

The Drinking Water Research Foundation and Yale University presents:

Quotable Quotes from the “Your Drinking Water: Challenges and Solutions for the 21st Century” Symposium

Poor quality tap water is responsible for a significant amount of acute gastrointestinal illness per year. The Centers for Disease Control and Prevention (CDC) reports that water spread diseases—Legionnaires’ disease, cryptosporidiosis, and giardiasis—cost the U.S. healthcare system as much as \$539 million a year in hospital expenses. The significant numbers of people affected by Legionnaire’s Disease has prompted U.S environmental laboratories to develop multiple initiatives to educate environmental professionals and the general public about *Legionella*, the organism that causes Legionnaires’ disease. In 2010, the CDC stated, “Each year, between 8,000 and 18,000 people are hospitalized with Legionnaires’ disease in the U.S. However, many infections are not diagnosed or reported, so this number may be higher” (www.cdc.gov).

While issues such as those cited are nothing new for the U.S. public water systems, they should remain of critical concern to the American public. That’s why the Drinking Water Research Foundation (DWRf) has created a website for consumers to go to for answers for their drinking water questions. Based on expert presentations presented as part of “Your Drinking Water: Challenges and Solutions for the 21st Century,” a symposium held at Yale University (<http://www.seas.yale.edu/watersymposium/>), the website’s mission is to educate the public about the importance of access to safe drinking water. There is also a YouTube video channel featuring all the expert presentations (<http://www.youtube.com/user/DWRfvid>).

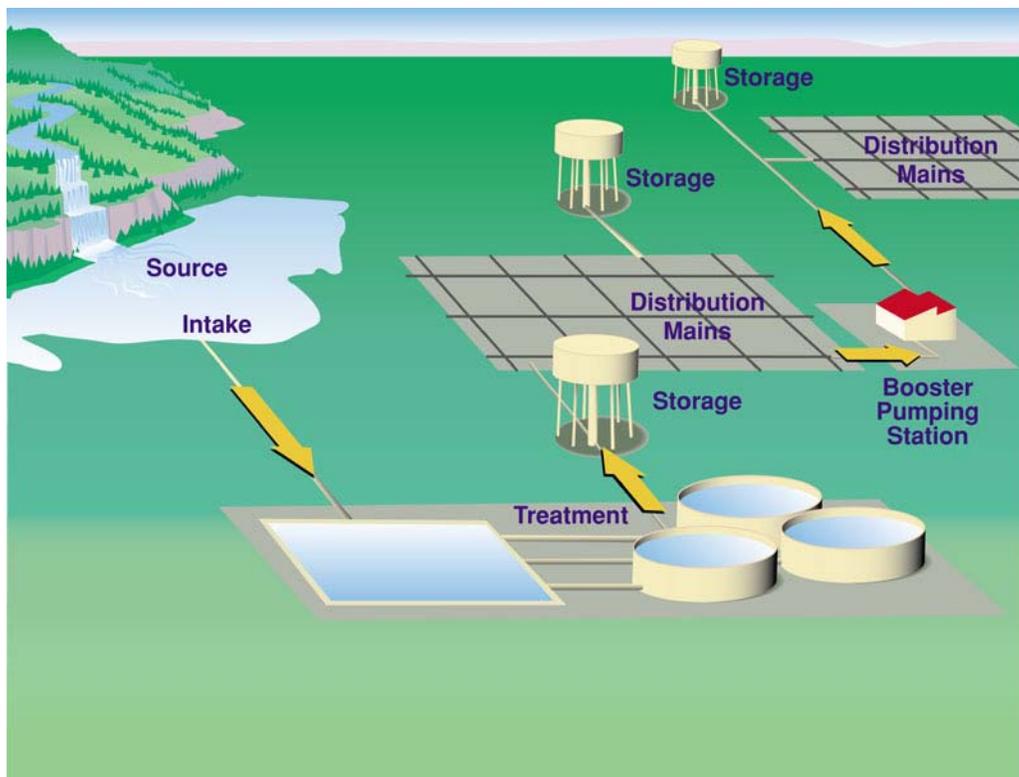
The purpose of the symposium was to bring together individuals who are leaders in their fields and discuss the latest data and information available concerning drinking water issues—and make that information available to the public so that they can make more informed decisions. The conference was conducted by Stephen Edberg, Professor in the Department of Laboratory Medicine at Yale's School of Medicine; Menachem Elimelech, Professor and Chair of the Chemical Engineering Department and Environmental Engineering Program at Yale's School of Engineering & Applied Science; and Dr. John Sinnott, Associate Dean and Professor at the Infectious Disease and International Medicine Department of the University of South Florida. The symposium’s goal, like that of the website, is to inform policy makers and the general public about issues such as wastewater management and water distribution systems, infrastructure repair, water reuse, and FDA’s regulation of bottled water.

Below you will find “Quotable Quotes” taken from the presentations of the professionals that contributed to the Symposium. These quotes are meant to be informative and educational, but they should encourage the reader to delve deeper into the entire presentation given by the speaker and enhance a desire to build a stronger edification on drinking water matters.

I. J. Alan Roberson P.E.

Roberson is the Director of Regulatory Affairs for the American Water Works Association in Washington, DC. He has over 12 years experience in government affairs, and another 12 years experience in the design and project management of water and wastewater plants and land development projects. Roberson’s presentation can be accessed via this link: [Your Drinking Water: A 21st Century Challenge and Solutions](#). Some interesting points made during the presentation include:

- In the United States it has been estimated that we use about 350 billion gallons of water per day--most of that is for power generation and agricultural irrigation. However, the public water supply is about 15% of that--about 42 billion gallons of water per day. The Diagram below shows the general scheme of how water travels from its source (surface water or ground water) and then to treatment (clarification, disinfection, and filtration) or storage facilities for various uses. After water is initially treated it can travel through distribution mains in order to reach consumers.



- The Water Research Foundation, formerly AWWARF, is currently monitoring trends that can potentially negatively impact in water utilities, which can impact consumer access to reliable and safe water. The National Environmental Services Center found in 2008 via a survey report that the top 5 factors that impact water utilities security include:
 - Aging Infrastructure (80% of systems facing this risk)
 - Lack of Planning (75%)
 - Retiring Operator Workforce (60.7%)
 - Natural Disaster (51%)
 - Local Vandalism

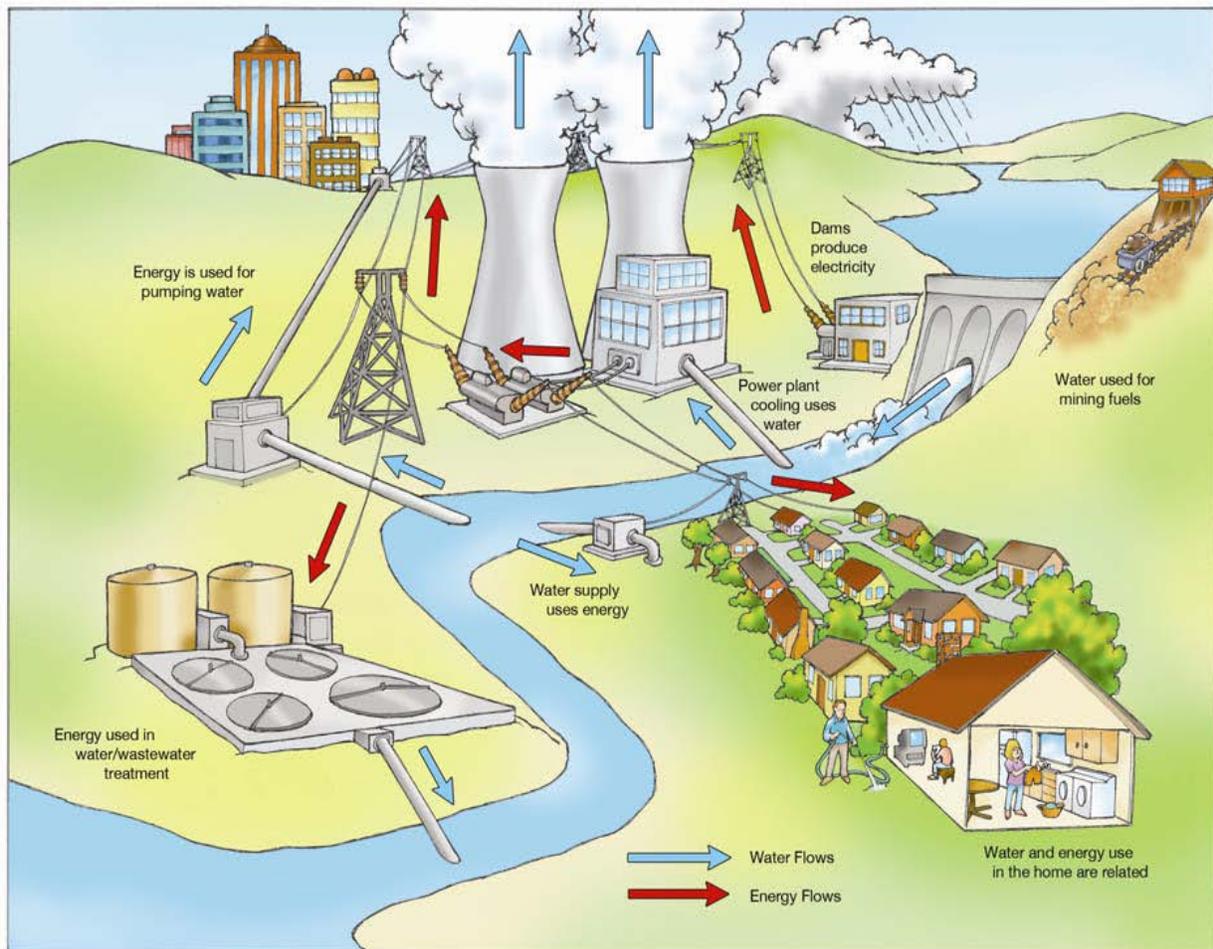
In addition, water quality and scarcity can be positively influenced by attention to numerous factors including:

- Increasing regulation and government oversight
- Dilapidated infrastructure
- Conservation and efficiency
- Focus on recycling and reuse
- Better measurement and monitoring
- Technological solutions
- Residential water consumption

II. **Mark W. LeChevallier, Ph.D.,**

LeChevallier is the Director of Innovation and Environmental Excellence at American Water, the nation's largest private water company. Based in Voorhees, NJ, the company serves more than 18 million people in 29 states and Canada, and is an industry leader in municipal water and wastewater management. To access Dr. LeChevallier's presentation, use this link: [Drinking Water: Challenges and Solutions for the Next Century](#). Below you will find some intriguing talking points extracted from this presentation:

- The U.S Department of Energy has stated in the US. Energy Policy act that energy and water are inextricably linked- a link that is vital to U.S. security and economic health, and that the nation's ability to continue providing both clean, affordable energy and water is being seriously challenged by a number of emerging issues.
- Below is a diagram showing water and energy flow (generation and use) running parallel to one another and often one cannot be used or generated without the other—i.e. power plants use water for cooling and energy is needed to pump water from one location to another.



- In order to illustrate how water reuse is important and has a direct impact on the public's water supply LeChevallier gave an overview of American Water recent studies on water reuse across the country. The studies found the following:
 - Water reuse in the U.S. is a large and growing practice--nationally, an estimated 1.7 billion gallons per day is reused.
 - Reclaimed water use on a volume basis is growing an estimated 15% per year.
 - In 2002, Florida reclaimed 584 million gallons of water/day (mgd), California ranked a close second with 525 mgd reclaimed daily.
 - Florida had an official goal of reclaiming 1 billion gallons of water per day by the year 2010.
 - Other leaders in water reclaiming include: Texas, Arizona, Nevada, Colorado, Georgia, Washington

- Although water reuse helps the public water supply issues we face today, there are still many concerns that should be addressed—one being Water Infrastructure. Issues with Water Infrastructure include:
 - The physical condition of the nation's 16,000 wastewater treatment systems is poor (due to a lack of investment in plant, equipment and other capital improvements)
 - Aging wastewater management systems discharge 850 billion gallons of untreated sewage into U.S. surface waters each year
 - Sanitary sewer overflows (SSOs), caused by blocked or broken pipes, result in the release of as much as 10 billion gallons of raw sewage yearly
 - The EPA estimates that the nation must invest \$390 billion over the next 20 years to replace existing systems and build new ones to meet increasing demands

III. Michele Prévost, Ph.D.

Dr. Prévost is a Senior Chair Holder, NSERC Industrial Chair on Drinking Water, and Professor, Civil Engineering, École Polytechnique de Montréal, Department of Civil Engineering--since 1994. Prévost is also the Vice President of Vivendi Water R&D North America (2000-2004). She was also a Junior Chair Holder, Adjunct-Professor, Civil Engineering, École Polytechnique de Montréal, (1992-1994) and a Project Manager with Gendron Lefebvre Consulting Engineers, Laval, (1985-1991). To access Dr. Prévost's presentation use this link: [Evaluating the Potential Causes of Excess GI Illnesses Observed in the Payment's Distribution System](#). See some informative talking points below:

- During her presentation, Dr. Prévost highlighted the significant portion of Water Born Outbreaks(WBO)/gastrointestinal illness incidences caused by Distribution System (DS) deficiencies (Craun et al. 2001, 2006). Factors that heavily influence the outbreaks include:
 - chemical and microbial contaminants entering the Distribution System (DS)
 - acute breakdown and/or contamination of the DS and reservoirs

Pathogens and water system deficiencies that are identified in outbreaks may also be important causes of endemic waterborne illness. Another major player in WBO related to drinking water is intrusion. Dr. Prévost noted that intrusion is a significant source of waterborne illnesses related to distribution systems, but corrosion and backflow were even more significant—in a study monitoring DS's from 1981 to 2002, data revealed that 10% of WBO's were due to intrusion, 15% were due to corrosion, and 50% due to backflow.

IV. Marc A. Edwards, Ph.D.

Dr. Edwards received the Outstanding Paper Award in the Journal of American Water Works Association (AWWA) and he received the H.P. Eddy Medal. His M.S. Thesis and Ph. D. dissertation won national awards from the American Water Works Association, the Association of Environmental Engineering and Science Professors and the Water Environment Federation (formerly the Water Pollution Control Federation). To review the presentation given by Dr. Edwards at the Symposium, use this link: [Lead in Potable Water as a Public Health Threat](#). Read some key points from Dr. Edwards' presentation below:

- Lead is a heavy metal listed among the "top 20 hazardous substances list" by the Agency for Toxic Substances and Disease Registry (ATSDR). Lead is number 2 on the ATSDR's "Top 20 List." Lead accounts for most of the cases of pediatric heavy metal poisoning (Roberts 1999). Heavy metals become toxic when they are not metabolized by the body and accumulate in the soft tissues. Heavy metals may enter the human body through food, water, air, or absorption through the skin. Some very interesting and little known facts about lead in water presented by Dr. Edwards include:
- Lead in water poses an acute health concern yet, EPA sampling methods miss many hazards and EPA Public health officials do not understand the problem. Edwards emphasized that the sampling protocol for the EPA Lead and Copper Rule is based mostly on the assumption that lead in water is soluble. The current sampling protocols are not designed to accurately measure particulate lead which is the real danger from lead in water (direct or indirect).
- 2007 studies found that many public school systems have a significant amount of lead in their water— 10.3% of Washington, D.C schools in 2007 (even after 45 minute pre-flush the night before), 4.5 % of Seattle schools in July 2004, and 57% of Massachusetts schools (in Washington DC, the highest sample contained 20,000 ppb lead).

V. L. Earl Gray, Jr., Ph.D.

Dr. Gray was a member of the Organizing Committee for the Ten Year Review of Endocrine Disrupting Chemicals Research for meeting at the Finnish Academy of Science (2006), a symposium organizer and co-chair of the International Toxicology Association meeting on sexually dimorphic behavior and nervous system development (2007), is listed as a member of the Expert Science Panel for Bisphenol A, Center for the Evaluation of Risks to Human Reproduction (2007) and was also a member of the Organizing Committee for the Copenhagen meetings on endocrine disrupting chemicals and reproductive health (2004 and 2007). Gray is currently a member of the Endocrine Disrupting Chemicals Research Planning Committee at the National Health and Environmental Effects Research Laboratory (EPA) and the Endocrine Disruptors Research Strategy Committee of the Office of Research and Development at the EPA. To read more about Dr. Gray's presentation, use the following link:

Environmental Estrogens Ethinyl Estradiol and Bisphenol: Are we drowning in a "Sea of estrogens" or, is this "Estro-Phobia?" Below you will find insightful talking points from Grays' presentation:

- Bisphenol A (BPA) is an important chemical building block that is used primarily to make polycarbonate plastic and epoxy resins, both of which are used in a wide variety of applications, including the production of food packaging. The safety of BPA has been extensively studied by regulatory agencies, academic and scientific institutions, and industry scientists for more than four decades. The American Chemistry Council has stated that numerous studies have consistently shown that realistic human exposures to BPA are well below any level of concern.
- Dr. Gray highlighted studies done to examine Ethinyl estradiol (EE2)- a common contaminant of aquatic systems from human pharmaceutical usage. Many studies work to draw parallels between BPA and EE2 and find any estrogenic effects. Gray emphasized that there were no known adverse effects of BPA in aquatic systems among "adequate" studies as reviewed by the National Toxicology Program's (NTP) Center for the Evaluation of Risks to Human Reproduction (CERHR), released November 2007. According to this prominent review of studies, BPA:
 - Does not cause cancer of the prostate, breast or any other tissue.
 - It is not mutagenic
 - Does not alter prostate weight or the weight of any androgen-dependent tissue
 - Does not alter hormone levels, lower sperm counts, alter puberty in male or female rats or male mice. Nor does it cause obesity

Overall, the NTP review found that BPA is far too weak an environmental estrogen for binding to the Endocrine Receptors (alpha and beta) that act as nuclear transcription factors to account for any low dose effects.

VI. Henry R. Hidell, III

Henry Hidell is the founder and Chairman of Hidell-Eyster International. Hidell-Eyster, founded in 1968, provides consulting services in the area of water resource management, bottled water, and the beverage industry. In its original consulting format the company specialized in water resource management and environmental issues including hazardous materials remediation of aqueous environments.

Mr. Hidell's expertise spans the spectrum of business, technical and educational services provided by the firm, with specific expertise in the formulation of business strategies, mergers and acquisitions, and turnkey development of beverage bottling facilities. To read Hidell's presentation for the Symposium, click here: [The Security of Public Drinking Water in the New Paradigm of Global Conflict and Risk](#). Below are some great point's presented during the presentation:

- Hidell pointed out there are many considerations that should be considered in order to ensure a constant supply of secured drinking water for all people—in the United States and in other countries. Hidell noted that access to and the security of drinking water supplies is urgently needed as the migratory urbanization of the world’s population continues to encourage population densities beyond local sustainability.
- Hidell highlighted some areas of focus for drinking water security and the related evaluation of complex socioeconomic relationships and the physical resource environment. These include 4 key facets:
 - Prevention: Reduce probability of disruption of a secured water supply through planning and deterrent technology
 - Detection: Comprehensive information management and remote sensing technology
 - Response: Impact reduction of supplying secured water through highly trained security and technical personnel with extensive response planning.
 - Recovery: Inventory of equipment, trained mechanics and system access ease - national coordination of partner businesses and utilities

VII. Menachem Elimelech, Ph.D.

Dr. Elimelech is Chair of the Chemical Engineering Department and Director of the Environmental Engineering Program. Professor Elimelech received his Ph.D. from Johns Hopkins University in 1989 in Environmental Engineering. His research interests include (1) environmental applications and implications of nanomaterials, (2) membrane separations for desalination and water quality control, (3) microbial transport and adhesion, (4) engineered osmosis for sustainable production of water and power, and (5) water and sanitation in developing countries. Professor Elimelech was elected to the National Academy of Engineering in 2006 and was awarded the Athalie Richardson Irvine Clarke Prize in 2005.

Dr. Elimelech’s presentation focused on water availability and source protection. To preview Elimelech’s presentation click here, [Science and Technology for Sustainable Water Supply](#). Here are a few key points from this informative presentation:

- The World Water Council has noted that the world's population tripled in the 20th century, which coincided with the increased use of renewable water--grown six-fold. Experts estimate that within the next fifty years, the world population will increase by another 40 to 50 %. This significant population growth along with constant industrialization and urbanization will surely result in an increasing demand for water and will have serious consequences on the environment. Elimelech went on to note that various studies have predicted that by the year 2025, 25% of world population and 33% of developing world population will live in areas of water scarcity.
- The 3 best ways to increase the amount of available water to people all over the world include:

- Water conservation
 - Repair of infrastructure
 - Improved catchment and distribution systems
- Elimelech pointed out that each of these aspects of increased water availability/avoiding water scarcity focus on improved use, not increasing supply. In addition there needs to be attention paid to advancing the science of water purification. Doing so can aid in the development of robust, cost-effective technologies appropriate for different regions of the world.

VIII. Joseph E. Harrison, P.E., CWS-VI

Harrison was most recently the technical director for the Water Quality Association, a not-for-profit trade association representing 2,500 member corporations that provide equipment and services in the residential, commercial, industrial and small-community water supply treatment industry. He works with WQA's Gold Seal Program, which provides third-party laboratory testing and ANSI-accredited certifications of water products to NSF/ANSI standards. He also provided training and education resources for WQA's professional certifications.

Harrison's presentation can be accessed by using this link: [POU/POE Devices as Final Barriers](#). The presentation focuses on Point of use (POU) and Point of Entry (POE) devices used in water treatment. See below for some interesting points taken from the presentation:

- The United States Environmental Protection Agency (EPA) has referenced that point-of-use (POU) and point-of-entry (POE) water treatment devices as being cited in their Water Security Research and Technical Support Action Plan as a topic requiring further research. POU devices are designed to purify only that portion of incoming water that is being used for drinking and cooking purposes, while POE devices treat all the water coming into a house or facility.
- Harrison noted that POU and POE devices can be useful in water treatment against various contamination threats including:
 - Particulates
 - Inorganics
 - Radium & other radionuclides
 - Volatile organic chemicals
 - Synthetic organic chemicals
 - Microbes

IX. Joseph A. Levitt

Joseph Levitt is a 25-year veteran of the U.S. Food and Drug Administration (FDA). At his law firm, Hogan Lovells, Levitt focuses on the development and implementation of legislative and regulatory policy regarding the manufacture and marketing of food, drugs, and medical devices and how to work effectively with the FDA and related agencies. Levitt also has an in-depth knowledge to a wide range of matters, including food and drug safety, biotechnology, labeling, advertising, and bioterrorism.

For six years (1998 -2003), Levitt served as Director of the FDA's Center for Food Safety and Applied Nutrition (CFSAN), where he led successful efforts to modernize food safety regulation and enhance the security of the U.S. food supply.

To review Mr. Levitt's presentation for the Symposium, click here: [FDA Regulation of Bottled Water](#). General principles of the presentation surrounded facts related to Bottled Water being Comprehensively Regulated by the U.S. Food and Drug Administration (FDA). Below are a few talking points taken from the presentation:

- Levitt highlighted that bottled water is regulated as a “food” under the Federal Food, Drug, and Cosmetic Act (FDCA) and that FDA Regulations applicable to all foods apply to bottled water and also there are FDA regulations specific to bottled water. Thus, bottled water is subject to general requirements for Product labeling (including claims) and Good Manufacturing Practices (GMPs).
- To address common public misconceptions about bottled water regulations versus the public water drinking supply regulations, Levitt pointed out that FDA's regulation of bottled water must be at least as stringent and protective of the public health as the regulation of public water systems by the EPA.
- In addition, the Bioterrorism Act of 2002 requires food manufacturers, including bottled water manufacturers, to:
 1. Provide prior notice of import arrival at the border within designated time frames.
 2. Register facilities with FDA and maintain current information for their registration.
 3. Maintain records of previous source and subsequent recipients of all products at their facility

X. Martin J. Allen, Ph.D.

With over 35 years of experience, Dr. Allen is a nationally recognized expert on microbial indicators including total coliforms, fecal coliforms, *E.coli*, and standard bacterial enumeration methods. He was the co-developer of Colilert® and provides advice on pathogen monitoring, microbial changes/regrowth during storage and distribution of drinking water, microbial aspects of point-of-use devices, and health relevance of CCL microorganisms. Prior to joining American Water Works Association Research Foundation (AWWARF), Allen was a Senior Environmental Scientist with USEPA-Dallas Regional Office (1979-1984) and has been committee member for *Standard Methods for the Examination of Water and Wastewater* since 1976. He has over published over 40 peer-reviewed publications; including AWWA's "The Plain Hard Truth on Pathogen Monitoring."

To review Dr. Allen's presentation, use this link: [Microbial Myths](#). Below you will find some informative points from Dr. Allen's presentation:

- Removing microbial contaminants from water will always be necessary and there are multiple methods of doing so. Allen elaborated with highlighting various processes for removal of microbes from water:
 - Pretreatment- application of roughing filters, microstrainers, off-stream storage, or bank infiltration
 - Coagulation
 - Flocculation
 - Sedimentation
 - Filtration
- To elaborate more on methods of filtration, Allen gave details on using granular media filters, slow sand, pre-coat filters, and membranes. He also noted that, oxidants may be added to water for a variety of purposes, including control of taste and odor compounds, removal of iron and manganese.
- In summary, Allen was sure to point out that the purpose of water treatment is to remove or inactivate all human pathogens. i.e. protozoa, bacteria, viruses – not to produce sterile water, and to provide safe, esthetically-pleasing drinking water.