thirst. Palacio de Congresos de Maspalomas, Gran Canaria, Spain (October 21-26, 2007).

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2. Cumming[†], A. and S.J. **Duranceau**. "*Assessing Pre-Treatment Alternatives to Address Water Quality Impacts on Coagulation-Ultrafiltration Process Performance*." Proceedings of the American Water Works Association Annual Conference and Exhibition. Boston, MA (June 9-12, 2014).
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5. **Duranceau,** S.J. and J. Tharamapalan[†]. "*Optimizing a Community's Fresh and Brackish Water Supplies with an Aeration, Ion-Exchange and Reverse Osmosis Treatment Portfolio*." 2013 Professional Program. Proceedings of the American Water Works Association Annual Conference and Exhibition. Denver, CO (June 9-13, 2013).
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16. **Duranceau, S.J.** "*Membrane Autopsies*." American Membrane Technology Association Technology Transfer Workshop. (December 12-13, 2007); Honolulu, Hawaii.
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1. Cumming[†], A. and S.J. **Duranceau**. "*Bench-scale Assessment of Pre-versus Post Ozonation for Controlling Disinfection By-Products.*". Proceedings of Florida Section AWWA Fall Conference Reliability in a Changing Environment. Orlando, FL (Nov. 30 – Dec. 4, 2014).

2. **Duranceau**, S.J. and P.G. Biscardi[†]. "*Potable Water Aquifer Storage and Recovery Adsorptive Media Isotherm Testing for Arsenic Removal Capacity*." Proceedings of Florida Section AWWA Fall Conference Reliability in a Changing Environment. Orlando, FL (Nov. 30 – Dec. 4, 2014).

3. P.G. Biscardi[†] and S.J. **Duranceau**. "*Optimization of Conventional Surface Water Treatment for Hollow Fiber Ultrafiltration*." Proceedings of Florida Section AWWA Fall Conference Reliability in a Changing Environment. Orlando, FL (Nov. 30 – Dec. 4, 2014). **Received Best Paper Award**.

4. **Duranceau,** S.J. and Y. Fang[†]. "*Effect of Surface Morphology on Mass Transfer and Fouling Behavior of Reverse Osmosis Membrane Processes*." Lockheed Martin 2014 Fellows Conference. Rosen Shingle Creek Orlando, FL (September 8-10, 2014).

5. **Duranceau,** S.J. "*Treatment of Organic-Laden Surface Waters*." 2014 Florida Water Resources Conference Proceedings. Sustainability: Balancing of Supply and Demand. Disney Coronado Hotel and Resort, Buena Vista, FL (April 6-9, 2014).

6. **Duranceau**, S.J. and Y. Fang[†]. "*Effect of Surface Morphology on Mass Transfer and Fouling Behavior of Reverse Osmosis Membrane Processes*." 2013 Florida Section American Water Works Association Fall Conference: For a Better Water Future Proceedings. Omni Orlando Resort at Champions Gate: Orlando, FL. (December 1-December 5, 2013).

7. Yonge[†], D., P. Biscardi[†] and S.J. **Duranceau. "***Comparing Anion Exchange Resins for Sulfate and DBP Precursor Removal from Aerated Groundwater Supplies*." 2013 Florida Section American Water Works Association Fall Conference: For a Better Water Future Proceedings. Omni Orlando Resort at Champions Gate: Orlando, FL. (December 1-December 5, 2013).

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10. Boyd[†]. C, and S.J. **Duranceau**. "*Dynamic Operation of Ultrafiltration Membranes for Potable Water Production*." 2013 Florida Water Resources Water Visions Conference Proceedings. Orlando, FL (April 28-May1, 2013).

11. Cumming[†], A and S.J. **Duranceau**. "*Controlling Disinfection By-Products Originating from a Volcanic Surface Water Supply*." 2013 Florida Water Resources Water Visions Conference Proceedings. Orlando, FL (April 28-May1, 2013).

12. Jeffery[†], S. and S.J. **Duranceau**. "*Assessing Disinfection and Corrosion of Full-Scale Reverse Osmosis and Nanofiltration Permeate Blends*." 2013 Florida Water Resources Water Visions Conference Proceedings. Orlando, FL (April 28-May1, 2013).

13. **Duranceau**, S.J.; R.J. Wilder[†], and H. Palmer-Emerson[†]. "*Impact of Bottled Water Storage Duration and Location on Bacteriological Quality*." 2013 Florida Water Resources Water Visions Conference Proceedings. Orlando, FL (April 28-May1, 2013).

14. **Duranceau,** S.J. and J. Tharamapalan[†]. "*Balancing Fresh and Brackish Water Supplies with Aeration, Ion-Exchange and Reverse Osmosis Processes*." Proceedings of Florida Section American Water Works Association Fall Conference Managing Responsibility: It's All One Water. Orlando, FL (November 25 – November 29, 2012).

15. Yonge[†], D. and S.J. **Duranceau**. "*A Comparison of Aluminum and Iron Coagulants*." Proceedings of Florida Section American Water Works Association Fall Conference Managing Responsibility: It's All One Water. Orlando, FL (November 25 – November 29, 2012).

16. Watson, I.C. and S.J. **Duranceau**. "*Split-Feed NanoFiltration – Jupiter Saves Energy*." Proceedings of Florida Section American Water Works Association Fall Conference Managing Responsibility: It's All One Water. Orlando, FL (November 25 – November 29, 2012).

17. **Duranceau,** S.J. "*Emerging Issues in Water Distribution Systems*." Florida Rural Water Assoc. 2012 Annual Conference. Daytona Beach Convention Center, Daytona Beach, FL (Aug. 13-16, 2012).

18. **Duranceau**, S.J. "*Emerging Issues Related to Premise Plumbing.*" Emerging Issues Facing Potable Distribution Systems Workshop. 87th Annual Florida Water Resources Conference Proceedings. Orlando, FL (April 28 - May 2, 2012).

19. Roque[†], J. and S.J. **Duranceau**. "*The Canary in a Membrane Process: An Alternative for Scale Monitoring*." 87th Annual Florida Water Resources Conference Proceedings. Orlando, FL (April 28 - May 2, 2012).

20. R.J. Wilder[†] and S.J. **Duranceau**. "*Evaluating In-Plant Infrastructure Corrosion after Replacing Lime Softening with Nanofiltration and Blending with Reverse Osmosis and Ion-Exchange Process Water*." Proceedings of Florida Section AWWA Fall Conference Protecting Florida's Water Infrastructure. Orlando, FL (Nov. 27 – Dec. 1, 2011). **Received Best Paper Award**.

21. **Duranceau**, S.J. "*The Emergence of Forward Osmosis and Pressure Retarded Osmotic Processes for Drinking Water Treatment*." Proceedings of Florida Section American Water Works Association Fall Conference Protecting Florida's Water Infrastructure. Orlando, FL (Nov. 27 – Dec. 1, 2011).

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23. **Duranceau,** S.J., C. Boyd[†], J. Nemeth-Harn, J. Harn. "*Beta Testing of a New Ultrafiltration Membrane for Treatment of Manatee County's Surface Water Supply*." Proceedings of Florida Section American Water Works Association Fall Conference Implementing our Future. Orlando, FL (Nov. 28 – Dec. 2, 2010). **Received Best Paper Award**.

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26. **Duranceau**, S.J. "*Desalination Post-Treatment Considerations*." Florida Section American Water Works Association Fall 2008 Conference, Renaissance Orlando Resort at Seaworld, Orlando, FL (November 30 – December 3, 2008). **Received Best Paper Award**.

27. **Duranceau**, S.J., Trupiano, V., Steven Whidden, S., Lowenstine, M. and Hopp, J. "*Innovative Hydrogen Sulfide Treatment Methods: Moving Beyond Packed Tower Aeration*." Florida Section AWWA Fall 2009 Conference, Renaissance Orlando Resort at SeaWorld, Orlando, FL (November 30 – December 2, 2009). **Received Best Paper Award**.

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Florida." Proceedings of the 2005 Florida Section AWWA 2005 Conference. Orlando, FL: AWWA (November 27 – December 1, 2005).

38. King, T., V. Ahkimie, S.J. **Duranceau**, S.J. and D. Plavcan. "*Oviedo's New Water Treatment Facilities: Designed for the Future and Built for Success*." Proceedings of the 2005 Florida Section AWWA 2005 Conference. Orlando, FL: AWWA (November 27 – December 1, 2005).

39. **Duranceau,** S.J. "*Chloramine and Internal Corrosion: Is There A Connection?*" Proceedings of the 80th Annual Florida Water Resources Conference. Jacksonville, FL: FS/AWWA, FWEA, FWPCOA (April 24-27, 2005).

40. Lovins, W.A., S.J. **Duranceau,** R. Powell and J.R. Voorhees. "*Blending Multiple Source Waters in a Common Water Distribution System*." Proceedings of the Florida Section AWWA 2004 Annual Conference. Orlando, FL (November 14-18, 2004).

41. **Duranceau,** S.J. "*Effects of Electrical Grounding on Pipe Integrity, Shock Hazard and Water Quality*." Proceedings of the Florida Section American Water Works Association 2004 Annual Conference. Orlando, FL (Nov. 14-18, 2004).

42. **Duranceau,** S.J. "*Membranes and Biofouling: A Slimy Situation.*" Proceedings of the 79th Annual Florida Water Resources Conference. Kissimmee, FL: FS/AWWA, FWEA and FWPCOA. Kissimmee, FL (April 4-7, 2004).

43. **Duranceau,** S.J. "*Membrane Pretreatment for Seawater Reverse Osmosis Desalination*." Proceedings of the 79th Annual Florida Water Resources Conference. Kissimmee, FL: FS/AWWA, FWEA and FWPCOA. Kissimmee, FL (April 4-7, 2004).

44. **Duranceau,** S.J. and L.R. Henthorne. "*Membrane Pretreatment for Seawater RO Desalination*." 2003 Florida Section AWWA Conference Proc. Orlando, FL: FS/AWWA. (Nov. 2003).

45. **Duranceau,** S.J., et. al. "*Process Conversion of the City of Sarasota's Reverse Osmosis Water Treatment Plant*." Proceedings of the 78th Annual Florida Water Resources Conference. Tampa, FL: FS/AWWA, FWEA and FWPCOA. (May 5-8, 2003).

46. **Duranceau,** S.J. "*Al Qaeda and Your Water*." 2002 Florida Section American Water Works Association Conference Proceedings. Palm Harbor, FL (November 2002).

47. **Duranceau,** S.J. "*Hyperfiltration – Florida's Most Successful Drought Management Technique*." 2001 Florida Section American Water Works Association Conference Proceedings. Kissimmee, FL (November 2001).

48. **Duranceau,** S.J. et. al. "*Use of Electrochemical Noise for Corrosion Control Monitoring*." Proceedings of the Florida Section AWWA 2000 Conference, Kissimmee, FL (Nov. 2000).

49. **Duranceau,** S.J. "*Use of Electrochemical Noise for Corrosion Control Monitoring*." Proceedings of the Florida Section AWWA 2000 Conference, Kissimmee, FL (Nov. 2000).

50. Manning, J.A.; S.J. **Duranceau**; et. al. "*Integration of Lime Softening and Ultrafiltration – A Powerful Water Quality Combination*." Proceedings of the Florida Section AWWA 2000 Conference, Kissimmee, FL (Nov. 2000).

51. Foster, J.; S.J. **Duranceau**; L. Hayes and C. Sammons. "*Consumer Confidence Reports in Central Florida–A Case Study*." Proceedings of the Florida Section American Water Works Association 2000 Conference, Kissimmee, FL (Nov. 2000).

52. **Duranceau,** S.J. et. al. "*Membrane Replacement at the City of Sarasota's Hollow-Fiber Desalting Facility*." Proceedings of the 75th Florida Water Resources Conference, Tampa, FL (April 2000).

53. **Duranceau,** S.J., et. al. "*Comparison of Hollow-Fiber and Spiral-Wound Ultra-Low Pressure*

Membrane Technologies on a Brackish Ground Water." Proceedings of the 74th Florida Water Resources Conference. Tallahassee, FL: April 24- 27, 515-525 (1999).

54. **Duranceau,** S.J., J. Foster, and C. Anderson. "*ICR Pilot Plant Testing for the Deltona Water System*." Proceedings of the Florida Section AWWA 1998 Annual Conference: ICR Water Quality Program. Orlando, FL: Nov. 8-11 (1998).

55. Lovins, W.A., J.S. Taylor, S.J. **Duranceau**, and R.M. Gonzalez. "*Bench-scale Treatment Alternatives for DBP Precursor Removal in a Highly Organic Surface Water Supply*." Florida Section AWWA 1998 Annual Conf.: ICR WQ Program Proc. Orlando, FL: Nov. 8-11 (1998).

56. **Duranceau,** S.J. et al. "*Innovative Use of an Interstage Turbine for Energy Recovery and Enhanced Water Production at a Membrane Desalting Facility*." Proceedings of the 73rd Florida Water Resources Conference. Ft. Lauderdale, FL: April 5 – 8, 59-66 (1998).

57. Gonzalez, R.M.; S.J. **Duranceau,** P.J. Lehman; S.S. Stone. "*Enhanced Coagulation and TOC Removal for a Florida Surface Water Supply*." Proc. of the 73rd Florida Water Resources Conf. Ft. Lauderdale, FL: April 5 – 8, 13-20 (1998).

58. Lovins, W.A.; S.J. **Duranceau,** S.J. and J.S. Taylor. "*Use of Factorial Design of Experiments for Process Optimization*." Proceedings of the 73rd Florida Water Resources Conference. Ft. Lauderdale, FL: April 5 – 8, 59-66 (1998).

59. **Duranceau,** S.J., J.V. Foster, J. Poole. "*Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality: Inorganic, Organic and Microbiological Findings*." Proceedings of the 72nd Annual Florida Water Resources Conference. Orlando, FL: April 20-23 (1997).

60. **Duranceau,** S.J. et al. "*Grounding Can Affect Water Quality*." Proc. 71st Florida Water Resources Conf. Ft Myers, FL: May 5-8, 357-362 (1996).

61. **Duranceau,** S.J., J. Foster, and J. Poole. "*Impacts of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality-Summary of Water Quality Findings*." Proceedings of AWWA 1997 Water Quality Technology Conference. Denver, CO: November 9-12 (1997).

62. Melear, E.L, S.J. **Duranceau**, D. Newnham, J. Robards, R.D. Teegarden. "*Implementing Lead and Copper Corrosion Control: Demonstration Test Programs for Three Central Florida Utilities*." Proc. of the 70th Annual Florida Water Resources Conf. Jacksonville, FL; April 2-5, 172-176 (1995).

63. Richardson, T., S.J. **Duranceau**, and D. Laliberte. "*Full-Scale Implementation of a Carbonic Acid Aeration System for Hydrogen Sulfide Removal*." Proceedings of the 70th Annual Florida Water Resources Conference. Jacksonville, FL; April 2-5, 62-72 (1995).

64. Magdziasz, J.K., and S.J. **Duranceau.** "*Effects of Potable Water Treatment Plant Residuals on Advanced Wastewater Treatment Operations: One Utilities Experience*." Proceedings of the 69th Annual Florida Water Resources Conference. Tampa, FL: 122-127 (Aug. 1994).

65. **Duranceau,** S.J. et. al. "*Comparison of Carbon Dioxide and Sulfuric Acid Pretreatment of Packed Towers for Hydrogen Sulfide Removal from Groundwater*." Proceedings of the 69th Annual Florida Water Resources Conference. Tampa, FL: August, 164-168 (1994).

66. **Duranceau,** S.J. and E.L. Melear. "*Balancing Multiple Water Quality Requirements of the Safe Drinking Water Act*." Proceedings of the 68th Annual Florida Water Resources Conference. Orlando, FL: Nov. 14-17, 37-41 (1993).

Other Paper Publications – Trade Magazines and Industry Documents

1. **Duranceau**, S.J. "*Understanding pH*. Recovery Zone. Stuart, FL: Southeast Desalting Association, Spring, 2014.
2. **Duranceau**, S.J. "*Maximize Post-Treatment to Stabilize Desalinated Water*." Opflow. Feb. 2012.
3. **Duranceau**, S.J. and C.C. Boyd†. "*Post-Sedimentation Ultrafiltration Membrane Performance for a Florida Water Supply*." Solutions. Stuart, FL: AMTA (Winter 2012).
4. **Duranceau**, S.J. and C.C. Boyd. "*Integrating Ultrafiltration within Conventional Coagulation Facilities and the Unintended Consequence of Membrane Maintenance Chemicals Entering Conventional Recycle Streams*." Solutions. Stuart, FL: Am. Membrane Tech. Assoc. (Fall 2011).
5. **Duranceau,** S.J. "*Membrane Technologies Address Emerging Contaminants*." Solutions. Stuart, FL: American Membrane Technology Association (Summer 2011).
6. **Duranceau,** S.J. Fact Sheet: Home Water Treatment Units: What Ocoee Customers Need to Know; A Fact Sheet that puts Home Water Treatment in Perspective (Winter 2010).
7. **Duranceau,** S.J. "*Optimum Permeate Blending*." Membrane Technology Solutions for Water Treatment. Supplement to the Water and Wastes Digest Summer Edition; p.16-18 (2010).
8. **Duranceau**, S.J. "*Considerations for Blending Permeate into Water Distribution Systems*." Solutions. Stuart, FL: American Membrane Technology Association (Fall 2009).
9. Whiting, D.D., et. al. with S.J. **Duranceau** (technical advisory committee). Protocols for Determining Major-Seawater-Ion Toxicity in Membrane Technology Water Treatment Concentrate. Tallahassee, FL: Florida DEP Bureau of Laboratories, December 28, 1995 (1995).

Keynote Presentations and Addresses (Invited)

- 2014. Florida Neighborhoods Conference Orange County, Florida. "*Strategic Environmental Engineering Infrastructure Plan for the Bithlo Rural Community*." Loews Royal Pacific Resort at Universal Orlando 6300 Hollywood Way, Orlando Florida 32819. July 11, 2014.
- 2010. American Membrane Technology Association's Membrane Treatment in the Caribbean Technology Transfer Workshop, InterContinental Resort and Hotel, San Juan, Puerto Rico, January 19-21, 2010. Presented "*The American Membrane Technology Association's Leadership Role in the Application of Membrane Technology in North America."* Other keynote presenters included Humphrey Gouverneur, Ir., Caribbean Desalination Association President, Cyprian Gibson, Caribbean Water and Wastewater Association, and Warner Palermo, Puerto Rico Water and Environment Association President.
- 2006. Innovation in Water Technologies for Preparedness, Security and Longevity, Honolulu, Hawaii, May 10-12, 2006, Hawaii Section AWWA. Presented a keynote address in the Closing General Session entitled "*Upcountry Maui Corrosion Control: Scratching out a Solution.*"
- 2000. Membrane Technology Conference, Royal Society of Chemistry (Cambridge, UK) and European Desalination Society. Location: Lancaster University; Lancaster, England, March 26-29, 2000. Keynote speaker for first United Kingdom international conference on membranes. Presented "*Membrane Case Studies: Past, Present Future*" to members of the Royal Society of Chemistry and the European Desalination Society.
- 1998. Conference on Membranes in Drinking and Industrial Water Production, Amsterdam, Netherlands, September 21-24, 1998. Keynote speaker for the international conference on membranes in conjunction with AquaTech98. Presented "*The Role of Membranes in Drinking Water Production*

in the United States" to members of the International Water Supply Association, the European Desalting Association, the Japan Water Works Association, and the American Water Works Association.

Presentations

1. "Spray Aeration as a Trihalomethane Control Measure." Hawaii Water Works Association 53rd Annual Conference: Knowledge Collaboration & Learning for Water Management, Kauai Marriott Resort, Lihue, Kauai, Hawaii (October 15-17, 2014).
2. "Membrane Filtration Processes" and "Distribution System Water Quality." Fundamentals of Drinking Water Treatment. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, WI (June 23-25, 2014).
3. "Effect of Surface Morphology on Mass Transfer and Fouling Behavior of RO Membrane Processes." Proceedings of the American Water Works Association Annual Conference and Exhibition. Boston, MA (June 9-12, 2014).
4. "Integration of Air Stripping in Storage Tanks for Controlling Trihalomethanes." 2014 Hawaii Water Conference, Hawaii Section AWWA and Hawaii Water Environment Association. Uniting Hawaii's Water Resources. Hawaii Convention Center, Honolulu, HI (May 6-May 9, 2014).
5. "Post-Treatment Challenges of Replacing Lime Softening with Nanofiltration." 2014 Membrane Technology Conference and Exposition, American Water Works Association and American Membrane Technology Association. Las Vegas, NV (March 10-March 14, 2014).
6. "Treatment of Organic Laden Surface Water." 2014 Florida Water Resources Conference: Water Balancing of Supply and Demand Conference, Orlando, FL (April 6-April 9, 2014).
7. "Effect of Surface Morphology on Mass Transfer and Fouling Behavior of Reverse Osmosis Membrane Processes." 2013 Florida Section AWWA Fall Conference. Omni Orlando Resort at Champions Gate: Orlando, FL. (December 1-December 5, 2013).
8. "Treatment of Organic Laden Surface Water." 2013 Hawaii Works Association Annual Conference, Makena Beach and Golf Resort, Wailai, HI (October 23-October 24, 2013).
9. "Optimizing a Community's Fresh and Brackish Water Supplies with an Aeration, Ion-Exchange and Reverse Osmosis Treatment Portfolio." 2013 Professional Program of the American Water Works Association Annual Conference and Exhibition. Denver, CO (June 9-13, 2013).
10. "Impact of Bottled Water Storage Duration and Location on Bacteriological Quality." 2013 Florida Water Resources Water Visions Conference. Orlando, FL (April 28-May1, 2013).
11. "Controlling Disinfection By-Products Originating from a Volcanic Surface Water Supply." 2013 Florida Water Resources Water Visions Conference, Orlando, FL (April 28-May1, 2013).
12. "Balancing Fresh and Brackish Water Supplies with Aeration, Ion-Exchange and Reverse Osmosis Processes." Florida Section American Water Works Association Fall Conference Managing Responsibility: It's All One Water. Orlando, FL (November 25 – November 29, 2012).
13. "Emerging Issues in Water Distribution Systems." Florida Rural Water Association 2012 Annual Conference. Daytona Beach Convention Center, Daytona Beach, FL (August 13-16, 2012).
14. "Membrane Mathematics." Southeast Desalting Association Spring Conference, Hyatt Regency Coconut Point, Bonita Springs, FL (June 17-20, 2012).
15. "Secondary Impacts of Alternative Cleaning and Backwash Chemicals on Ultrafiltration." American Water Works Association Annual Conference and Exhibition. Dallas, TX (June 10-14, 2012).
16. "Emerging Issues Related to Premise Plumbing." Emerging Issues Facing Potable Distribution Systems Workshop. 87th Annual Florida Water Resources Conf. Orlando, FL (April 28-May 2, 2012).

17. "Pi'iholo Water Treatment Plant Carbon Reduction to Control Disinfection By-Products Formation." Hawaii Section AWWA 38th Annual Conference- Convention Center, Honolulu, HI; April 18, 2012.
18. "Applying Green Chemistry to Resolve Membrane Backwash Recycle Stream Interferences with Conventional Coagulation Processes and the Replacement of Traditional Membrane Cleaning Solutions." American Water Works Association and American Membrane Technology Association Membrane Technology Conference and Exposition. Glendale, AZ (February 27 – March 1, 2012)
19. "The Effect of Stay Current on the Integrity of Continuous and Discontinous Reinforcing Bars Embedded in Concrete Infrastructure." Florida Section American Water Works Association Fall Conference Protecting Florida's Water Infrastructure. Orlando, FL (Nov. 27 – Dec. 1, 2011).
20. "The Emergence of Forward Osmosis and Pressure Retarded Osmotic Processes for Drinking Water Treatment." Florida Section American Water Works Association Fall Conference Protecting Florida's Water Infrastructure. Orlando, FL (Nov. 27 – Dec. 1, 2011).
21. "Integrating Ultrafiltration within Conventional Coagulation Facilities and the Unintended Consequence of Membrane Maintenance Chemical Entering Conventional Recycle Streams." 2011 American Membrane Technology Association/Southeast Desalting Association 2011 Joint Conference and Exposition, "Membranes are the Solution." Miami Beach, FL (July 17-21, 2011).
22. "Distribution System Water Quality: Pipe Corrosion Processes, DBPs and Blending." Fundamentals of Drinking Water Treatment. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, WI (May 17-19, 2011).
23. "Membrane Filtration Processes." Fundamentals of Drinking Water Treatment. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, WI (May 17-19, 2011).
24. "Submerged versus Pressure Membrane Applications." American Membrane Technology Association Technology Transfer Workshop, Ohio to the Outer Banks, Dayton, OH (May 23-25, 2011).
25. "Predictive Modeling of Sulfide Removal in Tray Aerators." Florida Water Resources Conference Gaylord Palms Resort and Convention Center, Orlando, FL (May 1- May 3, 2011).
26. "Nanofiltration Solutions to Address the Stage 2 Disinfectant/Disinfection By-Products Rule." Proceedings of Florida Section American Water Works Association Fall Conference Implementing our Future. Orlando, FL (November 28 – December 2, 2010).
27. "Pipe Corrosion Processes-Problems and Prevention." Improving and Upgrading Municipal Water Distribution Systems. University of Wisconsin College of Engineering Dept. of Engineering and Prof. Develop. on behalf of Prince William County Service Authority, Woodbridge, VA (Oct. 19-20, 2010)
28. "Determination of Total Iodide in Seawater Permeate." AMTA Annual Conference & Exposition; San Diego, CA (July 12-15, 2010).
29. "History of Synthetic Membrane Processes and Forward Osmosis." AMTA/Statkraft 2nd Osmosis Membrane Summit. San Diego, CA (July 11-12, 2010).
30. "Corrosion and Pipe Integrity." Improving and Upgrading Municipal Water Distribution Systems. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, WI (June 17-18, 2010)
31. "Membrane Processes; Adsorption Processes; Distribution System Water Quality." Fundamentals of Drinking Water Treatment. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, WI (June 14-16, 2010).
32. "Tightening the Membranes - Nano and RO Membranes: Why do I need more pressure?" American Membrane Technology Association Membrane Treatment in the Heart of the Great Smoky Mountains Technology Transfer Workshop. Marriott Knoxville Hotel, Knoxville, TN (May 4-6, 2010).

33. "Desalination Permeate Conditioning and Handling Needs." American Membrane Technology Association Membrane Treatment in the Caribbean Technology Transfer Workshop, InterContinental Resort and Hotel, San Juan, Puerto Rico (January 19-21, 2010).
34. "Desalination Post Treatment Strategies." Florida Section American Water Works Association Fall 2009 Conference, Renaissance Orlando Resort at SeaWorld, Orlando, FL (Nov. 30 – Dec. 2, 2009).
35. "Post-Treatment of Desalinated Water." AWWA Water Quality Technology Conference. Seattle, WA. (October 26 – 29, 2009).
36. "What the Future Holds for Membrane Processes." Florida Section American Water Works Association Region III Young Professionals Seminar. Orlando, FL (August 27, 2009).
37. "Post Treatment Stabilization & Distribution System Issues." Southeast Desalting Assoc. Spring Symposium: Making the Best of Existing Infrastructure, Clearwater, FL (June 7-10, 2009).
38. "Recent Advancements in Membrane Technology." American Membrane Technology Association Technology Transfer Workshop, Baltimore, MD (May 18-20, 2009).
39. "Membrane Processes; Adsorption Processes; Distribution System Water Quality." Fundamentals of Drinking Water Treatment. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, WI (May 12-14, 2009).
40. "Desalination Post-Treatment Considerations." Florida Section AWWA Fall 2008 Conference, Renaissance Orlando Resort at Seaworld, Orlando, FL (Nov. 30 – Dec. 3, 2008).
41. "Drinking Water Quality & Treatment: Nanoscience Opportunities?" Presentation to the UCF NanoScience Technology Center, Orlando, FL (November 12, 2008).
42. "Stabilization of RO Treated Water." Hawaii Water Works Assoc. Conf. 2008: Pipe Dreams–Meeting Increased Customer Demands. Grand Wailea Spa, Wailea, Maui, Hawaii (Oct. 29-31, 2008).
43. "New Membrane Technologies and Advancements." American Membrane Technology Association Technology Transfer Workshop – Membrane Use in the Great Lakes Area. Grand Geneva Resort, Lake Geneva, Wisconsin (October 1-2, 2008).
44. "Strategies for Addressing Endocrine Disruptors, Pharmaceuticals and Personal Care Products" Florida Section American Water Works Association Region III Young Professionals Summer Workshop – Emerging Compounds of Concern (August 28, 2008).
45. "Considerations for Blending Permeate into Water Distribution Systems." 2008 Joint AMTA and SEDA Conference and Exposition. Naples, Florida (July 14-17, 2008).
46. "Industry Advancements: Membranes, Pressure Vessels and Floating Seawater Desalting Facilities." 2008 Joint American Membrane Technology Association and Southeast Desalting Association Conference and Exposition. Naples, Florida (July 14-17, 2008).
47. "DBPs – Pros and Cons of Chloramines & Nitrification." Florida Rural Water Association 2008 Annual Conference, Daytona Beach, Florida (July 1, 2008).
48. "Stabilization of Desalted Water Supplies" 2008 AWWA Annual Conference and Exhibition. Atlanta, Georgia (June 8-12, 2008).
49. "Basic Membrane Operations." Southwest Membrane Operator Association Technology Transfer Workshop Hands-On Reverse Osmosis Water Plant Operator Training." Alameda County Water District, Freemont, California (May 29, 2008).
50. "Membrane Process Technologies Parts I to VI" Fundamentals of Drinking Water Treatment. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, Wisconsin (May 5-6, 2008).
51. "New Membrane Technologies and Advancements." AMTA Technology Transfer Workshop,

Charleston, SC (May 7-8, 2008).

52. "Total Organic Carbon Removal from Volcanic Water Supplies." Hawaii Section American Water Works Association 34th Annual Conference – Only Tap Water Delivers." Pacific Beach Hotel, Honolulu, Hawaii (April 30 – May 2, 2008).
53. "Membrane Processes for Water Treatment" Jones Edmunds University. Jones Edmunds & Associates, Inc Corporate Offices, Gainesville, Florida (April 18, 2008).
54. "General Session and Membrane Basics." Southwest Membrane Operators Association 2008 Annual Symposium "Membranes on the Move." Kona Kai Resort, San Diego, California (Feb 3-6, 2008).
55. "Membrane Autopsies." AMTA Technology Transfer Workshop. Membrane Applications Meet Islander's Needs. Honolulu, Hawaii (December 12-13, 2007).
56. "Use of Membrane Forensics for Solving Operational Problems in Desalting Facilities." World Congress on Desalination and Water Reuse – Desalination: Quenching a Thirst. Palacio de Congresos de Maspalomas, Gran Canaria, Spain (October 21-26, 2007)
57. "Membrane Filtration Systems; Adsorption; Ion-Exchange; Aeration." Fundamentals of Drinking Water Treatment. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison; at USBR Center, Bismark, ND (September 18 – 19, 2007).
58. "Conversion from Ground Water to Surface Water – The Kauai Grove Farm Project." AWWA Annual Conference and Exposition. Toronto, Canada. (June 11-13, 2007).
59. "Membrane Processes." Southeast Desalting Association 2007 Symposium, Wave of the Future Expansion & Modification of Membrane Plants. Ft. Lauderdale, FL (June 3-6, 2007).
60. "Water Quality Deterioration in Distribution Systems." Florida Department of Environmental Protection 2007 Drinking Water Annual Meeting, St. Petersburg, FL (May 31, 2007).
61. "Membrane Forensics and its Value to Membrane Water Plants." AWWA Membrane Technology Conference & Exposition, Tampa, FL (March 18-21, 2007).
62. "Technical Interactions with Customers Experiencing Plumbing Corrosion." Florida Section AWWA 2006 Annual Conference, Renaissance Resort at SeaWorld, Orlando, FL (November 26-30, 2006).
63. "Membrane Technologies." Fundamentals of Membrane Filtration. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, WI (October 11-12, 2006).
64. "Membrane Forensics and Troubleshooting Membrane Facilities." 2006 AMTA Biennial Conference and Exposition – Desalination Comes of Age. Anaheim, CA (July 31-Aug 2, 2006).
65. "Chemistry for Membrane Treatment." Southeast Desalting Association June 2006 Symposium – Advancing Membrane Treatment Together. Captiva Island (June 26-28, 2006).
66. "An Overview of Membrane Technologies." Selecting and Operating Membrane Filtration Plants. College of Engineering Department of Engineering and Professional Development. University of Wisconsin. Madison, WI (May 24-25, 2006).
67. "UpCountry Maui Corrosion Control: Scratching out a Solution." Hawaii Section AWWA 32nd Annual Conference, Honolulu, HI (May 10-12, 2006).
68. "Post Treatment and Distribution System Impacts." AWWA 2006 Desalination Symposium. Honolulu, HI (May 7-9, 2006).
69. "Chloramines and Coliform – Should You Be Concerned?" 2006 Florida Water Resources Conference – Water the Limited Resource. Orlando, FL (April 9-12, 2006).
70. "Causal Factors of Corrosion." Florida Section AWWA Corrosion Control and Monitoring

Techniques Seminar. Orlando, FL (March 30, 2006).

71. "Impacts of Blending Treated Surface Water with Groundwater." Florida Section AWWA Workshop – Surface Water Treatment. Orlando, FL (February 14, 2006).
72. "Desalination and Other Options for Addressing Saltwater Intrusion." AWWA Distribution Systems Symposium Conference and Exhibition. Tampa, FL (September 18, 2005).
73. "Realistic Measures and Technologies to Prevent Saltwater Intrusion for Small Water Systems." AWWA Distribution Systems Symposium. Tampa, FL (Sept. 18, 2005).
74. "Distribution System Considerations." American Membrane Technology Association 2005 Symposium. Minneapolis, MN (August 1-3, 2005).
75. "Post-Treatment." South Central Desalting Association – Working With Membrane Technologies. San Antonio, TX (July 21-22, 2005).
76. "Hydrogen Sulfide." Florida Department of Environmental Protection 2005 Annual Drinking Water Workshop. Sarasota, FL (July 6-8, 2005).
77. "Drinking Water Quality Regulations: Drivers for Membrane Treatment Facilities." Southeast Desalting Association Spring Symposium, Bonita Springs, FL (June 26-29, 2005).
78. "Chloramines and Internal Corrosion – Is there a Connection?" 2005 Florida Water Resources Conference Water Essentials. Jacksonville, FL (April 24-27, 2005).
79. "You Can't Hide from Hydrogen Sulfide." Florida Section AWWA 2004 Conference. Orlando, FL (November 14-18, 2004).
80. "Corrosion Control Study for UpCountry Maui." Hawaii Water Works 2004 Conference. Wailea, Maui, HI. (October 20-22, 2004).
81. "Desalination in Hawaii – Can We Afford It or Can We not Afford to Do It?" Hawaii Water Works 2004 Conference. Wailea, Maui, HI. (October 20-22, 2004).
82. "Drinking Water Quality Regs – The Current Outlook & Timeline." AMTA/SEDA Joint Symposium. Membranes-Florida's Conventional Water Treatment. Duck Key, FL (Sept. 26-28, 2004).
83. "Post Treatment: Disinfection Corrosion Control." Southeast Desalting Association June 2004 Symposium. Stuart, FL (June 27-30, 2004).
84. "Membrane Processes Advance Safe Drinking Water." Hawaii Section AWWA 30th Annual Conference. Honolulu, HI (May 12-14, 2004).
85. "Membranes and Biofouling – A Slimy Situation." 2004 Florida Water Resources Conference Integrating Water Resources for the Future. Kissimmee, FL (April 4-7, 2004).
86. "Membrane Pretreatment for Seawater RO Desalination." 2004 Florida Water Resources Conference Integrating Water Resources for the Future. Kissimmee, FL (April 4-7, 2004).
87. "U.S. Pilot Studies." International Desalination Association Workshop, The Importance of Pretreatment in Reverse Osmosis Desalination. Tampa, FL (March 25-26, 2004).
88. "Florida Water Treatment Processes – Cost and Quality." University of Central Florida Drinking Water Conf. – Water Resources for the Decade. Orlando, FL (March 9, 2004).
89. "Use of Membranes for the Removal of TDS from Surface Water Supplies." AWWA 2004 Inorganic Contaminants Workshop. Reno, NV (February 1-3, 2004).
90. "Drinking Water Quality and Regulatory Compliance." American Membrane Technology Association Membrane Plant Management School. Kill Devil Hills, NC (December 2003).
91. "Understanding Membranes: Reverse Osmosis and Nanofiltration." Southeast Desalting Association

Symposium, Membranes are to the Point. Bonita Springs, FL (October 2003).

92. "Retrofit Conversion of the Largest Hollow-Fiber Desalting Plant in the United States." IDA World Congress on Desalination and Water Reuse. Paradise Island, Bahamas (Oct., 2003).

93. "State-of-the-Art Filtration Technologies." Office of Naval Research Water Desalination Workshop, USBR, TARDEC. Crystal City, VA (May 2003).

94. "Process Conversion of the City of Sarasota's Reverse Osmosis Water Treatment Plant." Florida Water Resources Conference. Tampa, FL (May 2003).

95. "Blending Multiple Source Waters into a Common Water Distribution System." Increasing Customer Confidence During Challenging Times. Hawaii Section AWWA 29th Annual Conference. Honolulu, HI (May 2003).

96. "State-of-the-Art Filtration Systems." National Defense Industrial Association Petroleum and Water Systems Symposium II. Norfolk, VA (April 2003).

97. "Principles and Practices for Upgrading Older Desalting Facilities." AWWA 2003 Membrane Technology Conference and Exposition. Atlanta, GA (March 2003).

98. "Non-traditional Membrane Manufacturer Testing." AWWA 2003 Membrane Technology Conference and Exposition. Atlanta, GA (March 2003).

99. "Al Qaeda and Your Water." Florida Section American Water Works Association 2002 Seminar and Exhibits. Palm Harbor, FL (November 2002).

100. "Membrane Process Mathematics." Southeast Desalting Association Back to the Basics Conference. Orlando, FL (October 2002).

101. "Scale Inhibitor and Recovery Optimization for a Brackish Water Supply: Pilot Test Results, Full-Scale Experiences." IWA Membranes in Drinking and Industrial Water Production. Műlheim, Germany (September 2002).

102. "Scale Inhibitor and Recovery Optimization for a Brackish Water Supply: Pilot Test Results and Full-Scale Experiences." American Membrane Tech. Assoc. Biennial Conf. Tampa, FL (Aug. 2002).

103. "Optimizing Corrosion Control in Water Distribution Systems." Awwa Research Foundation Technology Transfer Conference. Seattle, WA (August 2002).

104. "The Filtration Spectrum: MF and UF Fundamentals and the Role of Membrane Filtration is Surface Water Treatment." Southeast Desalting Association Annual Membranes in the New Millennium Symposium. Cape Captiva, FL (June 2002).

105. "Membrane Technology." Workshop on Retrofitting and Optimizing the Operation of Drinking Water Treatment Plants. Department of Engineering Professional Development, University of Wisconsin-Madison, held in Madison, WI (May 2002).

106. "On-Line Electrochemical Noise Corrosion Monitoring in Potable Water Distribution Systems." Exploring Development Opportunities for Safe Water. Hawaii Section AWWA 28th Annual Conference. Honolulu, HI (May 2002).

107. "Removal of Hydrogen Sulfide from Groundwater Supplies and Residuals Control." AWWA Inorganic Contaminants Workshop. San Diego, CA (February 2002).

108. "Membranes for Water Reuse." Emerging Issues Facing Water Reuse. Florida Water Environment Association Seminar. Lake Buena Vista, FL (January 2002).

109. "Membrane Technology." Workshop on Retrofitting and Optimizing the Operation of Drinking Water Treatment Plants. Department of Engineering Professional Development, University of Wisconsin-Madison, held in Orlando, FL (January 2002).

110. "Drinking Water Quality and Regulatory Compliance." American Membrane Technology/Southeast Desalting Association Technology Transfer Workshop. Palm Coast, FL (December 2001).

111. "Hyperfiltration – Florida's Most Successful Drought Management Technique." Florida Section AWWA 2001 Seminar and Exhibits. Palm Harbor, FL (November 2001).

112. "Upgrading Older Reverse Osmosis Water Treatment Plants." California-Nevada AWWA Fall Conference, Palm Springs, CA (October 2001).

113. "Effects of Electrical Grounding on Pipe Integrity and Shock Hazard." Valley Counties Water Association Conference. Hanford, CA (September 2001).

114. "Design of Membrane Treatment Systems." Workshop on Retrofitting and Optimizing the Operation of Drinking Water Treatment Plants. Department of Engineering Professional Development, University of Wisconsin Madison, held in Las Vegas, NV (August 2001).

115. "Reverse Osmosis and Nanofiltration Technology: Inorganic, Softening and Organics Control." American Membrane Technology Association Annual Symposium, Isle of Palms, SC (August 2001).

116. "Reverse Osmosis Basics: Mathematics." SEDA Annual Symposium, Membranes and the New Millennium. Naples, FL (June 2001).

117. "Membrane Technology." Workshop on Retrofitting and Optimizing the Operation of Drinking Water Treatment Plants. Department of Engineering Professional Development, University of Wisconsin Madison, held in Madison, WI (May 2001).

118. "Membrane Processes for Small System Compliance with the Safe Drinking Water Act." 3rd NSF International Symposium-Small Potable Water/Wastewater Systems. Washington, D.C. (April 2001).

119. "Costs of Membrane Processes." 2001 AWWA Membrane Technology Conference and Exhibition. San Antonio, TX (March 2001).

120. "Membrane Replacement in Reverse Osmosis Facilities." 2001 AWWA Membrane Technology Conference and Exhibition: The Future of Purer Water. San Antonio, TX (March 2001).

121. "Membrane Technology." Workshop on Retrofitting and Optimizing the Operation of Drinking Water Treatment Plants. Department of Engineering Professional Development, University of Wisconsin Madison, held in Kissimmee, FL (January 2001).

122. "Integration of Lime Softening and Ultrafiltration for Surface Water Treatment: A Powerful Water Quality Combination." AWWA Water Quality Technology Conference. Salt Lake City, UT (November 2000).

123. "Integrating an Immersed Membrane Ultrafiltration Process into an Existing Lime Softening Water Treatment Plant." International Conference on Membranes in Drinking and Industrial Water Production, International Water Association, AWWA, European Desalination Society, and Japan Water Works Association. Paris, France (October 2000).

124. "Water Utility Issues." Guam Society of Professional Engineers Meeting. Agana, Guam, Mariana Islands (October 2000).

125. "Membrane Replacement in Desalting Facilities." International Conference on Membranes in Drinking and Industrial Water Production, International Water Association, AWWA, European Desalination Society, and Japan Water Works Association. Paris, France (Oct. 2000).

126. "Membrane Processes and the Design of Membrane Treatment Systems." Workshop on Retrofitting and Optimizing the Operation of Drinking Water Treatment Plants. Department of Engineering Professional Development, University of Wisconsin Madison in cooperation with the University of Nevada-Las Vegas, held in Las Vegas, NV (August 2000).

127. "Assessment of Integrated Membrane Systems for a Coastal Florida Surface Water Supply." American Desalting Association's 2000 North American Biennial Conference and Exposition, 21st Century Water Challenges. South Lake Tahoe, NV (August 2000).

128. "Disinfection By-Product Chemistry." Florida Rural Water Association Annual Conference, Orlando, FL (August 2000).

129. "Process and the Design of Membrane Treatment Systems." Workshop on Retrofitting and Optimizing the Operation of Drinking Water Treatment Plants. Department of Engineering Professional Development, University of Wisconsin Madison in cooperation with the Michigan Department of Environmental Quality, held in Ann Arbor, MI (July 2000).

130. "Future Forecasts for Membranes." SEDA Biannual Desalting Symposium. Jupiter, FL (June 2000).

131. "Equipment Technology Verification Protocols – Quality and Utility to Consulting Engineers." Georgia Environmental Protection Depart. Conference, Atlanta, GA (May 2000).

132. "Engineering and Construction Considerations for Integrated Membrane Systems." Georgia Environmental Protection Department Conference, Atlanta, GA (May 2000).

133. "Membrane Replacement at the City of Sarasota's Hollow-Fiber Desalting Facility." 2000 Florida Water Resources Conference, Tampa, FL (April 2000).

134. "Membrane Case Studies: Past, Present, Future." International Conference on Membrane Technology in Water and Wastewater Treatment. European Desalination Society and Royal Society of Chemistry. Lancaster University, Lancaster, United Kingdom (March 2000).

135. "Disinfection and Corrosion Control." Southeast Desalting Association Biannual Desalination Symposium, Water Supplies for Southeastern United States and Caribbean, Orlando, FL (Nov. 1999).

136. "The Chemistry of Disinfection By-Products." Florida Depart. of Environmental Protection 1999 Water Facilities Meeting Drinking Water Session, Clearwater, FL (June 1999).

137. "Future Forecasts for Membrane Processes in the United States." Southeast Desalting Association Desalination Symposium, Sundial Beach Resort, Sanibel Island, FL (June1999).

138. "Comparison of Hollow-Fiber and Spiral-Wound Ultra-Low Pressure Membrane Technologies on a Brackish Ground Water." 1999 Florida Water Resources Conference, Tallahassee, FL (April 1999).

139. "Interstage Turbines as Self-Regulating Osmotic Pressure Control Valves in a Desalting Facility." 1999 AWWA Membrane Technologies Conference. Long Beach, CA (March 1999).

140. "Comparison of Hollow-Fiber and Spiral-Wound Ultra-Low Pressure Membrane Technologies on a Brackish Groundwater." AWWA Membrane Technologies Conf. Long Beach, CA (March 1999).

141. "The Olivenhain Water Supply Project and Integrated Membrane Systems." National Water Research Institute Microfiltration II Conference, San Diego, CA (November 1998).

142. "Engineering and Construction Considerations for Integrated Membrane Systems." 1998 Florida Section Annual Conference, Orlando, FL (November 1998).

143. "Protocols for the Removal of Synthetic Organic Chemical Contaminants & Radionuclides by Membrane Technologies." 1998 AWWA Water Quality Tech. Conf., San Diego, CA (Nov., 1998).

144. "Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality." Association of State Drinking Water Administrators 1998 Annual Conference, Keystone, CO (Oct., 1998).

145. "Membrane Technology and Water Quality." 86th Annual Texas Municipal League Conference, San Antonio, TX (October 1998).

146. "Post Treatment and Disinfection." Southeast Desalting Association Operating the Membrane Plant

Post-Treatment and Cleaning Workshop, Ft. Lauderdale, FL (Oct. 1998).

147. "The Role of Membranes in Drinking Water Production in the United States." 1998 Conference on Membranes in Drinking and Industrial Water Production, Amsterdam, The Netherlands, (Sept. 1998).

148. "Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality." AWWA Research Foundation Technology Transfer Workshop, San Francisco, CA (August 1998).

149. "Investigation of the Causal Factors of Performance Decline in a Hollow-Fiber Desalting Facility." 1998 American Desalting Association Biennial Conf. and Expo, Williamsburg, VA (August 1998).

150. "Removal of Hydrogen Sulfide." Florida Department of Environmental Protection 1998 Annual Meeting, Safety Harbor, FL (July 1998).

151. "Water Quality Challenges." Florida Department of Environmental Protection 1998 Annual Meeting, Safety Harbor, FL (July 1998).

152. "Membrane Process Mathematics." Southeast Desalting Association Operating the Membrane Plant Treatment Train Operation Workshop, Ft. Myers, FL (June 1998).

153. "Enhanced Coagulation and TOC Removal for a Florida Surface Water Supply." 1998 AWWA Annual Conference and Exhibition, Dallas, TX (June 1998).

154. "Innovative Use of an Interstage Turbine for Energy Recovery and Enhanced Water Production at a Membrane Desalting Facility." 1998 AWWA Annual Conference, Dallas, TX (June 1998).

155. "Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality." American Backflow Prevention Association Conference, Tempe, Arizona (April 1998).

156. "Enhanced Coagulation and TOC Removal for a Florida Surface Water Supply." 1998 Florida Water Resources Conference, Ft. Lauderdale, FL (April 1998).

157. "Innovative Use of an Interstage Turbine for Energy Recovery and Enhanced Water Production at a Membrane Desalting Facility." 1998 Florida Water Resources Conf., Ft. Lauderdale, FL (April 1998).

158. "Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality." New England AWWA Joint Operations Conference, Marlborough, MA (March 1998).

159. "Carbonic Acid Air Stripping Process for Hydrogen Sulfide Removal." 1998 AWWA Inorganics Contaminants Workshop, San Antonio, TX (February 1998).

160. "Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality." AWWA Research Foundation Technology Transfer Workshop, The Research Advantage: Putting Breakthroughs in Drinking Water Science to Work for You, Atlanta, GA (February 1998).

161. "Basic Feed Water Chemistry." Southeast Desalting Association Operating the Membrane Plant Workshop, Key Largo, FL (October 1997).

162. "Investigation of Calcium Sulfate Supersaturation to Increase Yield from a Limited Resource." 1997 IDA World Congress in Desalination and Water Reuse, Madrid, Spain (October 1997).

163. "Implementation of Lead and Copper Corrosion Control Demonstration Test Programs for Three Florida Utilities." 1997 AWWA Annual Conference and Exhibition, Atlanta, GA (June 1997).

164. "Impacts of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality." AWWA Research Foundation Technology Transfer Workshop for Managers Only, Meeting the Management Challenge Through Research, Galvaston Island, TX (May 1997).

165. "Post-Treatment." Southeast Desalting Association Membrane Processes for Water Treatment Workshop, Longboat Key, FL (May 1997).

166. "Impacts of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality: Inorganic, Organic and

Microbiological Findings." 1997 Florida Water Resources Conference, Orlando, FL (April 1997).

167. "Basic Water Chemistry." 1996 Florida Department of Environmental Protection Annual Meeting, Naples, FL (October 1996).

168. "Post-Treatment, Degassification, Blending, Chlorination, and pH Adjustment." SEDA Operating the Membrane Plant Part III Post Treatment Workshop. Key Largo, FL (October 1996).

169. "Coping with a Variable TDS Brackish Water During the Retrofit Expansion of a Desalting Facility." 1996 American Desalting Association Biennial Conf. Exhibit., Monterey, CA (Aug. 1996).

170. "Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality: Inorganic, Organic and Microbiological Findings." 1996 AWWA Annual Conference and Exhibition, Toronto, Ontario, Canada (June 1996).

171. "Grounding Can Affect Water Quality." 1996 Florida Water Res. Conf., Ft. Myers, FL (May 1996).

172. "Membrane Processes." Florida Department of Environmental Protection Membrane Technology Workshop, Tampa, FL (March 1996).

173. "Grounding Can Affect Water Quality." AWWA Research Foundation Technology Transfer Workshop, Meeting the Management Challenge Through Research, Tampa, FL (February 1996).

174. "Implementation of Lead and Copper Corrosion Control: Demonstration Test Programs for Three Central Florida Utilities." 1995 Florida Water Resources Conference, Jacksonville, FL (April 1995).

175. "Membrane Process Post-Treatment." Southeast Desalting Association Membrane Processes for Water Treatment Conference, Kissimmee, FL (January 1995).

176. "Comparison of Carbon Dioxide and Sulfuric Acid Pretreatment of Packed Towers for Hydrogen Sulfide Removal from Groundwater" 1994 AWWA Water Quality Technology Conference, San Francisco, CA (November 1994).

177. "Comparison of Carbon Dioxide and Sulfuric Acid Pretreatment of Packed Towers for Hydrogen Sulfide Removal from Groundwater" 1994 Florida Water Resources Conf., Tampa, FL (Aug 1994).

178. "Balancing Multiple Water Quality Requirements of the Safe Drinking Water Act." 1993 Florida Water Resources Conference, Orlando, FL (November 1993).

179. "Membrane Process Post-Treatment." AWWA Membrane Tech. Conf., Baltimore, MD (Aug. 1993)

180. "Modeling the Permeate Transient Response in a Membrane Softening Process." AWWA 1993 Annual Conference/Exposition, San Antonio, TX (June 1993)

181. "Solute Charge and Molecular Weight Modeling for Prediction of Solute Mass Transfer Coefficients." 1992 Florida Water Resources Conference, Daytona Beach, FL (Oct. 1992).

182. "Evaluation of the Homogeneous Solution Diffusion Model Using Membrane Mass Transfer Coefficients and Operational Parameters." AWWA 1992 Annual Conference/Exposition, Vancouver, British Columbia, Canada (June 1992).

183. "Radionuclides in Membrane Concentrate Streams." Florida Section AWWA Safe Drinking Water Act Seminar, Ft. Lauderdale, FL (May 1992).

184. "Physical and Chemical Methods for Zebra Mussel Control." Florida Section American Chemical Society 1992 Annual Meeting, Cocoa Beach, FL (May 1992).

185. "Florida's Total Organic Carbon Problem and Trihalomethanes." Florida Section AWWA Safe Drinking Water Act Seminar, Daytona Beach, FL (May 1991).

186. "Synthetic Organic Compound Removal Using Nanofiltration." Florida Section American

Chemical Society 1991 Annual Meeting, Tampa, FL (May 1991).

187. "Modeling Membrane Mass Transfer Using Dimensional Analysis." AWWA Membrane Process Conference, Orlando, FL (March 1991).

188. "Investigation and Modeling of Membrane Mass Transfer." NWISA 1990 Biennial Conference, Walt Disney World, Orlando, FL (August 1990).

189. "SOC Rejection by Nanofiltration." AWWA 1989 Annual Conf., Los Angeles, CA (July 1989).

Participation in Expert Workshops (Invited)

- Water Research Foundation (formerly AwwaRF) Expert Workshops. Orlando, FL May 21-23, 2008; Irvine, CA, February 9, 2009 and Los Angeles, February 10, 2009; Post-Treatment Stabilization of Desalinated Water.
- WateReuse Foundation Research Needs Workshop, San Diego, CA, February 2-4, 2004. Participated in expert workshop and breakout groups to develop and prioritize research agenda for the WateReuse Foundation. Prioritized research needs related to water reuse and desalination. Assisted in the development of 50 research topics.
- Department of the Navy and Bureau of Reclamation Water Desalination Workshop, Crystal City, VA, May 6-7, 2003. Expert panelist on a US Government workshop sponsored by the U.S. Department of the Navy and the U.S. Bureau of Reclamation regarding filtration technologies.
- AwwaRF/USBR Membrane Workshop, Golden, CO, July 27-28, 2000. Participated in an expert workshop sponsored by the U.S. Bureau of Reclamation and the Awwa Research Foundation. Twenty-nine professionals from six nations representing manufacturing, government, academics, and consulting participated in this workshop.
- Intelligent Pipe and Meter Workshop, July 13 & 14, 1998. Participated in an expert workshop sponsored by the Awwa Research Foundation. Over 20 professionals from the manufacturing, academics, and consulting participated in this workshop. Workshop report identified the most important research needs related to distribution mains, pipelines, and meters.
- Non-Potable Water Reuse Workshop, Pomona, CA, July 23-25, 1999. Participated with 30+ other experts in a workshop on water reuse and water quality issues that was sponsored by the National Water Research Institute that employed the Nominal Group Technique.
- Membrane Processes for Drinking Water Treatment, Bar Harbor, Maine, June 8-9, 1995. Participated in an expert workshop sponsored by the AWWA Research Foundation. Over 30 professionals from manufacturing, academics, and consulting participated.

Patents

- U.S. Patent 7081205. *Mobile Desalination Plants and Systems, and Methods for Producing Desalinated Water*. Inventors: A.W. Gordon; CR Cushing; SJ Duranceau; JM Cavanaugh. Assignee: Water Standard Company, L.L.C. Filed 7/30/03 Issued: July 25, 2006.
- South African Patent 03684. *Mobile Desalination Plants and Systems, and Methods for Producing Desalinated Water*. International Classification CO2F 1/00. Application No. ZA20050003-684 200505059. Publication No. ZA200503684. Inventors: A.W. Gordon; C.R. Cushing; S.J. Duranceau; J.M. Cavanaugh. Assignee: Water Standard Company, L.L.C., September 6, 2005.
- South Korean Patent 1020057006197. *Mobile Desalination Plants and Systems, and Methods for Producing Desalinated Water*. Inventors: A.W. Gordon; CR Cushing; SJ Duranceau; JM Cavanaugh. Assignee: Water Standard Company, L.L.C. Issued: August 26, 2005.

- Canadian Patent 2,501,413. *Mobile Desalination Plants and Systems, and Methods for Producing Desalinated Water*. Inventors: A.W. Gordon; C.R. Cushing; S.J. Duranceau; J.M. Cavanaugh. Assignee: Water Standard Company, L.L.C.; August 25, 2005.
- Chinese Patent CN 1714048 A. *Mobile Desalination Plants and Systems, and Methods for Producing Desalinated Water*. Publication WO2004033372. CO2F 1/00. Inventors: A.W. Gordon; C.R. Cushing; S.J. Duranceau; J.M. Cavanaugh. Assignee: WSC, L.L.C.; April 22, 2004.

PROFESSIONAL ACTIVITIES

Service to the Department, College or University

- Civil, Environmental and Construction Engineering Department:
  - *2014. Curriculum Reform Committee (Fall). Discipline: Environmental Engineering*
  - *2014. Search Committee, Environmental Engineering (tenure track position)*
  - *2013-2014. Lead on ABET Preparation of EnvE Self Study for 2014-2015 Cycle*
  - *2012-Present. Review Department Industrial and Safety Hygiene Plan.*
  - *2008-Present. Water Bowl Coach-Advisor, Florida Section AWWA.*
  - *2008-2012. Equipment Committee Member. Determine allocations for classes.*
  - *2009-2010. Curriculum Reform Committee. Spring 2010. Environmental Engineering.*
  - *2009-2010. Hydro-Environmental Faculty Candidate Search Committee and Interviews*
  - *2009-2010. Graduate Student Awards Committee for "Builder of the Realm."*
  - *2009-2010. Graduate Awards Committee for Outstanding PhD, MS Thesis, GRA and GTA*
  - *2009-Present. Advisor to Society of Environmental Engineers (student organization).*
  - *2009-2011. CECE Industry Advisory Board Participant*
  - *2008-2009, Recruited for CECE Industry Advisory Board: Jones Edmunds & Associates, Inc.*
  - *2007-2008. Environmental Textbook Selection Committee*
- 2014. Served as Judge for the 10th Annual UCF 204 Graduate Research Forum (April 1, 2014).
- 2013. Served as Judge for the 10th Annual UCF 2013 Graduate Research Forum (April 2, 2013).
- 2009-2012. Member. Regional Water Steering Committee; Orlando Regional Chamber of Commerce. Orlando, FL (Representing UCF College of Engineering and Computer Sciences).
- 2011 and 2012. Participate in the Summer Research Academy (June 24, 2011; June 22, 2012).
- 2009-2011. Provided a presentation and met with parents and graduating high school students being recruited by the College of Engineering and Computer Sciences, on behalf of the CECE Department, as part of the CECS Open House Program for the following dates: *Saturday, March 26, 2012; Saturday, November 19, 2011;Saturday, March 26, 2011; Saturday, September 4, 2010; Saturday, October 24, 2009; Saturday, April 18, 2009; Saturday, March 28, 2009; Saturday, March 18, 2009.*
- 2010. Served as Judge for the 7th Annual UCF 2010 Graduate Research Forum (March 30, 2010).
- 2009. Recruited Affiliate Member for the NanoSciences & Materials Industrial Affiliates Program ($1,000) – Toray Membrane USA, Inc., Poway, CA.
- 2008-2012. Provided Lectures for ENG1007 Introduction to Engineering to present Environmental Engineering careers and classes. Presented on October 23, 2009 (two lectures – multiple classes); September 17, 2010 (two lectures – multiple classes); February 17, 2012 (three lectures together with former PhD student, now a practicing engineer; Erica Stone).

Service to the Profession

- Emeritus Director of the American Membrane Technology Association (AMTA); Served as President, [2008-2010]; Member, Board of Directors [2002-2012]; Chair of AMTA's Annual Conferences in 2006, 2007 and 2008.
- National Water Research Institute (NWRI), Research Advisory Board [2006-present].
- Association of Environmental Engineering and Science Professors [2008-present].
- American Water Works Association (AWWA); past Chair of: Desalting Committee; Membrane Processes Committee: Inorganic Contaminants Committees; Chair of AWWA's 1995 and 1997 Membrane Technologies Conferences; Member [1988 – present].
- Florida Section AWWA. Past Section Trustee-at-Large [1994-2001], Secretary of Technical and Education Council [1991-1993], Chair-Research Committee [2007-2012].
- Southeast Desalting Association (SEDA); Founding member, Board of Directors [1998-2004]; Chair of SEDA Annual Seminars 1998-2002, member [1998 – present].
- Southwest Membrane Operator's Association. Founding member; Board of Directors ['07-'08].
- International Desalination Association (IDA); member [2000-present].
- American Chemical Society (ACS); member [1982-present].
- Alpha Chi Sigma; member [1982-present]
- Fellow, American Institute of Chemists, Inc. (AIC); member [1996-present].
- Circle K International, Member [1979-1981], Lt. Governor [1980-1981].

Service as Member of Technical Editorial Board

- Editorial Board Member, *Membranes.* [2011-present].
- Associate Editor, *Water Treatment and Desalination*. [2008-present].
- Editorial Board Member, *Desalination*. [2002-2011].
- Editorial Advisory Board Member, *Journal American Water Works Association.* [2001-2008]
- Orange County Florida Development Advisory Board Member-Political Appointee [1991-1995].

Licenses and Certifications

- 2003-2006. Certified Chemical Engineer, by the National Certification Commission in Chemistry and Chemical Engineering, sponsored by the AIC, Inc., Philadelphia, PA.
- 2002-Date. Risk-Assessment Methodology [RAM™] Certification, American Water Works Association certified *Risk Assessment Methodology for Water Surety (RAM-W^{SM})*, licensed by Awwa Research Foundation and Sandia National Laboratories, Atlanta, GA (July 15-17, 2002).
- 1994-Date. Licensed Professional Engineer [Civil/Sanitary: 1994]: State of Florida #46583.

Project Advisory Committees and Peer Review

- 2012. National Science Foundation CBET Panel P121515, Program Director: Debra Reinhart; Arlington, VA [May 10-11, 2012].
- 2012. External Technical Peer Reviewer for the U.S. EPA Science To Achieve Results (STAR) Fellowships For Graduate Environmental Study [March 1, 2012]

- 2010. National Science Foundation Bridge II Panel P101445, Program Director: Ted Conway. Arlington, VA [May 25, 2010].
- 2011. U.S. Bureau of Reclamation's Science and Technology Program; Research and Development (R&D) Technical Reviewer of Research Proposals. Fourteen proposals were reviewed [August 19, 2011].
- 2010. U.S. Bureau of Reclamation's Science and Technology Program; Research and Development (R&D) Technical Reviewer of Research Proposals. Proposals reviewed were ID4141 and ID7532 [August 10, 2010].
- 2009. National Science Foundation CBET 1440 CAREER Panel 2; Program Director, Dr. Paul Bishop, Arlington, VA [Nov. 12-13, 2009].
- Technical Peer Reviewer for the following [1992-present];
  - *American Academy for the Advancement of Science KARST Reviews [Saudi Arabia]*
  - *Journal Environmental Science and Technology*
  - *Water Treatment and Desalination;*
  - *Desalination*
  - *Journal American Water Works Association*
  - *Journal Water Research and Technology Aqua*
  - *Journal American Society of Civil Engineers-Environmental Engineering*
- Project Advisory Committee; Awwa Research Foundation (Water Research Foundation).
  - *Development of a Microfiltration and Ultrafiltration Knowledge Base*
  - *A Novel Approach to Seawater Desalination Using Dual-Staged Nanofiltration*
  - *Comparing Nanofiltration and Reverse Osmosis for Treating Recycled Water*
  - *Development and Validation of ICR Membrane Protocol for Bench/Pilot Studies*
  - *Flat Sheet, Bench & Pilot Testing for Pesticide Removal Using Reverse Osmosis*

Other Service to the Community

- AWWA Region 3 Drinking Water Taste Test; Expert Panel Participant. Orlando, FL Mar 7, 2013.
- 2009-2012. Member. Regional Water Steering Committee; Orlando Regional Chamber of Commerce. Orlando, FL (Representing UCF College of Engineering and Computer Sciences).
- Winter Park High School, Teach-In 2011, Teacher for the Day [November 15, 2011].
- Winter Park High School, Teach-In 2010, Environmental Engineering [Nov. 17, 2010].
- Winter Park High School, School Advisory Committee (SAC) Member [2006 – 2012].
- Winter Park High School Naval Junior ROTC Booster Club Member [2006 –Present].
- St. Matthew's Episcopal Church Usher [2004 – 2008];
- Glenridge Middle School School Advisory Committee (SAC) Member [2003 – 2009]
- Orange County Utilities Water Division, Production and Distribution Employees Professional Development Courses (8 hour lectures each): *June 17, 2009 – Corrosion Control for Water Plant Operators; July 22, 2009 – Basic Chemistry for Water Plant Operators; August 19, 2009 – Lime Softening Chemistry and Hydrogen Sulfide Chemistry for Water Plant Operators; Orlando, FL.*

RECOGNITION AND AWARDS

- **2013 Learning Institute for Elders at UCF, Inc. Competitive Grant Award Winner**. for $2,130 for purchase of a Thermo Scientific™ general protocol convection oven (Model

51028064) designed to provide a temperature uniformity of ±4°C over an oven temperature range of 5°C to 75°C (November 26, 2013).

- **2013-2014 UCF Teaching Incentive Program Award** in recognition of outstanding teaching performance (April 28, 2014).
- **2013 Corporate Affiliate Board's Gold Star Award for Faculty Excellence**, UCF Civil Environmental & Construction Engineering Department's Builders of the Realm Ceremony, November 8, 2013.
- **2013 Recognition & Service Award. American Membrane Technology Association**. "*In recognition of his commitment to educate and share his wealth of membrane technology knowledge for the advancement of AMTA's members, students and event attendees. In addition, a special thanks for his service as a Past President and member of the AMTA Board of Directors from 2004 until 2012 and his prior service as a SEDA liaison.*"
- **2013 Nomination for Technical Excellence in Academia** by the American Society of Civil Engineers (ASCE) as part of Reaching for the Stars Central Florida's Engineer's Week.
- **2012 Lifetime Achievement Award - Southeast Desalting Association**. "*For his dedication and outstanding service in the development and continued support of the organization.*" Bonita Springs, FL (June 19, 2012).
- **2012 Emeritus Director Recipient**; American Membrane Technologies Association (July 2012).
- **2012 Excellence in Graduate Teaching Award**; University of Central Florida, College of Engineering and Computer Sciences (February 3, 2012).
- **2011 Best Paper (as a co-Author), Florida Section** – American Water Works Association's Fall 2011 Conference: "*Evaluating In-Plant Infrastructure Corrosion after Replacing Lime Softening with Nanofiltration and Blending with Reverse Osmosis and Ion-Exchange Process Water*." Orlando, FL (Nov. 27 – Dec. 1, 2011).
- **2011 Water Quality Person of the Year**, American Membrane Technology Association, "*In recognition of his years of hard work on behalf of AMTA, most recently his significant contribution and input to the Environmental Protection Agency (EPA) on the State Guidance Manuals*," Miami Beach, FL (July 20, 2011).
- **2011 Best Paper Presentation**, 2011 AMTA/SEDA Joint Conference and Exposition, "Membranes are the Solution," *Integrating Ultrafiltration within Conventional Coagulation Facilities and the Unintended Consequence of Membrane Maintenance Chemical Entering Conventional Recycle Streams* Miami Beach, Florida (July 20, 2011).
- **2010 Best Paper (as a co-Author),** Florida Section – American Water Works Association's Fall 2010 Conference, "*Beta Testing of a New Ultrafiltration Membrane for Treatment of Manatee County's Surface Water Supply*," Renaissance SeaWorld, Orlando, FL (December 2, 2010).
- **2010 Certificate of Appreciation,** University of Central Florida College of Graduate Studies, "*For judging presentations at the Seventh Annual Graduate Research Forum at the University of Central Florida*," (March 30, 2010).
- **2009 Best Paper (as a co-Author),** Florida Section – American Water Works Association's Fall 2009 Conference, "*Innovative Hydrogen Sulfide Treatment Methods: Moving Beyond Packed Tower Aeration*," SeaWorld Renaissance Resort, Orlando, FL (December 1, 2009).

- **2009 Distinguished Service Award**, Southwest Membrane Operator Association, "*In recognition of your contribution and support to the growth and development of the Southwest Membrane Operator's Association*," Costa Mesa, CA (February 24, 2009).
- **2008 Best Paper**, Florida Section – AWWA's Fall 2008 Conference, "*Desalination Post-Treatment Considerations*," SeaWorld Renaissance Resort, Orlando, FL (December 3, 2008).
- **2008 Presidential Award,** American Membrane Technology Association, "*In recognition of his untiring effort supporting the growth and development of AMTA through his service as Annual Conference chair and the furtherance of AMTA's mission to increase the understanding and use of advanced water treatment technologies to improve America's water supplies*,", Naples, FL (July 15, 2008).
- **2008 Certificate of Appreciation**, AWWA, "*For Service to the Association and the Industry as Chair of the Water Desalting Committee*," Atlanta, GA (June 16, 2008).
- **2006 Best Paper**, 2006 AMTA Annual Conference and Exhibition. "*Membrane Forensics and Troubleshooting Membrane Facilities.*" Anaheim, CA (August 2, 2006).
- **2006 Presidential Award**, American Membrane Technology Association, "*In recognition of his service to AMTA*," Anaheim, CA (July 21, 2006).
- **2004 Distinguished Service Award**, Southeast Desalting Association, "*In recognition of his contribution to the growth and development of the Southeast Desalting Association*," Stuart, FL (June 29, 2004).
- **1999 Certificate of Appreciation**, Olivenhain Municipal Water District: "*In recognition of his commitment to the membrane evaluation panel for Olivenhain's 25 million gallon per day ultrafiltration water treatment plant*," (Encinitas, CA; April 1999).
- **1995; 1998; 2001 Distinguished Service Awards**, Florida Section AWWA.
- **1988 Roy W. Likins Scholarship**, Florida Section AWWA (Inaugural recipient).

PROFESSIONAL ENGINEERING RESEARCH, STUDY, DESIGN AND OTHER EXPERIENCE

Water Research Foundation (Formerly Awwa Research Foundation) Research Projects

1. Tailored Collaboration with the County of Maui Department of Water Supply, HI. Principal investigator responsible for a study of Pretreatment of Low Alkalinity Organic-Laden Surface Water Prior to a Coagulation-Ultrafiltration Membrane Process.

2. Post-Treatment Optimization of Desalinated Water, Denver, CO. Principal Investigator responsible for the development of a guidance manual and research needs regarding post-treatment of permeate.

3. Investigating Pipe Cleaning Methods, Denver, CO. Provided technical expertise on water quality to assist in the development of a guidance manual on planning and implementing pipe cleaning programs, including an overview of existing and emerging pipe cleaning methodologies and technologies. The document provides general guidance for determining which distribution mains and pipes to clean, how often to clean, and what methods apply. Also discussed what considerations are important and how best to measure the results of a pipe cleaning program.

4. Optimizing Corrosion Control in Water Distribution Systems, Denver, CO. Principal investigator and project manager responsible for the demonstration of on-line technology (electrochemical noise) for corrosion monitoring in water distribution systems.

5. Water Quality Requirements for Industrial Applications of Reclaimed Water, Denver, CO. Technical

leader providing water quality technical expertise in the development of a industrial/ecological applications guidance manual for beneficial water reuse. Applicable WQ requirements are given as a means to evaluate the feasibility of a water reuse program.

6. Effects of Electrical Grounding on Pipe Integrity and Shock Hazard, Denver, CO. Principal investigator and project manager responsible for the evaluation of the relationship between electrical currents and service life of distribution pipe materials, and provided guidelines to investigate the potential for electrical shock hazard to utility personnel. The study included evaluating the distribution systems of 20 large utilities spread geographically across the US. The analysis evaluated the relationship between electrical currents and service life of distribution pipe.

7. Identify Causes and Solutions for External Corrosion on Buried Water Mains, Denver, CO. Responsible for support of a project relative to buried infrastructure and impacts on corrosion of water distribution systems, with focus on stray current, electrical grounding and lightening-strike impacts.

8. Impact of Wet Pipe Fire Sprinkler Systems on Drinking Water, Various locations in the United States and Canada. Principal investigator and project manager responsible for a study that included performing a survey to investigate fire sprinklers and potable water quality in distribution mains to determine if there is a significant health hazard associated with wet-pipe fire sprinklers and impacts on public health. The study included over 30 North American large utilities.

9. Membrane Process Water Plant Survey. Conducted a potable water membrane plant survey involving over twenty Florida operations and technical literature review for an AWWA Research Foundation sponsored project. Served as a primary co-author of final report.

Pilot-Plant, Planning and Development Projects

1. Polk County Utilities Evaluation of Alternative Sulfide Treatment Processes.

2. Dunedin Membrane Biofouling Pilot Plant Evaluation, Dunedin, FL.

3. Marco Island Integrated Membrane WTP Pilot Plant, Marco Island, FL. .

4. Deltona Water System Membrane Pilot Plant, Deltona, FL.

5. San Patricio Texas Seawater RO Pretreatment Pilot Study, Denver, CO.

6. Irvine Ranch Water District Deep Aquifer Treatment System Membrane Pilot Design, Irvine, CA.

7. Orange County Packed Tower Pilot Plant Study, Orlando, FL

8. Oviedo West Mitchell Hammock Water Treatment Facility Water Quality and Pilot Testing Program.

9. North Miami Beach Pilot Plant, North Miami Beach, FL

10. Venice Reverse Osmosis Enhanced Recovery Pilot Plant, Venice, FL

11. Membrane Pilot-Plant Evaluation, USEPA

12. Greater Pine Island Water Association, Bokeelia, FL.

Corrosion Research Studies and Investigations

1. Bahamas Water and Sewerage District Desk-Top Evaluation Corrosion and Red Water, Nassau.

2. County of Maui Lead Control Strategy, Maui, HI.

3. Guam-US Navy Corrosion Control and Protection Plan, Marianna Islands, Guam.

4. Eastern Service Area Corrosion Control Study, Orlando, FL.

5. Town of Jupiter In-Plant and Distribution System Corrosion Control Studies, Jupiter, FL.

6. Pinellas County Corrosion Inhibitor Screening and Evaluation, Pinellas County, FL.

7. Winter Park Lead and Copper Corrosion Control Study, Winter Park, FL
8. Mission Hill Lead and Copper Rule Compliance, Santa Barbara County, CA.
9. Water Quality & Corrosion Investigation - D. Creek, Sarasota County, FL.
10. Polk County Lead and Copper Corrosion Control Study for the Imperialakes WTP, Polk County, FL.
11. Polk County Small System Lead and Copper Corrosion Control Studies, Polk County, FL.
12. Florida Water Services Small System Lead/Copper Corrosion Control Studies, Orlando, FL.
13. Altamonte Springs Lead & Copper Corrosion Control Effectiveness Report, Altamonte Springs, FL.
14. Desk Top Corrosion Evaluation Reclaimed Water, Altamonte Springs, FL.
15. Altamonte Springs Lead and Copper Corrosion Control Study, Altamonte Springs, FL
16. Investigation of Drinking Water Quality Residential Copper Tube Pitting, Marco Island, FL.

Membrane Process Design and Evaluations

1. Olivenhain Municipal Water District Water Storage and Treatment Facilities Ultrafiltration Membrane WTP, San Diego County, CA.
2. Irvine Ranch Water District Deep Aquifer Treatment System Membrane Design-Build Design, Construction and Start-Up Assistance, Irvine, CA.
3. Brazos River Authority (BRA) Surface Water and Treatment System (SWATS) Membrane Plant Evaluations, Granbury, TX (***Served as expert witness in related US Federal Court landmark case***).
4. Marco Island Integration of Immersed Ultrafiltration into an Existing Lime Softening WTP and Process Upgrades, Marco Island, FL. (***This project represented the first ultrafiltration membrane process permitted for construction and used to produce potable water the state of Florida***).
5. T. Mabry Carlton Jr. Electrodialysis Reversal (EDR) WTP Monthly Operations Reports, Sarasota, FL (***At the time this was the largest demonstrated use of EDR for potable production in the world***).
6. Sarasota Reverse Osmosis 12-MGD WTP Retrofit Design and Specifications as the Owner's Representative for Design-Build Process Retrofit, Sarasota, FL. ***This project received the 2004 Grand Award in Florida Institute of Consulting Engineer's water/wastewater engineering competition***).
7. Marco Island 2.0-mgd Reverse Osmosis Retrofit Expansion, Marco Island, FL (***This project included the first known demonstrated use of interstage turbines for energy recovery in the world; in addition, this water plant was awarded the Most-Improved Water Plant Award by the Florida Department of Environmental Protection in-2000***).
8. Marco Island Reverse Osmosis Plant, Membrane Replacement Program, Marco Island, FL.
9. City of Dunedin Membrane Plant Feed Valve Replacement Program, Dunedin, FL
10. Collier County Regional 20-MGD Nanofiltration Membrane Softening Treatment Plant, Naples, FL
11. Reverse Osmosis Water Treatment Plant Expansion Preliminary Design, Jupiter, FL.
12. Burnt Store Reverse Osmosis Water Treatment Plant, Punta Gorda, FL.
13. Melbourne Reverse Osmosis Water Treatment Plant Assessment, Melbourne, FL.
14. U.S. Air Force Nanofiltration Water Treatment Plant Design - Moody Air Force Base, Valdosta, GA. (***This project represented the first nanofiltration membrane process permitted for construction and used to produce potable water the state of Georgia***)
15. U.S. Air Force Manta Seawater Desalination Study, Manta, Ecuador; U.S. Air Force Manta Ceiba WTP, Integrated Membrane Process Design, Manta, Ecuador.

16. NSF International Membrane Filtration Verification Report Reviews, Ann Arbor, MI.
17. Jupiter ROWTP Membrane Replacement Desk Top Evaluation, Jupiter, FL.
18. Dunedin Membrane Performance and Greensand Filter Evaluation, Dunedin, FL.
19. Alameda County Water District, Newark Reverse Osmosis Fouling and Remedy, Fremont, CA.

Vulnerability Assessments and Water Security

1. Town of Jupiter Water System Vulnerability Assessment, Jupiter, FL.
2. U.S. Navy Guam, COMNAVMARIANAS, Water System Vulnerability Assessment, Tamuning, Guam. Served as Principal Investigator for Project (***Project required a military security clearance***).
3. Sarasota County, Vulnerability Assessment, Sarasota County, FL.
4. Peace River Manasota Regional Water Supply Authority, Vulnerability Assessment, Sarasota, FL.
5. Santa Clara Municipal Water District; Security and Vulnerability Assessment, Santa Clara, CA.

Water Quality and Safe Drinking Water Act Studies

1. Peace River Option Water Quality Master Plan, Peace River, FL.
2. Breakpoint Chlorination & Chloramine Study, Pinellas County, Largo, FL.
3. Blending Source Waters in Hanamaulu Water System, Kauai, HI.
4. Review of Total Coliform in Water Distribution System, Pinellas County, FL.
5. U.S. Navy Guam Fena Water Treatment Plant Treatability Study, Tamuning, Guam.
6. U.S. Navy Guam Comprehensive Performance Evaluation (CPE) and Composite Corrective Program (CCP) of the Fena Surface Water Treatment Plant, Marianna Islands, Guam.
7. NSF International ETV Program Technical Report Review and Quality Control, Ann Arbor, MI..
8. Greater Pine Island SDWA Water Quality Study, Bokeelia, FL.
9. Immokalee Water Quality Evaluations, Immokalee, FL.
10. Lake Worth Safe Drinking Water Act Compliance Evaluation, Lake Worth, FL.
11. Polk County Consumer Confidence Reports, Bartow, FL
12. Polk County Imperialakes and Turner Road H_2S Treatment Alternatives Study, Winter Haven, FL.
13. Polk County Dinner Lake Hydrogen Sulfide Conceptual Treatment Alternatives, Winter Haven, FL.
14. City of Ocoee Initial Distribution System Evaluation, Ocoee, FL.
15. Town of Jupiter Initial Distribution System Evaluation, Jupiter, FL.
16. Conceptual Treatment Alternatives Study for Sarasota's Potable Water System, City of Sarasota, FL.
17. Evaluation of Oxidizing Media Filters for the Imperialakes and Turner Road Water Treatment Plants, Polk County; Winter Haven, FL.

Design Peer Reviews, Value Analysis, and Peer Review Projects

1. Town of Jupiter 10-MGD Membrane Softening Nanofiltration Process, Jupiter, FL
2. Electrodialysis Reversal Process Workshop Training and Plant Tours, Barcelona Spain.
3. Boca Raton 40-MGD Membrane Softening Plant Value Analysis, Boca Raton, FL
4. Peer Review of ROWTP-WQ Specifications, Clearwater, FL.
5. Irvine Ranch Water District Irvine Desalter Project Peer Review/Value Analysis, Irvine, CA.

6. Peer Review of El Paso Eastside Desalting WTP, El Paso, TX.
7. Reverse Osmosis Mixed Bed Filter Process Peer Review, Manitowoc, WI.
8. Wadi Ma'in Jordan Desalting WTP Peer Review, North Brunswick, NJ.
9. Pinellas County Utilities Quality Technical Peer Review, Largo, FL.
10. Government of Guam, Guam Water Works Authority, Ugum Water Treatment Plant 4-MGD Ultrafiltration Water Plant Review.
11. Peer Review and Program Review Comments for the 24-mgd Ultrafiltration process for the treatment of drinking water service Assistance with the Ciy of Waxahatchie, TX.
12. Peer Review Advisory Member for Under Ocean Floor Intake Project, Long Beach, CA.
13. Peer Review of the city of Waxahatchie, TX 24 MGD ultrafiltration process of surface water supply.
14. Peer Review of the city of Mansfield, TX 20 MGD ultrafiltration water treatment plant process.

Water Treatment Plant Design Experience as Principal-in-Charge Professional Engineer

1. City of Oviedo Mitchell Hammock Water Treatment Facility, Oviedo, FL (16 MGD).
2. Pinellas County Utilities Water Blending Facility, Clearwater, FL (100 MGD).
3. Marco Island Reverse Osmosis (RO) Desalination Facility, Marco Island, FL (6 MGD).
4. City of Sarasota Reverse Osmosis and Ion Exchange WTP Facilities, Sarasota, FL (12 MGD).

Other Miscellaneous Experience

- Town of Jupiter Initial Distribution System Evaluation (IDSE) for Drinking Water Systems greater than 100,000. Engineer-of-record for US EPA mandated IDSE for the Town of Jupiter.
- Town of Jupiter Groundwater Rule 4-log Certification. Engineer-of-record for US EPA mandated ground water rule certification of virus inactivation (Palm Beach County Health Department; FDEP).
- Town of Jupiter Lead and Copper Rule sampling plan revisions review and Update. Jupiter FL.
- Town of Jupiter Lime Softening Plant Evaluation, Jupiter, FL.
- Town of Jupiter Blending of NF Concentrate with Reclaimed Water, Jupiter, FL
- Pinellas County Phase I: Conceptual Water Quality Impacts and Master Planning, Clearwater, FL.
- Pinellas County Distribution System WQ Operations Study, Largo, FL
- Pinellas County Online Analyzer Design, Pinellas County, Largo, FL.
- Interim Treatment Facility Design and Distribution System O&M Practices Study, Clearwater, FL
- Polk County Water Quality Master Plan, Polk County, Largo, FL.
- Marco Shores Lime Softening Plant, Marco Island, FL
- Marco Island Integrated Membrane WTP Site Selection, Marco Island, FL
- Peace River Option T. Mabry Carlton Jr. EDR Water Quality Compatibility Evaluation, Sarasota, FL.
- City of Dunedin TTHM/Blending Demonstration, Dunedin, FL
- Barefoot Bay Water System Bond Compliance, Brevard County, FL
- Barefoot Bay Water Treatment Plant THM Compliance, Brevard County, FL
- Lake Marianna Ion Exchange Waste Stream Evaluation, Polk County, FL.

- Orange County Eastern Regional Water Supply Facility, Orlando, FL
- Pepsi-Cola Packed-Tower Aeration Pilot Plant Evaluation, Fort Myers, FL
- Groundwater Quality and Nanofiltration Cost Analysis, Olympia, WA
- U.S. Navy Fena Water Treament Plant - MILCON Evaluation, Tamuning, Guam.
- NSF International ETV Program Technical Reviewer and Quality Control, Ann Arbor, MI.
- NSF International Ion Exchange Nitrate Removal Test Plan, Ann Arbor, MI.
- NSF International Ozone Microbial/Synthetic Organic Chemicals Test Plan Review, Ann Arbor, MI.
- NSF International VOC Air Stripping Test Plan and Protocol
- Florida Dept of Agriculture & Consumer Services Lab Analytical Procedures, Tallahassee, FL.

Summary Table of Professional Engineering Funding Prior to UCF by Project Type

[Research; Design/Construction; Other]

[1996-2006]

Table Notes:

a. Project Identification description provided in SJ Duranceau Professional Engineering Project Experience.
b. Dollars in research/study column reflect SJ Duranceau as Principal Investigator and scope developer (1996-2006 only).
c. Dollars identified in 'other' are related to projects where S.J. Duranceau served in Quality Control reviewer or other role.
d. Research/Study category specifically related to research and development (fundamental and applied research) activities.
e. Design/Construction and Training reflect SJ Duranceau's ability as principal-in-charge/PE role; number reflects fee.
f. Not all fees managed by SJ Duranceau shown in Table – additional project experience information in Project Experience section.

Project Identification	*Research/Study*	*Design/Construction*	*Other*	*Comments*
AwwaRF				
1. Optimize Corrosion Control	**150,000**			Work resulted in peer review publication
2. Water Quality Industrial Reuse			**25,000**	Research document published (book)
3. Pipe Cleaning Methods			**15,000**	Research document published (book)
4. Electrical Grounding	**275,000**			Work resulted in peer review publication
5. External Corrosion			**15,000**	Research document published (book)
6. Wet-Pipe Fire Sprinkler WQ	**150,000**			Work resulted in peer review publication
Pilot Plant Research & Development				
1. Dunedin Biofouling Study	**35,000**			Work published as regional non-refereed paper
2. Marco Island IMS Pilot	**275,000**			Work published as regional non-refereed paper
3. Deltona Water System ICR Study	**50,000**			Work published as regional non-refereed paper
4. Orange County Packed Tower	**75,000**			Work resulted in peer review publication
5. Oviedo Pilot Testing Program	**250,000**			Work published as regional non-refereed paper
Corrosion Studies and Investigations				
1. Altamonte Springs LCR Study	**50,000**			Work published as regional non-refereed paper
2. Eastern Service Area Study	**145,000**			Work published as regional non-refereed paper
3. Guam US Navy Corrosion	**85,000**			Information classified
4. Pinellas County Inhibitor Studies	**350,000**			Work published as regional non-refereed paper
5. Winter Park LCR Study	**50,000**			Work published as regional non-refereed paper

Summary Table of Professional Engineering Funding Prior to UCF by Project Type (Continued).

Water Quality/SDWA				
1. Peace River WQMP	**450,000**			Work resulted in peer review publication
2. Blend Source Waters Kauai	**40,000**			Work published as regional non-refereed paper
3. Breakpoint Chlorine/Chloramine	**200,000**			Work published as regional non-refereed paper
4. Review Total Coliform			**50,000**	Work published as regional non-refereed paper
5. U.S. Navy Guam Fena WTP	**400,000**			Information classified
6. NSF International ETV Program QC		**55,000**		Work published as regional non-refereed paper
Vulnerability Assessments/Security				
1. Town of Jupiter FL System		**75,000**		Information classified USEPA and DHS
2.U.S. Navy Guam Fena WTP		**45,000**		Information classified USEPA and DHS
3. Sarasota County FL Utilities		**150,000**		Information classified USEPA and DHS
4. Peace River Authority FL		**200,000**		Information classified USEPA and DHS
5.Santa Clara CA (QC role)			**35,000**	Information classified USEPA and DHS
Membrane Process Design				
1. T. Mabry Carlton EDR Plant			**25,000**	Work published as regional non-refereed paper
2. City of Sarasota ROWTP		**450,000**		Work published as regional non-refereed paper; plant design awarded 1st place/FICE-2004
3. Marco Island 2.0 MGD RO		**650,000**		Work published as regional non-refereed paper; plant design awarded most improved plant award by Florida DEP-2000
4. Marco Island UF WTP		**295,000**		Work published as regional non-refereed paper; plant design represents first UF permitted in Florida
5. Moody Air Force Base NF		**245,000**		Work published as regional non-refereed paper; plant design was first NF permitted in state of Georgia
Other Water Projects				
1. City of Oviedo WTP		**2,100,000**		Work published as regional non-refereed paper; plant design included first-of-its kind water storage tank.
2. Pinellas Blend Facility		**3,300,000**		Work published as regional non-refereed paper; plant design first of its kind for blending desalted seawater, groundwater, surface water
TOTAL	**3,030,000**	**7,565,000**	**165,000**	**(Total funding for 10 year timeline is $10,760,000)**

TOTAL FUNDING PRIOR TO ENTERING UCF - 1996-2006**: $10,760,000**

COMMUNITY WATER FLUORIDATION FACT SHEET

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History and Current Practices of Community Water Fluoridation

a) Grand Rapids, Michigan was the first city to practice community water fluoridation (1945).

b) Community water fluoridation practices are reported to the Centers for Disease Control (CDC).

c) Fluoridation is practiced by approximately 16,000 public water systems across the United States.

d) Of those utilities that serve over 100,000 people, about 90 percent add fluoride to their water. Most of the utilities that do not fluoridate are small systems.

e) Since 1950, approximately 300 utilities in the United States have voted in some manner to stop fluoridation, representing less than 2 percent of the systems who fluoridate.

Basic Facts Regarding Fluoride and Fluoridation

a) Trace amounts of fluoride occur naturally in water in mineral form. Water supplies across the United States naturally contain low concentration levels of fluoride. Fluoride levels in central Florida groundwater varies between 0.1 and 0.4 mg/L (in general).

b) The USEPA has documented a link between prolonged exposure to high-level fluoride concentration and skeletal fluorosis, a condition similar to osteoporosis, as well as digestive and nervous system disorders. In addition, exposure to high levels of fluoride can cause dental fluorosis, a condition which leads to mottled tooth enamel, tooth discoloration, and in some cases erosion of effected teeth to the gumline. Hence, drinking water's fluoride content is hence limited under federal law. In 1986, the Environmental Protection Agency (EPA) set the maximum contaminant level (MCL) for fluoride in drinking water at 4 mg/L, and is only applicable to source waters with natural fluoride. The EPA Secondary Standard for fluoride is 2 mg/L.

c) The US Department of Health and Human Services has not recognized a causal link between low-level fluoride exposure and occurrences of cancer, brain damage or osteoporosis.

d) The concentration recommended by the Public Health Service (PHS) and the CDC has been adjusted since 1982. The current recommendation is 0.7 mg/L, which is believed to be the optimum level of fluoride that will prevent tooth decay and have a low risk of dental fluorosis (Department of Health and Human Services Federal Panel on Community Water Fluoridation, Public Health Reports, 2015).

e) The three primary chemicals used in fluoridation are sodium fluoride (sodium and fluoride atoms bonded together), sodium fluorosilicate (sodium, silicon and fluoride) and fluorosilic acid (hydrogen, silicon and fluoride).

Organizations that Support Fluoridation of Public Water Supplies

a) The American Water Works Association (AWWA) supports fluoridation of water supplies in a safe, effective and reliable manner within limits prescribed by public health officials subject to local decision-making processes. Since 1945, American water systems have added fluoride to their water supplies (Denver CO: American Water Works Association).

b) The American Dental Association (ADA) endorsed fluoridation in 1950, reaffirming its endorsement in 1997. The American Medical Association endorsed fluoridation in 1951, and reaffirmed its endorsement in 1996. The U.S. Public Health Service has also endorsed fluoridation.

c) As part of its "Healthy People 2000" project, the Center for Disease Control and Prevention (CDC) set a goal of increasing the level of the American population serviced by fluoridated water systems to 75 percent by the year 2010. Twenty states and the District of Columbia exceeded the Healthy People 2000 target. These States represent over 60 percent of the U.S. population.

Recent Studies of Interest

- May 2014. A New Zealand study finds no correlation between fluoridated water and lower IQs. New research from the University of Otago's Dunedin Multidisciplinary Study does not support claims that fluoridating water adversely affects children's mental development and adult intelligence quotient (IQ) as published in the May 15 (2015) issue of American Journal of Public Health.
- June 2015. Researchers at the University of Nevada recommend a lower limit of 0.6 mg/L for fluoride in drinking water in hot climates for children under six years of age based on data collected in the Upper East Region of Ghana, as published on June 8 (2015) in Science of the Total Environment.

Benefits

- Fluoride, when administered at low concentration levels, is proven to help prevent tooth decay.
- Although fluoride is present in toothpaste, dental applications, and mouthwashes, these are temporary doses. Fluoridated drinking water provides the consistent fluoride concentration in the saliva and dental plaque that prevents oral bacteria from attacking tooth enamel and causing decay (Toumba and Curzon, 2001. "Fluoride Concentrations in Saliva Related to Dental Caries Prevalence in Primary Teeth." *European Journal of Paediatric Dentistry* 2: 15-19.)
- Minorities and persons living below the poverty line have higher rates of decayed and missing teeth (Hudson et al., 2007. "The impact of socioeconomic status and race ethinicity on dental health." *Sociological Perspectives* 50(1): 7-25).
- Fluoridation protects all ages against cavities. Studies show that fluoride in community water systems prevents at least 25 percent of tooth decay in children and adults, even in an era with widespread availability of fluoride from other sources (such as fluoride toothpaste).

Issues and Concerns

- There are health-related concerns including, but not limited to, dental fluorosis, skeletal fluorosis, neurological effects, carcinogenicity, and endocrine disruption. Most of these concerns are cited by research performed in areas of the world where there is endemic fluoride exposure due to naturally high water concentrations and high air concentrations due to open coal burning. Generally, these concerns are not applicable to areas that practice community water fluoridation.
- The adverse effects of fluoride on the human endocrine system have not been adequately researched to date.
- There are concerns about the safety of the additives used in community water fluoridation. These concerns include the possibility of the additives not completely dissociating in water (and being a health risk) and the concern for utility worker safety when handling the additives. Research indicates that the additives do completely dissociate in water and do not pose a health risk. Utility workers undergo training and certifications to protect their health as well as public health.
- There are some ethical concerns about community water fluoridation. Some view it as a forced form of mass medication, whose dosage cannot be controlled, and with no easy way to opt out. U.S. court decisions have rejected the argument that fluoride is a medication that should not be allowed in water (Burt B, Eklund S. Dentistry, Dental Practice, and the Community,6th Edition. 2005. (Elsevier Saunders: St. Louis), p. 341.). However, fluoride is a mineral and not a medication.
- The cost-effectiveness of community water fluoridation has been discussed on both sides of fluoridation arguments. Fluoridation costs large utilities' customers less than $1 annually per customer. The benefits have been estimated to be about $30 per customer annually in cost savings (per person) associated with caries treatment (U.S. Department of Health and Human Services Federal Panel on Community Water Fluoridation 2015).

Additional Resources

- Cornwell, D.A, McTigue, N.E, and S.Hayes. 2015. State of the Science: Community Water Fluoridation. Denver, CO: Water Research Foundation. 48 pages.
- Centers for Disease Control and Prevention site: http://www.cdc.gov/fluoridation/index.htm.
- Environmental Protection Agency website: http://water.epa.gov/drink/contaminants/basicinformation/fluoride.cfm
- American Dental Association's website: http://www.ada.org/en/public-programs/advocating-for-the-public/fluoride-and-fluoridation
- American Water Works Association website: http://www.awwa.org/legislation-regulation/regulations/chemical-contaminants/fluoride.aspx
- National Academy of Sciences. 2006. Fluoride in Drinking Water: A Scientific Review of EPA's Standards. Washington D.C.: The National Academies Press. http://www.nap.edu/catalog/11571.html

Debating WATER FLUORIDATION Before Dr. Strangelove

Catherine Carstairs, PhD

In the 1930s, scientists learned that small amounts of fluoride naturally occurring in water could protect teeth from decay, and the idea of artificially adding fluoride to public water supplies to achieve the same effect arose. In the 1940s and early 1950s, a number of studies were completed to determine whether fluoride could have harmful effects. The research suggested that the possibility of harm was small. In the early 1950s, Canadian and US medical, dental, and public health bodies all endorsed water fluoridation. I argue in this article that some early concerns about the toxicity of fluoride were put aside as evidence regarding the effectiveness and safety of water fluoridation mounted and as the opposition was taken over by people with little standing in the scientific, medical, and dental communities. The sense of optimism that infused postwar science and the desire of dentists to have a magic bullet that could wipe out tooth decay also affected the scientific debate. (*Am J Public Health*. 2015;105:1559–1569. doi:10.2105/AJPH.2015.302660.)

IN THE MOVIE DR. STRANGELOVE, General Ripper claimed that water fluoridation was destroying "our precious bodily fluids"—a reference to the claim that water fluoridation was a conspiracy designed to weaken US willpower and make the country susceptible to a Communist takeover. Although there were occasional references to a Communist conspiracy in the antifluoridation movement in the United States and Canada, this was not a common feature of the debate. More commonly, opponents believed that they should not have to take medicine against their will. Much of the opposition focused on the possible health risks.[1] As communities across the United States and Canada debated whether to add fluoride to their water supply in the 1950s and 1960s, fluoride proponents claimed that there was no legitimate scientific opposition to fluoride, but in fact, in the late 1940s and early 1950s there was a significant debate over the merits of fluoridation within the scientific, medical, and dental communities.[2] By the late 1950s, this opposition had all but disappeared, leaving behind a small number of doctors, dentists, and scientists who continued their campaign primarily in the public domain. Fluoride proponents dismissed them as cranks and quacks, although their views had a significant impact on antifluoridation referendums in communities across the United States and Canada.[3] In this article, I explore why opposition to water fluoridation was quickly relegated to the fringes, at least within the scientific, medical, and dental communities.[4] First, evidence regarding the safety and effectiveness of water fluoridation mounted quickly, although there were still some significant gaps in knowledge. Second, dentists were eager to have a magic bullet that would enhance their professional prestige, so they promoted it heavily. Finally, the enormous optimism and sense of possibility that informed postwar US science and public health made the scientists and doctors working on fluoridation quick to reject the

possibility of potential side effects. By the early 1950s, long before the early trials had been completed, most dentists, doctors, and biochemists agreed that water fluoridation would save children's teeth without harming anyone else. Most of those who had spoken out against fluoridation in the late 1940s and early 1950s either changed their minds in light of the growing evidence in favor of fluoridation or quietly turned their attention to other topics.

What makes this story so interesting is that the benefits of fluoridation do not seem to be as great as was initially touted by proponents. Today, controlled studies show that fluoridation reduces cavities by approximately 15% to 35%, far less than the two thirds reductions claimed by researchers and public health promoters in the 1950s and 1960s.[5] There are several reasons for this. First, cavity rates have plummeted in both fluoridated and unfluoridated communities. It is unclear exactly why children get fewer cavities than they did 60 years ago. Fluoridated toothpastes and better dental care undoubtedly play a role.[6] (Early fluoride researchers believed that the effects were systemic, whereas today most researchers believe that the effects are predominantly topical, making fluoridated toothpaste a more effective intervention than researchers thought it would be in the 1950s and 1960s.[7]) Some have argued that the extensive use of antibiotics in childhood has reduced tooth decay, that high-fructose corn syrup is less cariogenic than sucrose, or that better living conditions have improved dental health.[8] Even if communities are not fluoridated, fluoridation might play a role in the decrease in tooth decay as those of us living in countries with widespread fluoridation consume fluoridated products through packaged beverages regardless of whether we live in fluoridated communities. Moreover, some of the early fluoridation studies had methodological problems, which may have exaggerated their benefits. Determining whether a tooth is decayed is somewhat of a subjective exercise even when x-rays are used. Most of the early studies did not use x-rays or used them only partially. The early studies were also not blinded; everyone knew which community was fluoridated and which community was not.[9] There is also growing concern about dental fluorosis (tooth stains caused by excessive fluoride) despite the relatively low levels of fluoride used in community water fluoridation programs.[10]

EARLY HISTORY OF WATER FLUORIDATION

The history of water fluoridation began in the early 20th century when Fred McKay began practicing dentistry in Colorado Springs, Colorado. Many of his patients had ugly brown stains on their teeth. He eventually discovered that the stain also occurred in the Rocky Mountains as well as in Texas, Italy, and Portugal. In the early 1930s, two researchers, more or less simultaneously, discovered that the stain was caused by fluoride in the water supply. Margaret Smith, a biochemist at the University of Arizona, created mottled teeth (or dental fluorosis) in rats by feeding them fluoridated water.[11] H.V. Churchill, the chief chemist for the Aluminum Company of America, discovered that the water in Bauxite, Arkansas, which had experienced considerable trouble with mottled teeth since its water supply had been changed in 1909, had a high level of fluoride.[12] McKay arranged for other communities with a high degree of mottling to send water samples to Churchill for testing. All of the water tested high in fluoride.

At first, fluoride (or fluorine as it was referred to in many early studies) was seen as a problem.[13] In severe cases, the stain was disfiguring, and the teeth were brittle and difficult to repair. In the 1930s, a dentist with the US Public Health Service, H. Trendley Dean, began a widespread study of fluoride and tooth mottling to determine how high the level of fluoride in the water could be before it damaged teeth.[14] The Public Health Service hoped that communities with high levels of fluoride in the water could switch their water supply or reduce the fluoride within it. A number of researchers, including Smith and her husband H.V. Smith, began working on filters that could remove fluoride from water.[15] In the course of his study, Dean discovered that at lower levels fluoride seemed to have a protective effect. In 1938, he published an article showing that children in places with one part per million of fluoride in their water had less tooth decay than children in communities without it. He suggested that artificially adding fluorides to the water supply might reduce tooth decay and advised that more research be done.[16] Over the next few years, additional research showed that cities with naturally fluoridated water had lower rates of cavities than cities that lacked fluoride in their water supply. A large number of researchers also investigated the impact of dietary

fluoride on the teeth of rats. Most showed a substantial reduction in caries.[17]

RESEARCH ON THE EFFECTS OF FLUORIDE IN THE 1940S

By 1942, the US Public Health Service was considering a study that would artificially add fluorides to a city's water supply. But first they needed to make sure that fluorides would not cause any harm. There were several important issues. First, would fluoride have systemic effects on the body? Everyone recognized that high levels of naturally occurring fluorides led to tooth mottling—was there any possibility that it would affect the body in other ways? Fluoride accumulates in bones more than it does in teeth, so much of the research focused on bone health. Up to this point, Danish physician Kaj Roholm was the world's leading expert on fluoride. In the 1930s, Roholm began an extensive study of cryolite workers in Copenhagen. Cryolite is an unusual mineral used in glass and mineral production; it contains significant amounts of fluoride. He found that the vast majority of workers had some degree of osteosclerosis and a significant percentage (20.5%) had moderate or great reductions in the mobility of their spines. In the worst cases, workers could no longer bend down to pick up items from the floor. In addition, 81% of the workers complained of gastric symptoms and 51% of respiratory or circulatory problems.[18] As a result of Roholm's study, bone health became the primary concern of fluoride researchers, but some researchers were also concerned about the impact of fluoride on enzymes and on the thyroid.[19]

Two articles published in 1937 revealed cases of crippling fluorosis in Southern India.[20] Historian Christopher Sellers argued that the early fluoride researchers failed to take the Indian evidence seriously. In fact, they did examine the Indian evidence, but the most extensive article on fluorosis in India, published in 1940, argued that malnutrition was a significant complicating factor (there had been severe famines in the region), and the US researchers did not believe that the situations were comparable.[21] A US article published in 1941 showed that people living in communities with high levels of naturally occurring fluorides in their water showed no signs of sclerosis.[22] Within the US Public Health Service, Frank McClure, the chief of the Laboratory of Biochemistry, began investigating the ability of the body to excrete fluoride and the accumulation of fluoride in body tissues, particularly skeletal tissue. Other researchers, most notably Willard Machle and Harold Hodge, carried out similar investigations. They concluded that the body eliminated most of the fluoride and that there was no relationship between bone fractures and fluoride consumption. Fluoridated water also did not affect height or weight. Most of the research, however, was done on younger men, so there was little sense of what the impact of fluoride might be on older populations. Moreover, as McClure admitted,

> epidemiological studies of the non-dental effects of fluorine . . . are extremely few in number and very limited in scope.[23]

Most researchers dismissed the mild mottling caused by low levels of fluoride in the water, but not everyone concurred. In 1942, Margaret and H.V. Smith published a scathing critique of water fluoridation. They argued that although mottled teeth might be initially resistant to decay, they "are structurally weak, and that unfortunately when decay does set in, the result is often disastrous."[24] They studied a community in St. David, Arizona, where the water contained somewhere between 1.4 and four parts per million of fluoride. By their mid-20s, more than 50% of the population of St. David was wearing dentures. Margaret and Smith warned,

> The range between toxic and non-toxic levels of fluorine ingestion is very small. Any procedure for increasing fluorine consumption to the so-called upper limit of non-toxicity would be hazardous.[25]

In short, by the mid-1940s, an increasing number of studies had demonstrated that fluoride was effectively excreted by the body and the apparent healthfulness of naturally fluoridated communities relieved many people's concerns. But scientific consensus had not yet been achieved. In 1944, the long-standing editor of the *Journal of the American Dental Association*, L. Pierce Anthony, opposed water fluoridation, saying that "sodium fluoride is a highly toxic substance"[26] and that we did not yet know enough about the impact it might have on bones or other tissues and that there was evidence that drinking water with as little as 1.2 to 3.0 parts per million of fluoride had caused osteosclerosis, spondylosis, osteoporosis, and goiter. He concluded that the potential benefits of reducing dental decay in children were smaller than the risk of "producing such serious systemic disturbances."[27] Two months later,

Anthony issued an addendum indicating that the original editorial had been misinterpreted. He maintained that dentists needed to keep in mind the "possibility of harm" but that there was "abundant evidence" that fluoride reduced cavities and asserted the fluoridation study being planned for the state of New York was fully justified.[28] Anthony then retied as editor of the journal. Was Anthony pushed out of the editorship because of his negative editorial? This is possible, but it seems more likely that at 68 years old he was ready to retire.[29] Regardless, the change in editors represented a significant shift in the conversation; dental researchers were increasingly optimistic about the possibilities of water fluoridation and were keen on promoting it. In 1945, the US Public Health Service, the state of New York, and the city of Brantford, Ontario (soon to be assisted by the Canadian Department of Health) began studies of controlled fluoridation. Although some people still expressed concern about the potential side effects, seven years of research had not resulted in any definite evidence of harm, at least in the US context. (The one exception, perhaps, was the research the Smiths conducted on the fragility of mottled teeth, but their findings had not been confirmed by other researchers, and the community in question had a much higher rate of fluoride in its water than was being contemplated through controlled fluoridation.)

PROMOTING WATER FLUORIDATION

The mid-20th century has often been regarded as the "golden age" of US medicine: infant mortality had plummeted, life expectancy had increased, the introduction of new vaccines had significantly reduced infectious disease, and new drugs promised to combat bacterial infections.[30] Infused with optimism about what postwar science and medicine could accomplish, some dentists and public health officials used the beginning of controlled trials to launch a concerted campaign in favor of fluoridation. Historian Donald McNeil has described the crusade led by John G. Frisch, a Madison, Wisconsin, dentist who was such an enthusiastic promoter of fluoride that he provided his children with fluoridated water that he mixed at home. He labeled the water that came out of the taps in his home as "poison." When his daughter developed a mild form of dental fluorosis, he eagerly displayed her damaged teeth across the state. Together with Frank Bull, dental health officer at the State Board of Health, he campaigned for fluoridation across the United States, but especially in Wisconsin, where more than 50 communities had fluoridated their water by 1950. Frisch was a dentist, not a researcher, and he had little patience for the detailed, careful studies being conducted by the US Public Health Service. When several biochemists at the University of Wisconsin objected to the fluoridation of Madison's water supply in 1947, asserting that fluoride tablets would be a better solution, Frisch claimed that they "didn't know a fluorosed tooth from a bed pan."[31] Indeed, as both Ruth Roy Harris and McNeil argued, scientists at the US Public Health Service were reluctant to endorse water fluoridation in 1950 but were ultimately overwhelmed by pressure from the state dental directors.[32]

Why were the state dental directors so eager to have fluoridation? First, the war had revealed the extent of dental disease in the United States. To join the armed services, men had to have six opposing teeth in their upper and lower jaws; in 1941, almost 10% of recruits were rejected for this reason alone. Dental defects were the leading cause of rejection. Eventually, the Selective Service began a dental program to upgrade the dental health of the men and render them eligible for service.[33] The US Office of Education, the US Public Health Service, and the American Dental Association joined forces to improve dental health among high school students so that they would be fit for service upon graduation.[34] Although today we might think of dental caries as a relatively minor problem, if untreated, as many people's cavities were during the mid-1900s, they can led to tooth loss, mastication problems, malnutrition, and infectious complications. In the early 1950s, two public health researchers stated that on average young men between the ages of 20 and 35 years had already lost an average of 4.2 teeth and that 90% of them were in need of bridges or full or partial dentures.[35]

Public health dentists were convinced that it would be impossible to meet the backlog of necessary dental care. Although they knew that significant improvements in dental health could be achieved by filling caries, this was too expensive to be undertaken on a wide scale.[36] There was also a significant shortage of dentists. In 1944, Henry Klein, the senior

dental officer in the US Public Health Service, suggested that the White population of the United States required at least double the number of dentists currently in practice to meet dental needs.[37] There was great hope that fluoride would provide the solution to both the growing problem of dental decay and the shortage of dental manpower.[38] Another advantage of fluoride is that it would reduce the amount of dental care required by children. Despite a growing number of dentists in the post-World War II era whose practice focused on children, there were still many dentists who dreaded the appearance of the screaming, uncooperative child.[39] Fluoridation could alleviate this problem by making significant improvements in children's dental health.

As Alyssa Picard has also argued, fluoridation was connected to the issue of professional prestige.[40] At the turn of the century, Painless Parker was still traveling across the United States with placards that promised tooth extraction along with circus tricks. In the 1910s and 1920s, the theory of focal sepsis—the idea that infections in one part of the body led to infections in another—began to shift the image of dentists from mechanics to practitioners of scientific medicine. It also resulted in an explosion of unnecessary tooth extractions.[41] In the interwar years, most dental schools revised their curriculum and extended the amount of time required to complete a degree. Even still, research in dentistry was limited. In the 1920s, there were only a dozen dental schools in the United States that conducted research. The National Institute of Dental Research had only been created in 1948. By 1961, total spending on dental research by the federal government, universities, philanthropy, and industry only amounted to slightly over six million dollars.[42] Few dental researchers had a PhD.[43] Dentists continued to worry about the prestige of their profession. In 1955, for example, Leroy Johnson, the former dean of the Harvard School of Dental Medicine, wrote that although American dentists were the best in the world in creating bridges and plates and restoring teeth, this work was too expensive, and there were not enough dentists to meet the demand. He complained that reveling in "repair" compromised the status of dentistry as a profession. To gain respect, dentists needed to improve their training in the basic sciences, cooperate with medical schools and do more research, and serve more people.[44] Fluoridation was based on solid research and stressed prevention over cure; many believed it to be a panacea for dentistry's image problem.

Fluoridation also seemed like a boon to frustrated dentists who believed that the public could not be trusted to brush their teeth or eat less sugar. Francis Arnold, an important fluoridation proponent within the National Institute of Dental Research, dismissed dietary interventions as unlikely to have much success.[45] David Ast, the director of the New York State Bureau of Dental Health and leader of the Newburgh fluoridation experiment, said that there were two sure-fire methods of preventing tooth decay—reducing sugar consumption and brushing teeth after every meal. But, he added, these methods were "unrealistic" because "few people will adopt them conscientiously."[46] Francis Bull, the state dental director in Wisconsin, argued that cavities could be decreased by practicing good oral hygiene, restricting sugar consumption, and improving diet, but he did not think that the public was likely to do these things. Fluoride, in his view, offered the first real preventive for dental caries.[47]

CONTROLLED STUDIES AND ONGOING OPPOSITION

By the early 1950s, the controlled studies were producing impressive results. After five years, cavities in Newburgh were down by 30%, with more pronounced improvements among the six-year-olds who had drunk fluoridated water for most of their lives.[48] Still, not everyone was convinced. In 1950, James Delaney, a Democratic congressman, established a committee to investigate the use of chemicals in foods and cosmetics. Many people concerned about food additives and pesticide use also opposed water fluoridation, and the Delaney committee also examined water fluoridation.[49] In the years to come, the antifluoridation movement would make extensive use of these committee hearings. The committee invited scientists from the US Public Health Service and the National Institute of Dental Research, including Bruce Forsyth (Assistant Surgeon General and Chief Dental Officer, Public Health Service), Trendley Dean (National Institutes of Health), and John

"Fluoridation was based on solid research and stressed prevention over cure; many believed it to be a panacea for dentistry's image problem."

Knutson (Public Health Service). Forsyth explained that fluoridation had been more thoroughly studied than any other public health measure and that it reduced cavities by two thirds. Knutson and Dean described the studies that had been carried out by the National Institute of Dental Research. They also provided the commission with a bibliography pertaining to the safety and effectiveness of fluoridation and copies of the research articles produced by the Public Health Service.[50]

The committee also invited several opponents. The first was Robert S. Harris, a nutritionist at the Massachusetts Institute of Technology. During World War II, he worked on developing nutrient-enriched food products that could be used among undernourished populations. In 1950, in collaboration with a dentist from Tufts University, he began researching diets and dental caries. These studies convinced him that phosphate and other minerals played an important role in dental health.[51] At the hearings, he introduced a metaphor that would subsequently be used by many antifluoride activists. If you have a headache and take aspirin and the headache goes away, that does not mean that the headache was caused by an aspirin deficiency. The fact that fluoride reduced cavities did not mean that humans required fluorides. Instead, we should be investigating the cause of dental decay.[52] He was concerned about the long-term effects of fluoride consumption, testifying as follows:

> The literature indicates that fluorine at 1 part per million in water supplies can effectively reduce the incidence of caries in children in certain areas. The literature does not indicate, however, that the continued ingestion of fluorine at this level is harmless.[53]

He believed, as did most dental researchers, that dental decay was multicausal and that the emphasis on a single solution was misguided. Harris went on to have a successful career in dental caries research and always emphasized the multiple causes of dental decay.[54]

Another opponent who appeared before the Delaney Commission was Alfred Taylor, a biochemist at the University of Texas who specialized in cancer research. Taylor discovered that rats that were fed fluoridated water died earlier than those that were fed unfluoridated water. Although this work had not yet been published when he testified, it was published in 1954.[55] The US Public Health Service had heard about his results in advance of the hearings, and in 1951, they sent Dean and Howard Andervont, chief of the biology section of the National Cancer Institute, to investigate. They discovered that the rats were consuming very high amounts of fluoride in their food, which they felt invalidated the results of his experiment. In addition, the sample sizes were small, and the observed differences fell within the normal range of variability.[56]

The Smiths also testified against water fluoridation. Margaret Smith began by stating that it was clear that fluoride played an important role in diminishing tooth decay. She expressed her respect for the research carried out by the US Public Health Service and believed in their results, but she argued that tooth mottling could occur at low levels of fluoride and that the psychological effects of having damaged teeth could be severe. She pointed out that people drink variable amounts of water, especially children, making it difficult to control the dose. She argued that the topical application of fluoride held greater promise and took the view that better nutrition and teeth-cleaning habits might be better ways to reduce tooth decay. By this point, she had resigned from her position at the University of Arizona to care for her children, but her husband continued their work. At the hearings, H.V. Smith argued that even at one part per million a significant number of children would have mottled teeth. The Smiths' views were informed by the fact that they lived in Arizona, where several communities had high levels of naturally occurring fluoride in their water supply and where water consumption was higher than average because of the heat, thus producing a greater degree of mottling even at recommended levels of fluoride. Indeed, scientists at the Public Health Service agreed that the amount of fluoride in the water needed to be adjusted for climactic conditions. Smith also worried about the effects of fluoride on people with inadequate renal function and the fact that the amount of fluoride in food varied widely, making it very difficult to control the dose.[57] In 1952, in short, there were still highly respected scientists expressing concerns about fluoridation.

CHANGING NATURE OF OPPOSITION TO WATER FLUORIDATION

By 1954, when another set of hearings were held in Washington, DC, scientists who had expressed concerns about water

fluoridation just a few years previously were either not asked to appear or chose not to appear. In 1954, H.V. Smith publicly retracted his opposition after visiting Newburgh, New York. He stated that the mottling in Arizona had to do with climatic differences.[58] Alfred Taylor did not appear before the hearings in 1954, although in subsequent work he continued to argue that fluoride might increase tumor growth. There were doctors and dentists who testified against fluoridation at these hearings, but for the most part they did not have the same prestige as the people who appeared before the Delaney committee two years earlier. Leading the crusade in 1954 was Seattle radiologist Frederick Exner. Exner had been president of both the local Anti-Tuberculosis League and the State Radiological Society, but he had no record as a researcher. He complained that the leading fluoridation scientists were all just quoting and citing one another. He pointed to errors in McClure's study of fluoride excretion, argued that children consume widely varying amounts of water, suggested that mottling was more severe than Dean's studies indicated, and asserted that dentists varied widely in the number of cavities they found. He condemned fluoridation as "totalitarian medicine" and described the fluoridation trials at Newburgh and Grand Rapids as a "flagrant violation of the most sacred laws of God and man."[59] Although a number of Exner's concerns were similar to those expressed by those at the 1952 hearings, his passionate opposition to fluoridation, his attacks on the honesty and professionalism of fluoride scientists, and his scattered use of evidence diminished the quality of his testimony. It was clear he had an axe to grind, and it was easy for people sympathetic to fluoridation to dismiss his views.

The other leading opponent was George Waldbott, an allergist from Detroit, Michigan. Waldbott did not attend the hearings, but he did send a statement. Waldbott, like Exner, was a respected physician—he was vice president of the American College of Allergists and had published more than 100 articles, although most were case studies.[60] He feared that one part per million might not be safe for everyone in the community, especially people with allergies or those with impaired kidney function. He worried that mottled teeth would not remain healthy over the long term and pointed out that it would be extremely difficult to trace the symptoms of fluoride poisoning because many of the symptoms (joint pain, malaise) were vague and could result from any number of conditions. He asserted that the best dental journals refused to publish anything with an antifluoride stance and complained that the American Medical Association's endorsement of fluoridation had been rushed through the House of Delegates. Again, his allegation that there was some nefariousness on the part the profluoridation forces (which has been a consistent aspect of the antifluoridation discourse ever since) weakened his argument in the view of many dentists and research scientists who believed that researchers like Dean, McClure, and Hodge were fair, evenhanded scientists. Moreover, some of the concerns about the potential long-term effects of fluoride on the body had been alleviated by a long-term study of Bartlett, Texas, which had approximately eight parts per million of fluoride in its water, and Cameron, Texas, which had approximately 0.4 parts per million of fluoride in its water. Long-term residents of both communities had medical histories, physical and dental examinations, and blood and urine analyses taken in 1943 and 1953. The study showed that there were no significant differences in the health of the two populations other than a high rate of dental fluorosis in Bartlett.[61]

In the years to come, Exner and Waldbott would become the leading scientific voices in the antifluoridation movement. Exner and Waldbott's antifluoride work was widely accessible. In 1957, they published *The American Fluoridation Experiment* with a mainstream press. Written in clear, passionate prose, Exner and Waldbott argued that the fluoride experiment marked an unprecedented expansion of the powers of public health officials into the lives of the public, that it would provide entire communities with a medication that would only benefit a few, and that more research needed to be done because it was likely that fluorides would accumulate in the body and cause damage to bones, teeth, and joints, as well as gastric distress. They argued that the best way to reduce cavities was to cut sugar consumption and asserted that the Sugar Research Foundation was a leading force behind fluoride promotion. In a chapter entitled "Big Brother Knows Best: Budding Authoritarianism in Our Public Health Service," Exner argued that bureaucrats were interested in increasing their sphere of authority while the aluminum and fertilizer companies who produced fluoride were eager to

increase their profits.[62] In 1955, Waldbott and his wife started the *National Fluoridation News*, a tabloid-style newspaper that favored conspiratorial headlines, shocking revelations of profluoridation tactics, scathing denouncements of fluoride's dangers, and funny cartoons.

In this increasingly fractious atmosphere, it became more difficult to engage in the debate on the opposition side without losing respect in the scientific community. One of the few who successfully walked the line was Clive McCay, a nutritional researcher at Cornell University.[63] McCay was best known for his research on how underfeeding rats led to significantly longer lifespans. He and his wife Jeanette created Cornell bread—a whole wheat flour bread enriched with high-protein soy flour, wheat germ, and milk solids that was distributed by food cooperatives. He also tried to convince the government of New York to tax carbonated beverages. (In short, he had much in common with the natural food activists who became some of the leading opponents of water fluoridation.) He had done some research on fluorides ever since he started at Cornell in 1927, although it was never the major focus of his research. He was uneasy about the potentially toxic effects of fluorides and worried that researchers had not followed people or animals for a long enough period of time to determine the long-term effects of fluoride in the body.[64] He expressed respect for the leading fluoridation researchers but believed that water fluoridation was moving ahead too quickly.[65] In 1953, his opposition was reinforced when he spent a sabbatical year in Switzerland, where a scientific committee had rejected fluoridation. Indeed, water fluoridation never became widespread in Europe. He believed that the Swiss investigations showed that there was more than one way of understanding the fluoride science. In 1954, when fluoridation was under consideration in Ithaca, New York, where Cornell is located, he gave a radio talk against the procedure. He argued that fluoride did improve teeth and that the leading researchers in the field were "honest, critical, and reliable men" but that he was still not convinced that long-term consumption of fluoride would not damage the thyroid or kidneys. He also expressed concern about the impact fluoride might have on aquatic life. He felt that fluoridated sugar would be a better option because sugar was the leading cause of dental decay.[66] In 1956, one of his graduate students completed a PhD on the long-term effects of fluoride consumption on white rats. The thesis concluded that fluoride accumulated in bones, even at one part per million, and that this accumulation had a serious impact on their teeth and likely on their kidneys as well. As a result, McCay became more willing to share his views, although he never became an antifluoridation crusader. In a 1956 letter, he claimed that he was opposed to water fluoridation but that "I have decided to keep out of the controversy" because "I did not think it has been handled in a scientific manner." He complained that "it is being considered as a panacea by one party and a poison by another."[67] In 1957, he became one of the scientists to sign the Statement on Fluoridation by the Medical–Dental Ad Hoc Committee on Evaluation of Fluoridation. Indeed, McCay's reasoned opposition to fluoride was unusual in a debate that was so fiercely divisive. By the late 1950s, there was little room for doubts or uncertainties on either side.

CONCLUSIONS

As communities across the United States and Canada debated the possibility of adding fluorides to the water supply in the 1950s and 60s, proponents regularly stated that dentists, doctors, and scientists were unanimous in their approval.[68] This was not true. There were dentists, doctors, and scientists who opposed fluoridation, but as the debate grew more heated, and the scientific evidence mounted in favor of fluoridation, the experts who had initially expressed hesitation either changed their mind or removed themselves from the debate, leaving the opposition largely in the hands of a few crusaders. The extreme views expressed on both sides of the debate created a hostile atmosphere for researchers who were opposed to water fluoridation. Eventually, fluoride opponents would establish their own journal, *Fluoride*, which exclusively published articles critical of fluoridation.[69] Most scientists doing research in the field were very clearly identified as profluoridation or antifluoridation, with confusing ramifications for the public debate. Who should members of the public believe? The reassuring pamphlets that told the public that fluoridation was safe, effective, thoroughly tested, and endorsed by experts? Or the far more lengthy and detailed books, leaflets, and pamphlets distributed by the antiforces that asserted that fluoride might lead to joint problems, heart and kidney disease,

and cancer? The fact that the scientists and doctors appeared to be so divided may have contributed to the perception that the experts were hiding evidence of possible harm. As the most thorough review of fluoridation debates showed, the public felt they were being asked to decide on the safety of fluoridation during referendums and thus often chose caution.[70]

At the same time, the fact that dental leaders and public health officials believed that fluoridation had been proven safe (and dismissed the few opposing researchers as cranks) meant that little money or resources were devoted to fluoridation research after the 1950s. Although research on the safety and effectiveness of fluoridation continued, the quality was often poor. In 2000, when the University of York published the most extensive systematic review of fluoridation ever completed, the authors expressed dismay at the quality of much of the fluoride research that had been done in the preceding decades. Most of the studies they reviewed were published after 1966. They divided the studies into evidence levels A, B, and C, with A representing the highest-quality studies. On the question of whether water fluoridation prevented cavities, they found 26 studies. There were no randomized controlled trials, and none of the 26 studies was characterized as being in the A category of evidence. On the question of whether fluoride had negative effects, the studies were of equally dismal quality. All studies of the impact of fluoride on bone health were ranked as evidence level C. All but one of the studies on dental fluorosis were ranked as evidence level C.[71] After more than 70 years of investigation, there are still questions about how effective water fluoridation is at preventing dental decay and whether the possible risks are worth the benefits. Although water fluoridation undoubtedly did improve the dental health of many children in the 1960s and 1970s, fluoride proponents were perhaps too hasty in declaring that community water fluoridation was the best (or only) solution for dental decay. A less fractious debate might have encouraged a more open discussion in which the possible harms could have been more fully discussed and other options, such as providing fluoridated toothpaste, more fully considered. ■

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Endnotes

1. This article focused on the United States and Canada, where much of the early science and debate over water fluoridation took place. European countries (with the exception of the United Kingdom, Ireland, Spain, and Serbia) do not fluoridate their water. Fluoridation is also widespread in Australia, New Zealand, and some South American countries, including Brazil and Chile.

2. For a review of the political debates over water fluoridation, see G. Reilly, "'This Poisoning of Our Drinking Water': The American Fluoridation Controversy in Historical Context, 1950–1990." PhD diss., George Washington University, 2001; C. Carstairs and R. Elder, "Expertise, Health and Popular Opinion: Debating Water Fluoridation," *Canadian Historical Review* 89, no. 3 (2008): 345–371.

3. Review of fluoridation referendums can be found in D.R. McNeil, *The Fight for Fluoridation* (New York, NY: Oxford University Press, 1957); R.L. Crain, E. Katz, and D.B. Rosenthal, *The Politics of Community Conflict: The Fluoridation Decision* (Indianapolis: Bobbs-Merrill, 1969); and C. Sellers, "The Artificial Nature of Fluoridated Water: Between Nations, Knowledge and Material Flows," *Osiris* 19 (2004): 182–200.

4. One of the few works to examine the scientific debate over water fluoridation is B. Martin, *Scientific Knowledge in Controversy: The Social Dynamics of the Fluoridation Debate* (Albany, NY: State University of New York Press, 1991). However, this sociological study examines the contemporary scientific debates rather than the history of the debate.

5. M. McDonagh, P. Whiting, M. Bradley, J. Cooper, A. Sutton, I. Chestnutt, K. Misso, P. Wilson, E. Treasure, and J. Kleijnen, "A Systemic Review of Public Water Fluoridation NHS Centre for Reviews and Dissemination," http://www.york.ac.uk/inst/crd/CRD_Reports/crdreport18.pdf (accessed March 26, 2015); D. Locker, *Benefits and Risks of Water Fluoridation: An Update of the 1996 Federal Provincial Subcomittee Report* (Toronto, ON: Community Dental Health Services Research Unit, 1999); Australian Government, National Health and Medical Research Council, *Fluoridation: A Systematic Review of the Efficacy and Safety of Water Fluoridation* (Canberra, Australia: National Health and Medical Research Council, 2007).

6. H.G. Petersson and D. Brathall, "The Caries Decline: A Review of Reviews," *European Journal of Oral Sciences* 104 (1996): 436–443; D.H. Leverett, "Fluorides and the Changing Prevalence of Dental Caries," *Science* 217 (1982): 26–30; M. Diesendorf, "The Mystery of Declining Tooth Decay," *Nature* 322 (1986): 125–129.

7. V.C.C. Mariho, J.P.T. Higgins, S. Logan, and A. Sheiham, "Fluoride Toothpastes for Preventing Dental Caries in Children and Adolescents," *The Cochrane Collaboration* 1 (2009): CD002278.

8. R.A. Freeze and J.H. Lehr, *The Fluoride Wars: How a Modest Public Health Measure Became America's Longest-Running Political Melodrama* (Hoboken, NJ: John Wiley and Sons, 2009): 191–212; P. Nadanovsky and A. Sheinam, "Relative Contribution of Dental Services to the Changes in Caries Levels of 12 Year Old Children in 18 Industrial Countries

"As the most thorough review of fluoridation debates showed, the public felt they were being asked to decide on the safety of fluoridation during referendums and thus often chose caution."

in the 1970s and Early 1980s," *Community Dentistry and Oral Epidemiology* 23 (1995): 331–339.

9. Of the first three studies in Grand Rapids, MI, Newburgh, NY, and Brantford, ON, none initially used x-rays. Newburgh started using x-rays in 1949, whereas Grand Rapids did some examinations by x-ray beginning in 1946. See F. McClure, *Water Fluoridation: The Search and the Victory* (Bethesda, MD: US Department of Health, Education, and Welfare, 1970), 119, 124. In a 1941 study of eight examiners using a mirror and explorer found substantial differences in the number of cavities found—on average there was a 5.8 carious surface difference. Thus, for example, in the case of one patient, the first examiner found 21 carious surfaces, whereas the third examiner found only 8. See D. Radusch, "Variability of Diagnoses of Incidence of Dental Caries," *Journal of the American Dental Association* 28 (1941): 1959–1961. In a review chapter, Burt and Eklund described the early fluoride studies as "pioneering" but added as follows: "Sampling methods and dental examiners tended to vary from one year to another, thereby risking bias and unnecessary random error. Methods of statistical analysis, by today's standards were crude." See B.A. Burt and S.A. Eklund, *Dentistry, Dental Practice, and the Community, 4th Edition* (Philadelphia, PA: W.B. Saunders, 1992), 158.

10. D. Locker, *Benefits and Risks of Water Fluoridation*; S. Erdal and S.N. Buchanan, "A Quantitative Look at Fluorosis, Fluoride Exposure, and Intake in Children Using a Health Risk Assessment Approach," *Environmental Health Perspectives* 113 (2005), no. 1: 111–117.

11. M.C. Smith, E.M. Lantz, and H.V. Smith, "The Cause of Mottled Enamel," *Science* 74 (1931), no. 1914: 244.

12. H.V. Churchill, "Occurrence of Fluorides in Some Waters of the United States," *Industrial and Engineering Chemistry* 23 (1931), no. 9: 966–968. An excellent account of the McKay's efforts can be found in McNeil, *The Fight for Fluoridation*, 4–18.

13. When the chemical fluorine is in water it will always be ionized and therefore will exist in the form of fluoride. Eventually, fluoride became the more commonly used term.

14. H.T. Dean and E. Evolve, "Further Studies on the Minimum Threshold of Chronic Endemic Dental Fluorosis," *Public Health Reports* 52 (1937): 1249–1295.

15. H.V. Smith and M.C. Smith, "Bone Contact Removes Fluorine," *Water Works Engineering* (November 19, 1937), Howard Vernon Smith File, University of Arizona Archives, Tucson, AZ.

16. D.H. Trendley, "Endemic Fluorosis and its Relation to Dental Caries," *Public Health Reports* 53 (1938), no. 33: 1443–1498.

17. H. Hodge and R.R. Sagnnaes, "Experimental Caries and a Discussion of the Mechanism of Caries Inhibition by Fluorine," in F.R. Moulton, ed., *Dental Caries and Fluorine* (Washington, DC: American Association for the Advancement of Science, 1946): 53–73.

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19. D.A. Greenwood, "Fluoride Intoxication," *Physiological Reviews* 20 (1940), no. 4: 582–616; F.J. McClure, "Nondental Physiological Effects," in *Dental Caries and Fluorine*, 88–89; W. Machle, E.W. Scott, and E.J. Largent, "The Absorption and Excretion of Fluorides," *Journal of Industrial Hygiene and Toxicology* 24 (1942), no. 7: 199–204; W. Machle and E.J. Largent, "The Absorption and Excretion of Fluoride," *Journal of Industrial Hygiene and Toxicology* 25 (1943), no. 3: 112–123; F.A. Smith, D.E. Gardner, and H.C. Hodge, "Investigations on the Metabolism of Fluoride," *Journal of Dental Research* 29 (1950), no. 5: 596–600; G.J. Cox and H. Hodge, "The Toxicity of Fluorides in Relation to Their Use in Dentistry," *Journal of the American Dental Association* 40 (1950): 440–451.

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32. R.R. Harris, *Dental Science in a New Age: A History of the National Institute of Dental Research* (Rockville, MD: Montrose Press, 1989): 109–110.

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Academic Press, 1969). This edited book, with 27 chapters, has very little on fluoride.

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57. US Congress, *Chemicals in Foods and Cosmetics*, 1602–1614.

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59. US Congress. House. 83rd Cong., 2nd sess. Committee on Interstate and Foreign Commerce, *On HR 2341, a Bill to Protect the Public Health from the Dangers of the Fluorination of Water* (Washington, DC: Government Printing Office, 1954): 62–86; quoted material on 83.

60. Waldbott is not mentioned in a hagiographic history of the American College of Allergists. J.A. Bellanti, "Proud of the Past: Planning for the Future, *Annals of Asthma, Allergies and Immunology* 70 (1993), no. 6: 445–461.

61. N.C. Leone, M.B. Shimkin, F.A. Arnold Jr., C.A. Stevenson, E.R. Zimmerman, P.B. Geiser, and J.E. Lieberman, "Medical Aspects of Excessive Fluoride in a Water Supply," *Public Health Reports* 69 (1954), no. 10: 925–936.

62. B. Frederick, *Exner and George Waldbott, American Fluoridation Experiment* (New York, NY: Devin-Advair Co., 1961): 118–120.

63. McCay was also a keen outdoorsman who did some of his early research on the impact of industrial water pollution on fish. See J. McCay, *Clive McCay, Nutrition Pioneer: Biographical Memoirs by His Wife* (Charlotte Harbour, FL: Tabby House, 1994): 100–101.

64. C. McCay to unknown recipient, December 13, 1951, Box 14, File: "Fluorides 1948–1952," Cornell University Archives.

65. In 1951, although he expressed concerns about the toxicity of fluoride, he told a letter-writer that "if the question of using fluorides in our local water supply arises I will not oppose it because I feel the value probably outweighs the danger." Letter from C. McCay to M. Ambrose, March 21, 1951, Box 14, File: "Beverages 1948–1952," Cornell University Archives.

66. C. McCay, "Should We Put Fluoride into the Water Supply of Ithaca, NY," to be recorded for a radio presentation, December 14, 1954, Box 14, File: "Fluoride," Clive McCay Papers, 1920–1967, Division of Rare and Manuscript Collections, Cornell University Library (hereafter Clive McCay Papers).

67. Letter from C. McCay to Dr. Hamilton B.G. Robinson, Associate Dean, The Ohio State University, March 20, 1956, Box 14, File: "Beverages 1956," Clive McCay Papers.

68. See, for example, American Dental Association, *Fluoridation Facts: Answers to Criticisms of Fluoridation* (Chicago, IL: American Dental Association, 1952), which stated that "every national health body in the United States that speaks with authority on the benefits and safety of fluoridation has adopted policies favourable to the measure"; Health League of Canada, *Fluorine: Facts…and Fancies* (n.d.) also claimed that there was unanimity of opinion among public health bodies and universities.

69. *Fluoride* is published by the International Society for Fluoride Research, a coalition of antifluoridationists. See http://www.fluorideresearch.org (accessed March 26, 2015).

70. Crain, Katz, and Rosenthal, *The Politics of Community Conflict.*

71. McDonagh et al, "A Systemic Review of Water Fluoridation."

CITY COUNCIL AGENDA ITEM

REQUESTED COUNCIL MEETING DATE 10/27/2015

Consent item: No

SUBJECT: 2016 Legislative Priority List

DEPARTMENT: City Manager

GOAL:

OBJECTIVE:

RECOMMENDED MOTION: Move to approve the 2016 legislative priorities.

SUMMARY: Each year the City identifies its legislative priorities. This provides direction for staff on what items are important to the City during the upcoming State legislative session.

In recent discussions with our lobbyist, the topics that are likely to be in the forefront of state legislators in the coming year include: Water projects, transportation infrastructure, land preservation and parks and recreation.

Project No.:	Funding Account No.:

ATTACHMENTS:

1.	Volusia County Legislative Delegation Meeting 10 16 15	Volusia County Legislative Delegation Meeting Agenda 10 16 15.pdf
2.	City of Port Orange Legislative Program 2016	City of Port Orange Legislative Program 2016.pdf

Rosen, Alan
Donahue, Kent
Johansson, M. Jake

Created/Initiated - 09/22/2015
Approved - 10/01/2015
Final Approval - 10/22/2015

VOLUSUA COUNTY LEGISLATIVE DELEGATION MEETING

Senator David Simmons, Chairman

AGENDA

Friday, October 16, 2015
10:00 am to 1:00 pm
DeLand City Hall Commission Chambers
120 S. Florida Avenue DeLand, FL 32720

I. **Call to Order** – Senator David Simmons, Chairman

II. **Roll Call**

III. **Pledge of Allegiance** – Senator Dorothy Hukill

IV. **Invocation** – Representative Fred Costello

V. **Chairman's Remarks** – Senator David Simmons, Chairman

VI. **Introduction of Delegation Members**

VII. **Delegation Member Remarks**

VIII. **Election of Delegation Officers for 2016**

IX. **Local Legislation – None to discuss**

X. **Elected Officials/Local Government Presentations**

1. **The Honorable Robert Apgar** Mayor, City of Deland	Welcome to DeLand, Legislative Agenda
2. **The Honorable Robert Apgar or** **The Honorable Leigh Matusick** Mayor or Vice Mayor City of Deland	Orange Baker Post 187 Funding
3. **The Honorable Heidi Herzberg** Commissioner, City of Deltona	Volusia League of Cities Legislative Priorities

4. **The Honorable Brandon Young**
   Vice-Mayor, City of South Daytona
   — Legislative Priorities

5. **The Honorable Pat Patterson**
   Vice-Chair, Volusia County Council
   — Legislative issues important to Volusia County

6. **The Honorable Michael "Jake" Johansson**
   City Manager, Port Orange
   — Port Orange's Key Community Issues and Budget Requests

7. **The Honorable James Hathaway**
   Mayor, City of New Smyrna Beach
   — Isleboro Stormwater Submittal

8. **The Honorable Terence Perkins**
   Chief Judge, Seventh Judicial Circuit Court
   — State Courts System

9. **The Honorable Bill Partington**
   Deputy Mayor, City of Ormond Beach
   — Legislative Priorities

10. **The Honorable Deb Denys**
    Council Member, Volusia County
    — Department of Juvenile Justice State-County Cost-share and state reimbursement to county for overbillings/overpayments

11. **Gerald Chancellor**
    Public Works Director/City Engineer
    City of Deltona
    — Future Alternative Water Supply Funding

12. **Hardy Smith**
    Government Relations Administrator,
    City of Daytona Beach
    — City of Daytona Beach Legislative Priorities

13. **Steve Burley or John Eiff**
    Economic Development Manager or
    Airport Manager
    — Sports Aviation Village

14. **Tom Russell**
    Superintendent, Volusia County
    School District
    — District Cost Differential (DCD)

15. **Linda Costello**
    Chairman, Volusia County School Board
    — Proposed legislation: Home Rule Act

XI. **Public Testimony**

16. **Joe Sullivan**
    Chief Professional Officer, Boys and Girls Clubs of Volusia/Flagler Counties
    — Boys and Girls Club State Funding

17. **Cynthia Ramirez** Executive Director, FUTURES Foundation For Volusia County Schools	Update on our programs and legislative funding requests for FUTURES Foundation and Take Stock in Children
18. **Dr. Dan Holsenbeck** Vice President, University Relations University of Central Florida	To thank the delegation for their support during the last session and ask for their continued support for the next session.
19. **Julie Shaw** CEO/President, disAbility Solutions for Independent Living, Inc.	Legislative Platform
20. **Mark Jones** CEO, Community Partnership for Children	Status of Children Welfare in Volusia
21. **Timothy Ayers** Field Organizer, American Heart Association	Healthy Food Financing Initiative - HB 153 and its companion bill in Senate
22. **Michael Putkowski** Community Life Center - Deltona	Funding/Grants for community service organizations
23. **Dr. Tom LoBasso** President, Daytona State College	Higher Education
24. **Nick Conte Jr.** Executive Director, Deland Area Chamber Of Commerce	West Volusia Priorities (2016)
25. **Lori Richards** Executive Director, PACE Center for Girls, Volusia-Flagler	Legislative Priorities
26. **Jim Cameron** VP Government Relations, Daytona Regional Chamber of Commerce	2016 Chamber recommendations
27. **Dixie Morgese** Executive Director, The Healthy Start of Flagler & Volusia Counties	Funding priorities for FY15-16 for the Healthy Start Coalition of Volusia & Flagler Counties and the Healthy Families program
28. **David Batten** Board Chair, Early Learning Coalition of Flagler and Volusia Counties (ELCFV)	State Legislative Priorities for 2015-2016

29. **Nicole Barnes**
Executive Director, AMIkids Volusia

AMIkids Volusia and the services we can provide to community youth

30. **Steven DeVane**
CEO, Duvall Homes

iBudget

31. **Susan Moor and Dorothy Lefford**
VP Gift Planning and Clinical Director
Easter Seal Society of Volusia and Flagler Counties, Inc.

Request for Autism Center of Excellence program support

32. **Robin King**
CEO/President, Career Source of Flagler Volusia

Workforce services

33. **Fr. Chris Hoffman**
Pastor, Our Lady of Hope, Port Orange

Juvenile Civil Citations Senate Bill 408

34. **Sandra Walters (constituent)**

To Be Determined

35. **MaryLou McKeon**
Senior VP, Council on Aging of Volusia County Inc.

COA 7th Judicial Public Guardian and HB 232 endorsement

36. **Sherri Rummel**
President, Halifax Business and Professional Women's Association

Economic equity, self sufficiency, and health care for women

XII. **Other Public Comments**

XIII. **Final Remarks of Delegation Members**

XIV. **Adjournment**

Appearance cards will be located near the door for members of the public who wish to speak. Speakers are asked to limit their presentations to three minutes.

City of Port Orange Legislative Program 2016

October 16, 2015

Community Budget Requests

Drainage Projects:

Virginia Avenue and Monroe Street Drainage Improvement

The Virginia Avenue and Monroe Street corridor has flooded during past storm events. The corridor is bounded in the east and west by railroad tracks and the Halifax River, and in the north and south by the streets Dunlawton Avenue and White Place. Mitigation of the flooding will include improvements to existing storm water drainage facilities and/or installation of new facilities. Engineering design is ongoing and anticipated to be completed by December 1, 2015. The design will provide alternative solutions with cost estimates to address the flooding.

Sleepy Hollow Drainage Improvement

The Sleepy Hollow subdivision is a platted 60 acre subdivision located south of Jackson Street, west of Woodlake Subdivision and north and east of Nova Road. The area has historically flooded during past storm events. Structural flooding tended to concentrate along Horseman Drive, west of Tarry Town Trail; along Tarry Town Trail, south of Horseman Drive; and Kristina Court, west of Sleepy Hollow Drive. Mitigation of the flooding will include installation new storm water drainage facilities. Engineering design is ongoing and anticipated to be completed by December 1, 2015. The design will provide alternative solutions with cost estimates to address the flooding.

Pineland Avenue and Isabelle Avenue Drainage Improvements

The existing corrugated metal pipe culvert underneath Pineland Avenue and Niver Street has deteriorated to the point that it will not support the roadway. For safety to life and property, this roadway has been closed to pedestrians and vehicle traffic. In addition, the corrugated metal pipe culvert underneath Isabelle Avenue and Niver Street is also showing signs of deterioration and is beyond its estimated life cycle.

Estimated construction cost $375,000.00

Estimated Design and permitting cost $28,427.00

Ryanwood Entrance Drainage Improvements
The Ryanwood subdivision has only one outlet, which traverses the Halifax Canal. The dual pipe culvert underneath the neighborhood's access road is collapsing and could cut off residents during a flooding event. In addition, it could block the Halifax Canal creating additional flooding.
Estimated construction cost $332,000.00
Estimated Design and permitting cost $25,650.00

Howes Street Drainage Improvements
Howes Street is located north of Commonwealth Boulevard and west of U.S. 1/Ridgewood Avenue in the Allandale area of Port Orange. Howes Street experiences standing water several times a year due to the lack of a drainage system to convey the runoff. Public Works has expended numerous hours in traffic control and pumping due to the standing water. The project consists of correcting the drainage deficiencies on Howes Street.
Estimated construction cost $450,000.00
Estimated Design and permitting cost $49,250.00

Tumblebrook Drive Drainage Improvements
Tumblebrook Drive is located in Sweetwater Hills subdivision in central Port Orange. In order to prevent flooding to the area, Public Works staff must mobilize a pump to an isolated pond, which becomes inundated during rain events to. The project will improve stormwater drainage by connecting 1,000 linear feet of 24" reinforce concrete pipe and adding additional structures and cross section of reinforce concrete pipe to existing retention pond.
Estimated construction cost $118,750.00
Estimated Design and permitting cost $36,650.00

Recreation Project:

Coraci Recreational Land Acquisition
With the recent participation increase in the city's recreational programs, acquisition of additional land for recreational facilities has been identified (CIP #201378). Measuring roughly 80 acres, the land is located north of the existing Coraci Sports Complex, 5200 Coraci Boulevard. The vision is to augment the existing facilities at the complex and thus enhance the city's ability to accommodate the growing trend in participation and to host larger tournaments for different sports. Facilities planned are three (3) baseball fields, six (6) soccer/football fields, lights and support buildings. Moreover, the plan includes the construction of stormwater ponds, parking lots, playgrounds, picnic areas and trails.

Community Issue:

Spruce Creek Rising

The ability to safely navigate kayaks and boats on Spruce Creek under the Florida East Coast Railway trestle has become a concern. The growth of oyster beds and sand bars have limited the east west navigation routes under the trestle bridge from nine openings to just one.

Two possible solutions. First, remove organic and inorganic materials from underneath and around the Florida East Coast Railway trestle. Secondly, remove 100 feet of the south railway causeway to increase water flow and navigation.

CITY COUNCIL AGENDA ITEM

REQUESTED COUNCIL MEETING DATE 10/27/2015

Consent item: No

SUBJECT: Legislative update and discussion of proposed action regarding transportation right of way expenses and the relocation of utilities in the right of way

DEPARTMENT: City Attorney

GOAL: 4 - Fiscal Sustainability

OBJECTIVE: N/A

RECOMMENDED MOTION: Discussion only.

SUMMARY: Senate Bill 416 as originally proposed would have shifted private utility relocation costs (for utilities in government rights-of-way and easements) currently borne by the utility and its users to taxpayers the State or local governments.

During a senate committee meeting on October 20, 2015 an amendment was introduced and passed unanimously that removed language requiring local governments bear the costs of utility equipment relocation if the equipment is located within the right-of-way and needs to be relocated for a non-transportation purpose. However, the bill as amended still includes the provision requiring local governments to pay to relocate equipment within a public utility easement regardless of the purpose.

The current bill analysis and fiscal statement provided by the Florida Senate indicates that, "this bill is expected to have an indeterminate negative fiscal impact on local governments."

The amendment provides a legislative response to the matters urged in the Resolution adopted by the City of Orange City, Florida. Therefor, a resolution modeled after the City of Orange City is not needed, but another resolution may be appropriate. The FLC advises that additional information and guidance on the next recommendation will be forth coming. Staff can provide the updates at the council workshop. Consideration of a resolution, if any, may be scheduled for council's meeting on November 3, 2015.

Project No.:	Funding Account No.:

ATTACHMENTS:

1.	Resolution	Resolution Expenses Caused by Utility Interference.pdf
2.	FLC Legislative Update to SB	FLC Update 10 21 15.docx

	416	

Fenwick, Robin	Created/Initiated - 10/15/2015
Roberts, Margaret	Approved - 10/21/2015
Johansson, M. Jake	Final Approval - 10/22/2015

RESOLUTION NO. 15-

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF PORT ORANGE, VOLUSIA COUNTY, FLORIDA, URGING THE FLORIDA STATE LEGISLATURE TO UPHOLD THE CURRENT FLORIDA STATUE PROVIDING FOR PAYMENT OF EXPENSES CAUSED BY THE INTERFERENCE OF UTILITY FACILITIES WITH TRANSPORTATION PROJECTS; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, local government relies heavily on its statutorily-authorized police power to best serve the interests of its citizens; and

WHEREAS, one of the essential functions of local government is to provide for health, safety, and welfare of its citizens, particularly in the area of physical infrastructure; and

WHEREAS, the local government can and must address the critical needs of its citizens by providing safe roadways and transportation corridors for pedestrians and vehicles; and

WHEREAS, under Florida common law, established over 100 years ago, and under statutory law, particularly § 337.403 of the Florida Statues, local government has utilized its home rule authority to conduct local transportation projects and to require electric and other utilities to relocate utility equipment when necessary for the completion of such projects to require utilities to pay for such relocations; and

WHEREAS, recent Florida case law directly on the issue of local government's exercise of its authority under § 337.403 upheld that authority and resulted in a judgment in favor of local government and against a utility's distinctions based on equipment locations within rights of way and public utility easements; and

WHEREAS, HB 391 and SB 896, previously considered by the State Legislature, would dramatically and negatively affect local government's ability to fulfill its obligations to its citizen in the area of transportation projects by transferring the costs of utility relocations to local government and its constituent taxpayers, thereby further burdening local government and its taxpayers with heretofore non-existent costs; and

WHEREAS, in particular, HB 391 and SB 896 would prevent local government from requiring utilities to pay the costs of relocation unless the utilities are in a "right-of way" as opposed to the current common sense requirement for utility relocations occurring "upon, over, under, or along" a roadway; and

WHEREAS, additionally, HB 391 and SB 896 would require local government, and not the utility, to bear the cost of relocating a utility's equipment if such equipment is located within a utility easement, regardless of the private or public nature of the easement; and

WHEREAS, the expense of relocating a utility's equipment in the public easement/right of way will greatly increase the costs of completing transportation projects at a time when local government continue to struggle with funding for such projects; and

WHEREAS, local transportation projects often are the catalyst for economic development and the result of growth within a community, which benefit the utility in terms of expanded customer base.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PORT ORANGE, FLORIDA;

Section 1. That the City of Port Orange hereby encourage the Florida State legislature to preserve Florida common law and statutory law by not agreeing to take up these matters or any further attempts to limit local government's ability to serve its citizens.

Section 2. This resolution shall take effect immediately upon its adoption.

_____
MAYOR ALLEN GREEN

ATTEST:

_____
Robin L. Fenwick, CMC, City Clerk

Adopted this day of

Reviewed and approved: _____
City Attorney

Update on SB 416

Tuesday afternoon, the Senate Community Affairs Committee considered **SB 416** (Flores), addressing utility relocation. Senator Brandes offered an amendment to the bill that removed language requiring local governments bear the costs of utility equipment relocation if the equipment is located within the right-of-way and needs to be relocated for a non-transportation purpose. The amendment passed unanimously.

The bill as amended still includes the provision requiring local governments to pay to relocate equipment **within a public utility easement** regardless of the purpose.

The League will continue to work with the bill sponsor to find an equitable and fair solution for all parties involved as it relates to public utility easements.

To date there is no House bill, but we will continue to keep you posted as this issue progresses.

Thank you to all the municipal officials who responded to the Legislative Alert and contacted members of the Senate Community Affairs Committee. Your advocacy really makes a difference. The Committee definitely heard from you.

Please thank members of the Senate Community Affairs Committee and the bill sponsor, Senator Flores for amending the bill.

Senate Community Affairs Committee

Senator	Tlh. Ph.	E-mail:
Wilton Simpson, Chr. (R-18)	(850) 487-5018	simpson.wilton@flsenate.gov
Jeff Brandes, V. Chr (R-22)	(850) 487-5022	brandes.jeff@flsenate.gov
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Geraldine Thompson (D-12) (850) 487-5012 thompson.geraldine@flsenate.gov

Bill Sponsor
Senator Anitere Flores (R-37) Ph. 850-487-5037 E-mail: flores.anitere@flsenate.gov

Thank you,
Allison Payne
FL League of Cities

Florida League of Cities, Inc.
LOCAL SELF-GOVERNMENT
the keystone of American democracy

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←get social with the FLC →