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FEATURES

DEPARTMENTS

Did You Know?

President's Page

The **Benefits of AAEE Membership** table printed alongside President Flynn's article in the Spring 2011 (V 47, N 2) issue of *Environmental Engineer* was incomplete. **The member benefits are missing from lines 1, 3, 5, 7, and 9.** How well do you know the Benefits of AAEE Membership? Place an 'X' in the corresponding boxes and send in a copy via email or fax to YMoulden@aaee.net or 410-266-7653. The first five correct responses will receive an exclusive AAEE notebook tablet, and winners will be announced in an upcoming issue of *Environmental Engineer*. Good luck!

	*E	*I	*C
1. Can recognize expertise of potential hire or employee.			
2. Demonstrates capability to new employer or client.		■	
3. ABET Accreditation program assures consistency in quality of graduates (i.e. out of school hires).			
4. Excellence in Environmental Engineering competition provides recognition of high quality projects and programs.	■	■	
5. Who's Who identifies Members, BCEEs, and BCEEMs for hire by company or client.			
6. Optional listing in *Environmental Engineering Selection & Career Guide* provides visibility for firm in the marketplace.	■		
7. A career and marketing advantage versus non-AAEE members.			
8. Expertise has been Board Certified (independently testified).	■	■	■
9. Acknowledged competency in any of 8 fields of Environmental Engineering.			
10. 10% higher earnings on average.		BCEEs & BCEEMs	
11. Your interests as an Environmental Engineer are represented by the Academy.		■	
12. *Environmental Engineer* magazine provides technical and managerial knowledge.		■	
13. 50% discount on BCEE/BCEEM application and exam fees.		■	
14. Networking with Academy Members provides broader access to career opportunities.		■	
15. Opportunity to work and learn from other environmental engineering professionals by working on Academy committees.		■	
16. Use of BCEE/BCEEM credential by clients is promoted by AAEE.	■	■	
17. Can obtain marketing edge with some clients through consideration of the BCEE/BCEEM.	■	■	
18. Provides additional expert criteria for environmental litigation work.	■	■	■
19. Academy provides information to assist in preparing for BCEE/BCEEM exam.		■	

*Notes: E = Employer Benefit; I = Individual (Members, BCEEs, BCEEMs) Benefit; C = Client Benefit

The Race

Educating Engineers in Advancing Profession

By Joel G. Burken
Professor, Missouri University of Science and Technology – President, AEESP

The field of environmental engineering is changing, that is for sure. At the AEESP summer conference, theme topics included 'Vulnerability and adaptation to climate change,' 'Energy as a cross-cutting theme,' and 'Integration of Sustainability into Practice.' These themes are a far stretch from the typical tracks and themes of a decade ago: biology, wastewater, chemistry, air, modeling and drinking water. Certainly, our profession is changing to meet the needs of our society and the challenges we face. We now see many more environmental engineers on staff in a wide array of industries and sites. Our students are now being placed at mining sites, refineries and manufacturing facilities, and they are challenged to evaluate the breadth of large, diverse operations as members of the environmental engineering profession. Today's and tomorrow's environmental engineers are not only called in to put treatment at the end of a pipe, but also looking at day-to-day operations to help avoid problems before they occur, rather than treat them after the fact. Many of these 'problems' can be related to a changing, or yet undefined, regulatory scene (like greenhouse gas regulation) and also the scrutiny of society and an infinite set of definitions to 'sustainability' and 'being green.'

Our future is certainly bright though. These types of positions and challenges have helped fuel the continued growth in our field, as the US Bureau of Labor and Statistics has for years listed Environmental Engineering as one of the top two growth areas in engineering, projecting a 31% growth over the pending decade. The demand and interest of students has led to a rapid expansion of the undergraduate programs in environmental engineering. The number of accredited BS programs is closing in on 60, after taking 30 years to go from one program in 1965 to nine in 1995. The rapid burst in new BS Environmental Engineering programs and graduates has led to a change in the students produced. A student with a BS EnvE degree certainly is a change from the majority of entering environmental engineers from 10-20 years ago, that had a BS in Civil or Chemical Engineering with a MS degree in Environmental Engineering, which usually included a thesis project. This often remains the 'desired' entering student of the profession, even though the student profiles are clearly changing. As a result, we face questions in practice such as: Is the entering professional a BSEnvEng student? Or a non-thesis MS with a foundation education in Civil or Chemical? We face these questions as a combined academic and practice profession.

So as our profession has started to embark on work in areas of green infrastrucuture, sustainability and carbon footprints, educational programs are also changing in level of students entering the profession and educational programs are also responding to our changing profession by embracing and integrating these topics into education programs, as noted above for the summer AEESP conference. This is happening at both the educational level and across the profession. AEESP and AAEE are both engaged and moving forward in the race as well. AAEE has embraced the changing profession, and now has specialty certification in Environmental Sustainability and is considering certification in Environmental Sciences as well.

In any case, we'll be engineering for a better tomorrow… and that has never changed. Didn't the environmental engineers of the '70s (most with no 'Environmental Engineering' degrees) tackle the problems of acid rain, ozone depletion, and broad contaminants of lead, DDT, dioxins and greatly improve our nation's water and air quality? This legacy will carry forward as we race into the future… and AEESP-AAEE will be running the race together. EE

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by Joseph S. Cavarretta, CAE

Think Honor, Respect, and Dedication

Over the past 40 years, the Academy has established awards recognizing individuals and organizations for their contributions to environmental engineering and public health/environmental protection. When you think about "honor, respect, and dedication," who are you motivated to nominate? It's time to think about exceptional leaders – robust mentors who embody the past, present, and future of environmental engineering – and cutting edge organizations that push the known boundaries and set new standards of environmental engineering advances and advocacy through outstanding practice.

One cannot begin to appreciate advances in environmental engineering without appreciating individuals who are forever etched in the fields of education and practice and in Academy activities. The Academy honors three past leaders in environmental engineering by providing awards in their names: Gordon Maskew Fair, Edward J. Cleary, and Stanley E. Kappe.

- The Gordon Maskew Fair Award was established in 1971. It commemorates exemplary professional conduct, recognized achievements in the practice of engineering, and significant contributions to the control of the quality of the world's environment.
- The Edward J. Cleary Award was established in 1973, and confers to one who demonstrates outstanding performance in environmental protection enterprises; exemplary professional conduct, personal leadership, and originality in devising new environmental protection techniques; and sensitivity and responsiveness to social, economic, and political factors in environmental protection.
- The Stanley E. Kappe Award was established in 1983. It recognizes outstanding performance and service in advancing public awareness of the Academy and its mission and goals.

"When you think about 'honor, respect, and dedication,' who are you motivated to nominate?"

As a past or present active practitioner of environmental engineering, think about someone who made a difference in your career and the careers of others. Review the criteria for each award at *www.aaee.net/Website/AAEEAwardCriteria.htm*, and then nominate your candidate for an appropriate award.

The lists of past winners of each award can be found by visiting *www.aaee.net/Website/AAEEAwards.htm* and clicking on the appropriate Award.

The candidates for 2012 Awards will be evaluated in the early fall, so please submit your nominations soon.

Excellence in Environmental Engineering Awards

For the past 21 years, consulting firms, agencies, and academic entities have been competing to win the Academy's prestigious Excellence in Environmental Engineering Awards – specifically, the Superior Achievement, Grand Prize, and Honor Awards. The quality of all the entries is generally outstanding, and judges are often hard pressed to select the winners.

One key problem that would-be competitors encounter is meeting the entry deadline – due to internal controls requiring sign offs on certain elements of an entry. Starting the entry process four to five months in advance is not too early. It will guarantee your ability to put your organization's best work forward and enhance your chances of recognition. Here are the categories:

1. **Research** - of a basic or applied nature including research leading to new or improved environmental engineering equipment;
2. **Planning** - related to environmental control projects, systems, or environmental management facilities;
3. **Design** - of pollution control or other environmental control facilities including projects involving alternative methods (e.g., design-build, design-build-operate).
4. **Operations/Management** - of pollution control facilities or other environmental control facilities, pollution prevention programs, or environmental regulatory programs (i.e., federal, state or local).
5. **University Research** - of a basic or applied nature, that advances the state of the art of environmental engineering, under the direction of a full-time faculty member.
6. **Small Projects** - Any research, planning, design, or operations/management work as defined in the above categories where actual capital expenditures were $5 million or less or an operation or management activity with an annual budget of $500,000 or less.

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7. **Small Firms** - Any research, planning, design, operations/management or small project as defined by the above categories conducted by a small firm with annual gross revenue of $5,000,000 or less.
8. **Environmental Sustainability** - Environmental Sustainability is the supporting of the quality of life while living within the carrying capacity of all systems. A long-term balance of environmental stewardship, economic development, and social wellbeing must be achieved. Research, planning, design, or operations/management projects must document renewable resources timely regenerated, timely substitute replacement of nonrenewable resources, and harmful substances absorbed timely or made harmless.
9. **New Category In 2012** - Industrial Waste Practice. This year, the Academy is proud to introduce a ninth category of competition. It was created and designed to promote and recognize the best practices among leaders in industry. The category is called Industrial Waste Practice. The top winner of this category will also earn the right to receive the Dr. W. Wesley Eckenfelder Industrial Waste Management Medal on behalf of the W. Wesley Eckenfelder Memorial fund, managed by the Environmental Engineering Foundation.

The deadline for entries is February 1, 2012. You can also reserve an entry in advance. For entry forms and details on how to enter, visit *www.aaee.net/Website/E3Competition.htm*.

As always, for more information on the Academy's Awards programs, please call 410-266-3311. Any of the staff will be happy to take your call. You can also email *jsolmo@aaee.net*. EE

2012 Election Results

The ballots have been counted! While the results will not be official until the Annual Meeting when the Board confirms the Teller's Report, the following individuals have been elected for 2012. Current President-Elect **Michael Selna,** will succeed to the Office of the President; **Pasquale "Pat" Canzano** will be President-Elect; **Christian Davis-Venn** has been voted as Vice President; and **Kristin Morico** and **C. Hunter Nolen, Jr.,** have been elected to the two open Trustee-at-Large positions.

Our thanks to **Mark Houck, James Johnson** and **Dennis Kamber** for serving as our ballot counters.

Awards & Honors

Keith S. Dunbar, P.E., BCEE F.ASCE, John T. Morris, P.E., BCEE, F.ASCE, and **Otis J. Sproul, D.Sc., P.E., BCEE, F.ASCE,** were among the five new Honorary Diplomates earning the Diplomate, Water Resources Engineer (D.WRE). They were honored at the 7th annual AAWRE Diplomate Induction Ceremony held this past May during the EWRI's World Environmental & Water Resources Congress. Mr. Dunbar has been board certified in Water Supply and Wastewater Engineering since 2009; Mr. Morris has been board certified in Water Supply and Wastewater Engineering since 1981; and Dr. Sproul has been board certified in General Environmental Engineering since 1979.

Dr. Paul W. Grosser, P.E., BCEE's firm, P.W. Grosser Consulting, won first place in the first Annual National A/E/C Best Employer Award for mid-sized firms. This award was presented by PSMJ Resources, Inc. Dr. Grosser, President and Founder, stated, "I am proud that our employees think so highly of the firm. They are our most important asset." He has been board certified in Water Supply and Wastewater Engineering since 1988.

Dennis M. Kamber, P.E., BCEE, was named as one of ENR's Top 25 Newsmakers (ENR, April 11, 2011). Mr. Kamber, Senior Vice President of ARCADIS US, Inc. (Washington, D.C.) was recognized for his efforts following Hurricane Katrina. He has been board certified in Water Supply and Wastewater Engineering since 1983.

Dr. Linvil Gene Rich received the Order of the Palmetto, the highest civilian honor awarded by the state of South Carolina. The Palmetto was created in 1972 to recognize individuals who make contributions of statewide significance. Dr. Rich, former dean of engineering at Clemson University, was instrumental in creating Clemson's first environmental systems engineering program and elevated the program to become its own department in 1968. "This came as a complete surprise to me," Rich said. "But I think it helps frame the story of our department. We had one of the first departments in this field in the country, and it's good that this be recognized." Additional information can be found online at the Clemson University Newsroom at *http://www.clemson.edu/media-relations/3531*.

Dr. Rich, now an Emeritus member, was board certified in Sanitary Engineering in 1958.

Dr. Udai Singh, BCEEM, is the 2011 Delegation Leader for the People to People Citizen Ambassador Program. The program is coordinating a delegation of professionals specializing in environmental and water resources who will travel to Russia from October 6-14, 2011.

This delegation will seek to increase collaboration with Russian professionals and organizations on topics of mutual interest in the environmental and water resources area. This will be combined with cultural activities highlighting the sights and sounds of the country. Delegates will enjoy insider views of the environmental and water resources systems in Russia and experience the culture in ways that most travelers never do, from exploring Red Square and the famous Hermitage to observing professional counterparts in their element.

Program details and an application form are available by calling 877.787.2000 or emailing *citizens@peopletopeople.com*. A direct link to the planned itinerary can be found online at: *www.peopletopeople.com/udaisingh*.

Please consider joining this exciting exchange!

Dr. Singh is Vice President of CH2M Hill (Oakland, California), and has been board certified in Hazardous Waste Management since 2006.

In Memoriam

AAEE is saddened to announce the passing of the following members.

Dr. Larry A. Esvelt, P.E., BCEE, of Spokane, Washington, passed away on April 25, 2011. Dr. Esvelt, Senior Member of Esvelt Environmental Engineering, LLC, made significant contributions to the environmental engineering profession. Dr. Esvelt was a Life Member and had been board certified in Sanitary Engineering since 1969. An extended profile of Dr. Esvelt will appear in the Fall issue of Environmental Engineer.

Dr. John S. Hunter, III, P.E., BCEE, of St. Paul, Minnesota, passed away on March 11 of Melanoma Cancer. Dr. Hunter was a Life Member of AAEE and had been board certified in Sanitary Engineering since 1972.

William E. Korbitz, P.E., BCEE, of Louisville, Colorado, passed away on May 29. Mr. Korbitz, a Life Member, had been board certified in Water Supply and Wastewater Engineering since 1975. EE

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The AAEE website is currently undergoing a transformation. Just as The AAEE Center launched in 2010 to address member demands for online renewal, the new AAEE.net will address member demands for a website that is easy to navigate, user-friendly, and more informative.

This multi-phase design/build project will enable AAEE to reach its goal of becoming **the** online source for Environmental Engineering.

Phase 1 - Interactivity was completed with the launching of The AAEE Center. Members Only features include renewing membership and specialty recertification online, searching committees, accessing an online member directory, and ordering certificates and lapel pins. Additional features allows both members and non-members to register for events, apply for membership, and to purchase additional items from the AAEE Store. Official LinkedIn and Facebook pages were also launched.

Phase 2 - AAEE.net Redesign has been completed. The layout is cleaner and ties in to The AAEE Center. The navigational menus and graphics are crisper and easier to read.

Phase 3 - AAEE.net Content Reorganization has begun. An AAEE Events Calendar has already been added and the AAEE Library (formerly named Online Publications) is being expanded. Other content will also be consolidated, streamlined, and easier to find.

Phase 4 - AAEE.net New Content has been proposed by the AAEE Website Task Force. Among the suggestions for new sections: Students & Young Professionals, Training/Continuing Education, and Governance & Leadership. Current content will also be revised and new website material will be implemented that will be useful to both members and nonmembers.

The goal is to have AAEE.net become the primary source for interested parties seeking information on Environmental Engineering. We encourage the membership to visit the website often over the next several months. Feel free to direct all comments and suggestions to Yolanda at YMoulden@aaee.net.

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ENVIRONMENTAL ENGINEERING FOUNDATION

2010 ANNUAL REPORT

The Environmental Engineering Foundation was established by the American Academy of Environmental Engineers to provide a tax-exempt vehicle to raise funds in support of the Academy's programs. The Mission Statement of EEF is "advancing the stature and practice of Environmental Engineering by promoting the profession, educating the public, assessing issues and recognizing professional achievements." Funds received by EEF are used to carry out this mission in cooperation with AAEE and its member organizations.

The Environmental Engineering Foundation made great strides in 2010. The Foundation funded several educational pursuits including AAEE's Student and Young Professionals Committee, and assisted in financing of the Sustainable Dream House competition and the participation of the winners in the USA Science and Engineering Festival in Washington in October. The Brewster Snow Award was organized in cooperation with AAEE and AEESP with the inaugural award presented in 2011.

AAEE Past-President Debra Reinhart was elected to the EEF Board. The EEF By-laws were amended to assure that retiring Presidents in future years are given the opportunity to serve on the Board. To facilitate the on-going addition of AAEE candidates, term limits are suggested in the revised By-laws.

The Foundation entered into agreement with the Friends of Wes Eckenfelder to act as the repository for and caretaker of a funds program honoring the late W. Wesley Eckenfelder, P.E., DEE. These funds will support a Distinguished Lectureship, an Outstanding Graduate Award, an Industrial Waste Management Medal, and a University Lecture program. The various activities are co-sponsored by AAEE, AEESP, WEF, and others.

We encourage members of American Academy of Environmental Engineers to contribute to the Environmental Engineering Foundation. Donations can be mailed to Environmental Engineering Foundation c/o AAEE or by using the PayPal button on the websites of EEF or AAEE.

The Foundation is truly emerging into the leadership role envisioned by its founders. EE

Respectfully submitted,
Charles A. Willis
P.E., BCEE, EEF President

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By Yolanda Moulden

The 41ST Annual AAEE Awards Luncheon

The 41ST Annual
AAEE Awards Luncheon & Technical Conference

The 2011 AAEE Awards were held on May 4, 2011, at the National Press Club in Washington, DC. AAEE also held its first-ever all day technical conference in conjunction with the luncheon.

This full-day event started off with the morning session of the technical conference. The technical conference was a great opportunity for several of the award-winning projects of 2011's Excellence in Environmental Engineering Competition to give full-length presentations on their projects as well as offering a great opportunity for attendees to network.

Nathan Weeks, P.E., BCEE, conducted the first presentation for GHD Inc. and Town of Chatham's Grand Prize-Planning winner for Town of Chatham MA Comprehensive Wastewater Management Planning (CWMP) Project. The second presentation was for Malcolm Pirnie, The Water Division of ARCADIS' Grand Prize-Design Award-winning project, Arlington County Water Pollution Control Plant Upgrade and Expansion, conducted by Engineer-in-Charge Nicholas Rodzianko, P.E., BCEE. Roberto Gonzalez, P.E., conducted the third presentation for AECOM's Operations/Management grand-prize winner, Recovery and Treatment of Construction Stormwater Peace River Manasota Regional Water Supply Authority. The last presentation for the morning session was given by Dr. Bruce E. Rittman, NAE, FAAAS, for Arizona State University, Center for Environmental Biotechnology & School for Sustainable Engineering and the Built Environment's The Hydrogen-Based Membrane Biofilm Reactor: A Versatile Platform for Oxidized Contaminants Removal.

1 Eighteen awards were given for the 2011 Excellence in Environmental Engineering Competition.

2 Tim Brodeur, Robert Gonzalez, and Douglas Eckmann with AECOM's award for Grand Prize-Operations/Management.

3 The Superior Achievement for Excellence in Environmental Engineering Award was presented to CH2M Hill for their project, Talking Water Gardens.

4 President Flynn hands the ARCADIS US Inc.'s Honor Award for Design to Jennifer Williams. She is accompanied by Peter Milionis and Engineer-in-Charge Eric Panhorst.

After the end of the technical conference's morning session, AAEE held its traditional champagne reception, allowing a great networking opportunity for attendees of both the conference as well as the following awards luncheon. Steve Maguin, P.E., BCEE, Chair of AAEE's Excellence in Environmental Engineering Awards Committee, served as the Master of Ceremonies. Over 170 years of environmental engineering innovation and quality service were recognized for the leadership.

Peter Silva, P.E., BCEE, Retired Assistant Administrator for Water, EPA, was keynote speaker. With a career spanning more than 30 years, Mr. Silva provided unique insights with his topic: *The Clean Water Act: Where We Are, and Where We're Going.*

Before the announcement of the 2011 winners of the E3 Competition, five distinctive individuals were honored.

Dr. Stephen P. Graef, P.E., BCEE, presented the first-ever William Brewster Snow Award to John Alexander Maxwell of the Clarkson University. The William Brewster Snow award was established to inspire engineering students to pursue graduate environmental engineering education.

2010 AAEE President, Dr. Cecil Lue-Hing, P.E., DEE, Hon.M.ASCE, NAE, presented Richard F. Lanyon, P.E., BCEE, with the Edward J. Cleary Award. 2011 Vice President Pasquale S. Canzano, P.E., BCEE, presented the Stanley E. Kappe Award to Sandra L. Tripp, P.E., BCEE.

AAEE President-Elect Michael W. Selna, P.E., BCEE, presented the Honorary Award to Dr. Clifford W. Randall, Dis.M.ASCE.

AAEE President Brian P. Flynn, P.E., BCEE, presented the Gordon Maskew Fair Award to Dr. Hillel I. Shuval, P.E., BCEE.

1 Robert Gonzalez giving the Grand Prize-Operations/Management presentation at the technical conference.

2 President-Elect Selna gets the Technical Conference underway.

3 Executive Director Joseph Cavarretta looks on as John Alexander Maxwell accepts the first-ever William Brewster Snow Award.

4 Attendees at the AAEE technical conference.

1 Malcolm Pirnie, the Water Division of ARCADIS, won the Grand Prize in the Design Category.

2 Engineer-in-Charge Nathan Weeks accepts the Grand Prize-Planning award. He is accompanied by Fred Jensen and William Hall, Jr.

After a stirring tribute from close friend Dr. Khalil Hosny Mancy, Dr. Shuval then gave a rousing presentation about global warming. The full transcript of this presentation can be found following on page 27 of this issue of *Environmental Engineer.*

After the individual awards were presented, the winners of the 2011 Excellence in Environmental Engineering Competition were announced.

Two awards were given for Research. Dr. Diego Rosso was on hand to accept Hazen and Sawyer's Honor Award for Comparison of Parallel IFAS and ASP Reactors: Oxygen Transfer and Uptake, Nutrient Removal, Carbon and Energy Footprint. ENVIRON International Corporation received the Grand Prize in this category. On hand to accept the award were Engineer-in-Charge Dr. Carl E. Adams, Jr., P.E., BCEE, Kelly Ferrara, and Brent Jones, P.E., BCEE.

For Planning, Doug Owen, P.E., BCEE, was on hand to accept the Honor Award for Malcolm Pirnie, the Water Division of ARCADIS' Surprise, Arizona, Integrated Water Master Plan. Engineer-in-Charge Nathan Weeks, P.E., BCEE of GHD accepted the Grand Prize for Town of Chatham Massachusetts Comprehensive Wastewater Management Planning (CWMP) Project.

There were three awards presented for Design, including two Honor Awards. The first Honor Award was for ARCADIS U.S. Inc.'s Lake City Army Ammunition Plant and was presented to Engineer-in-Charge Eric Matthew Panhorst, P.E., Jennifer Williams, and Peter Milionis. The second Honor Award, for CDM/R2 Resources, Inc.'s Lower Baker Adult Fish Trap Upgrade was accepted by Matthew Schulz.

The Grand Prize for Design was presented to Malcolm Pirnie, the Water Division of ARCADIS, for the Arlington

1 President Flynn presenting the Grand Prize for Small Projects to Linda N. Daubert

2 Dr. Carl Adams, Jr., presenting his Grand Prize-Research winning project at technical conference.

3 Mathew Schultz accepted CDM/R2 Resource, Inc.'s Honor Award for Design.

4 Diego Rosso accepts the Honor Award for Research.

County Water Pollution Control Plant. Engineer-in-Charge Nicholas Rodzianko, P.E., BCEE, Larry Slattery, Jim Noonan, Craig Murray, Joe Husband, Charlie Schwenker, Bill Cunningham, Ryan Kowalski, and Bob Bolton were on hand to accept the award.

Two awards were presented for Operations/Management. The Honor Award went to Department of Water Affairs: Water Service Regulation (State Department) for Green and Blue Drop Certification for Incentive-Based Regulation in the South African Water Sector. The Grand Prize was presented to AECOM's Recovery and Treatment of Construction Stormwater Peace River River Manasota Regional Water Supply Authority. Engineer-in-Charge Roberto Gonzalez, P.E., accepted the award.

Three awards were presented for University Research. Engineer-in-Charge Dr. Mark Rood, BCEEM, accepted the first Honor Award for the University of Illinois' Organic Gas Capture for Effective Reuse or Disposal. Dr. Hans van Leeuwen, P.E., BCEE, accepted the second Honor Award for Energy Center and Center for Crops Utilization Research, Iowa State University with MycoInnovations. Dr. van Leeuwen also served as Engineer-in-Charge of that project. Grand Prize in this category went to Arizona State University, Center for Environmental Biotechnology & School of Sustainable Engineering and the Built Environment. Engineer-in-Charge Dr. Bruce Rittman was on hand to accept the award.


1


3


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4

1 2010 President, Dr. Cecil Lue-Hing with Edward J. Cleary Award recipient, Richard F. Lanyon.

2 President Flynn with Joseph Wiseman, who accepted two Honor Awards on behalf of CDM in the category of Environmental Sustainability.

3 President-Elect Selna presents the Honorary Member award to Dr. Clifford W. Randall.

4 Sandra L. Tripp was honored with the Stanley E. Kappe Award.

Small Projects had two winning entries. The Honor Award went to Jacobs Engineering Group, Inc., for the Wainwright Short Range Radar Station Interim Removal Project. Grand Prize was presented to Linda N. Daubert of IBM East Fishkill Environmental Engineering for their project, Catalytic Hydrogen Peroxide Treatment System.

For Environmental Sustainability, the first Honor Award went to CDM and Ashville, North Carolina, for Asheville Sustainability Management Plan. The second Honor Award went to CDM and Catawba County for the Catawba County EcoComplex and Resource Recover Facility Program. Joseph Wiseman, P.E., BCEE, who served as Engineer-in-Charge and accepted the award. He also accepted the first Honor Award for CDM and Ashville, North Carolina's project on behalf of Engineer-in-Charge Jeffrey Payne, P.E., BCEE.

The Grand Prize went to CH2M Hill for the Clayton County Water Authority Sustainable Water Supply Project. Engineer-in-Charge Wayne D. Murphy, P.E., accepted the award.

The top prize, the Academy's Superior Achievement for Excellence in Environmental Engineering, was presented to CH2M Hill for their Talking Water Gardens project. Accepting the award were Engineer-in-Charge Mark Madison and Diane Tanaguchi-Dennis.

Following the luncheon, the technical conference continued with the afternoon sessions. Mark Madison, P.E., conducted the first of the afternoon sessions for the Superior Achievement Award winning project by CH2M Hill, Talking Water Gardens. The second presentation was conducted by Jodie Willson for CH2M Hill's Grand Prize in the category of Environmental Sustainability for Clayton County Water Authority Sustainable Water Supply Project. Brent M. Jones, P.E., BCEE, conducted the third presentation for ENVIRON International Corporation's Grand Prize-Research winning project, Patented & Innovative Cost-Saving Control Device for Facility-Generated Volatile Organic Compound (VOC) Emissions, Marathon Refinery. The last presentation was by Linda N. Daubert of IBM for Small Project Grand Prize winning project, Catalytic Hydrogen Peroxide Treatment System.

Full profiles of all winners and award recipients were featured in the Spring 2011 (V46, N2) issue of *Environmental Engineer* and can also be found at *www.aaee.net.*

Attendees were also able to earn professional development hours for having attended the luncheon and technical sessions. For any attendees who require a certificate for proof of continued education units, please contact Academy headquarters. EE

1 Dr. Hans van Leeuwen accepting his Honor Award in University Research.

2 Judith Shuval and Gordon Maskew Fair recipient, Hillel I. Shuval

The 41ST *Annual*
AAEE Awards Luncheon & Technical Conference

1 President Flynn presents the Gordon Maskew Fair Award to Dr. Hillel I. Shuval.

2 Dr. Bruce Rittman presenting his Grand Prize-University Research winning project at technical conference.

3 President Flynn addresses the luncheon attendees.

4 Dr. Mark J. Rood with his Honor Award in University Research.

5 Dr. Lue-Hing presents Pete Silva with his certificate for Board Certified Environmental Engineer.

6 Pete Silva was this year's keynote speaker.

Thank you

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The Challenge of Global Warming: The Role of Environmental Engineering and Sciences in the World Climate and Water

Crisis Remarks on the Occasion of Receiving the Gordon Fair Award on May 4, 2011 by Professor Hillel Shuval, D.Sc. PE, DEE[1]

Two Hundred Year Excursion from Malthus to Kyoto

I would like to take us all on a short two hundred year excursion from Thomas Malthus in 1798 to Kyoto in 1997 in an attempt to examine what history can teach us about the role of environmental engineering and environmental sciences with regard to the world's approaching climate and water crisis.

1st Alarm Bell — 1798 Thomas Malthus Predicted Collapse of World Society in 100 Years as a Result of Global Famine

In 1798, the English scientist, Thomas Malthus, in his Essay on the Principle of Population, developed the world's first global simulation model in which he predicted that the exponential growth rate of the world population would soon outrun the supply of food which at best could only grow in a linear manner. This, he predicted, would lead to worldwide famine within one hundred years, as a result of too many people and too little food.

Malthus pointed out that there were severe constraints on the world's ability to increase world food supply to parallel population growth due to the limitation of usable agricultural land and the limits in the supply of essential fertilizers, particularly nitrogen, which at that time was almost exclusively based on animal manure. Thus, he predicted that the world would not be able to supply enough food for the rapidly growing population.

Some people accepted the Malthusian Theory, but most rejected it and said:

- He is an alarmist.
- It's all a myth.
- Some said his model and calculations are wrong.
- Thus, we don't have to do anything-
- Others, innovative individuals — scientists and engineers, didn't wait and began to work seriously on solutions to meet the challenge.

Activist Intervention by Engineers and Scientists Succeeded

In a short period after Malthus expounded his theory, a number of important scientific and engineering inventions and developments changed everything.

1. Mechanical engineers developed powerful steam pumps and water engineers developed piping systems for the transport of water over hills from one watershed to another and over great distances, opening up vast new agricultural areas.
2. Water and irrigation engineers developed modern irrigation methods that greatly expanded the availability of productive agricultural lands of the world.
3. Agronomists and geneticists developed new seed strains for wheat and other food staples that increased yields as much as seven fold.
4. Chemists and chemical engineers developed the revolutionary Haber Process which produces all the world's needs for nitrogen fertilizer in unlimited amounts a relatively low cost from the atmosphere by an electrolytic process.
5. Chemists and entomologists developed new insecticides which dramatically reduced crop destruction by insect pests, resulting in a great increase in the yield of foods crops.
6. As a result of these scientific and engineering developments and activ-

On Receiving The Gordon Maskew Fair Award:

Comments by Professor Hillel Shuval: Receiving the Gordon Maskew Fair Award of the AAEE is a double honor for me.

To receive the top AAEE award for lifetime achievement is more than enough recognition and source of pride for any environmental engineer and the pinnacle of his career. However, the award in the name of Professor Gordon Fair, who was one of my mentors and sources of inspiration, has special meaning for me. In 1954-55, I had the privilege of attending some of Professor Fair's lectures and seminars at Harvard and was inspired by his broad view of the role of the environmental engineer (then called sanitary engineer).

His 1950 pioneering paper: Shattuck, Chadwick and the Engineer in Public Health provided the conceptual and philosophical basis for the broad based-holistic approach for the environmental engineers and environmental scientists role in the management and control of water, air, solid and liquid wastes, insect vectors, noise, light and ventilation in homes and in industry. Fair was a giant, way before his time and an early 'green' pioneer concerned with conservation of natural resources, the development of alternative energy, recycling water and wastes and the need to promote environmental improvements for all. He was truly among the first environmental scientists.

He inspired me to see this broad view of the role of the environmental engineer and convinced me that we should not only work on the design of high quality engineering projects, but should be leaders and advocates working to promote the conservation of natural resources and for a better and safer environment in our own communities as well as for the world. I followed his inspiring lead on these concepts and ideas throughout my career. His eloquent language and style raised the image and prestige of the environmental engineer to new heights. Today [the proposal] of the AAEE to certify Environmental Scientists follows in the true spirit of Professor Gordon Fair.

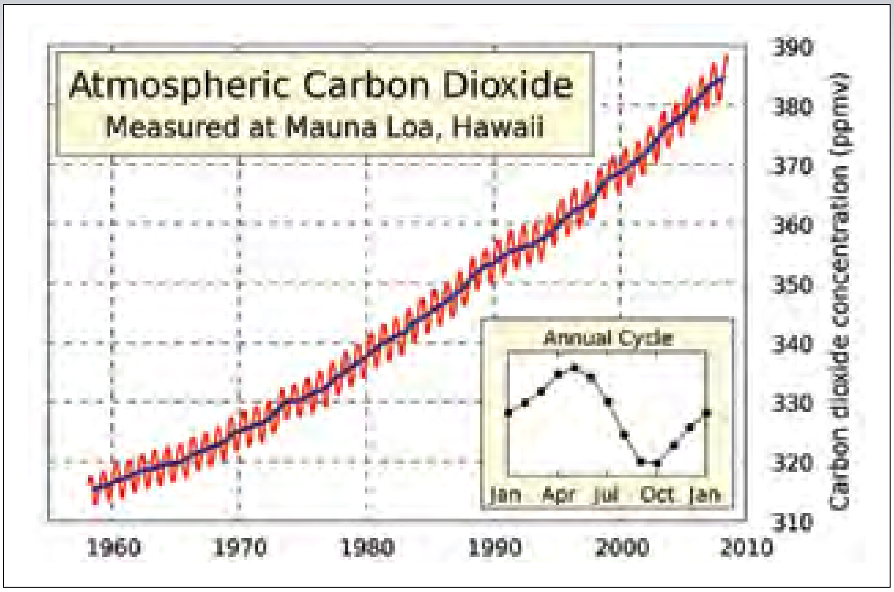

Figure 1: The " Keeling Curve" which demonstrated a 25% increase in global atmospheric CO_2 concentrations between 1960 and 2010 mainly from anthroprogenic sources of burning of fossil fuels-coal, fuel oil and gasoline. These measurement provided one of the key inputs into the understanding of the mechanism of global warming. This figure was created by Robert A. Rohde from published data and is incorporated into the Global Warming Art project.

ist interventions, food production worldwide increased dramatically within a hundred years and, to this day, meets all of the food needs of the world. World famine did not result from the rapid growth of population as predicted by Malthus. However, we are not sure it can continue like this indefinitely.

What Are The Lessons We Learned From the Malthus Period?

It is important to internalize the lessons learned from the success of the Malthus period and apply them to the world's current problems.

We must develop good, reliable, and validated simulation models to predict the future global developments of mankind. Based on reliable predictions of changes and problems we will face in the future, we must plan ahead to meet future needs.

We must be leaders and advocates to convince society that it must take the measures needed to assure the future of the world. We must take full advantage of human ingenuity and initiative.

Stimulated by the threats expounded by the Malthusian Theory, engineering and scientific creativity and initiative won out. This must be the case dealing with today's global crisis.

2nd Alarm Bell - 1997 Kyoto Predications of Global Warming with Catastrophic Environmental Impact:

Dr. Charles Keeling's development of an accurate method of measuring atmospheric CO_2 in 1950 and his historic measurements at the Mauno Loa Observatory in Hawaii have provided the world with one of the cornerstones for the scientific basis for the predictions of global warming. It has become dramatically apparent that there has been a 25% increase in global CO_2 concentration from 310 ppm in 1960 to 390 ppm in 2010 (see Figure 1).

The Kyoto Conference in 1997 provided the first serious and authoritative alarm bell that global warming was primarily the result of anthroprogenic pollution of the atmosphere with CO_2 and methane resulting primarily from the massive burning of fossil fuel-coal, fuel oil and gasoline, and other human activities. The simulation models predicted that there may be an increase in global temperature of 1-5 °C in the next 20-50 years. This may result in massive melting of the ice caps at the poles and glaciers, which could lead to the rise in sea levels by 0.5 to 3 meters.

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Predictions of Some of the Possible Outcomes of Global Warming

Many areas of the world may suffer from significantly reduced rainfall leading to reduced safe yields from existing water sources and reduced water supplies for both domestic and agricultural use. This may result in shortages of water for domestic and urban use and severe food shortages in some areas of the world.

Other areas of the world may suffer from significantly increased rainfall, overloading existing urban drainage systems resulting in severe flooding of urban areas and homes. The increase in rainfall in some areas may result in the overloading of rivers and dams and increased flooding.

Ice caps at poles and glaciers will melt at ever increasing rates resulting in the rise in sea levels.

Many low areas of the world will be flooded and millions of people may be displaced permanently from their homes and even from their countries leading to massive migration of "climate change refugees".

Certain previously lightly populated 'frozen' areas of the world such as Siberia, Northern Canada, Alaska, may become temperate in climate and potentially important future agricultural areas and be opened up for the absorption of large numbers of 'climate-change refugee' migrants.

There is likely to be an increase in weather extremes – more hurricanes and droughts.

According to the WHO, with the increase of temperatures and rainfall in some temperate areas there may be a spread of tropical diseases such as malaria, West Nile Fever, and bilharzia.

Some Major World Powers, Industrial Groups, and Individuals Minimize the Threat of Global Warming and Take a Go Slow Approach

As in the days of Malthus when not everyone accepted his theories, today, major world powers, some scientists, and some industrial groups are not convinced of the climate change threat and are not prepared to take action for various reasons. A few scientists have legitimate questions and doubts. However, the hesitation of others is often determined by considerations of self-interest.

> *Some say the reports on global climate change are needlessly alarmist.*
>
> *Others say: "It's a myth."*
>
> *A few scientists say: "The models and calculations are wrong."*
>
> *Some governments say: "We don't have to do anything."*
>
> *Others say: "It's too expensive to do any thing, so let's wait and see."*
>
> *Some say: "The world will manage on its own."*

However, in 2007, the conclusions of the Nobel Prize winning report of the Intergovernmental Panel of Climate Change-IPCC of the United Nations, representing the considered opinion of 95% of the world's top scientists, concluded:

> *"Human activity is the main factor in climate change and if nothing is done to stop it the world temperature can rise from 1-5 degrees over the next 20-30 years."*

It is true that science is not based on a majority vote, but on the validity of the data and the reliability, credibility, and standing of the researchers. It is beyond the scope of this paper to enter the debate with the scientists who hold opposing views. In my view, however, with the United Nations IPCC report, the debate in the scientific community has essentially ended, except for a few hold-outs, so it is possible to say that the world community, as represented by their most prestigious, dependable, and reliable scientists, free from vested interests, is convinced by credible, validated evidence that global warming is indeed the result of human activities and can only be controlled by human initiated preventive and control measures.

Since the IPCC report was published several years ago, there are more and more scientific studies that indicate that global warming and it's effects are proceeding even faster than predicted. For example, the Washington Post on May 4, 2011, reported that "Rise in sea levels may be faster than expected" according to a study by the Oslo based Arctic Monitoring and Assessment Program (AMAP).

I, along with many others, believe we should not wait and that we must begin to work on solutions now to meet the challenge before it is too late.

What Should We in the Environmental Engineering and Sciences Do?

1. Actively Promote the Programs to Prevent Global Warming:

I believe that the environmental engineering and sciences professions have the moral obligation and responsibility, the needed academic and scientific qualifications, as well the required standing and prestige in their communities to become advocates and leaders in promoting essential steps and programs to prevent and control global warming. These programs are basically aimed at the following goals:

- Reduce energy consumption in homes, municipalities, industry and agriculture.
- Promote the development and introduction of alternative non-global warming energy such as:
  - Solar energy
  - Wind energy
  - Atomic energy
  - Hydro-electric energy
  - Hydrogen
  - Others

2. Prepare for the Possibility that Prevention Will Fail - Start Early to Plan, Develop, and Promote Amelioration Programs:

But what if not enough effort is invested in national and global prevention and control programs or they are started too late to be effective? Then society will be left with no choice but to initiate, as early as possible, active plans and programs to determine in advance the expected effects of global warming in different locations, followed by proactive corrective and amelioration programs as the need develops.

High Resolution Simulation Models

The first vital step is to develop accurate and reliable simulation models of anticipated weather changes with a much higher resolution than those currently available. The IPCC models have too low a level of resolution which make it difficult for specific cities and watersheds, or even states and countries, to predict their future needs with the required degree of accuracy. For example, Israel has developed its own high-resolution simulation models to predict future rainfall patterns over various watersheds and aquifers. In general, Israel's water management authorities can now predict that in the medium case scenario of global climate change, Israel's total water safe yield will be reduced by some 10-20%. Since there are no possibilities of increasing yields from fully exploited natural ground or surface water sources to meet future needs, resulting from climate change, Israel is planning on a major increase in desalination of seawater to meet those needs. Thus, the possibilities of reduced rainfall from global warming are already being included in Israel's long-term water resources development plans.

A few simple examples of potential needs for amelioration planning effecting the environmental engineering profession are presented below:

- Communities that will be faced with the possibility of significantly reduced water supplies should start developing back-up shelf plans for increasing water supplies from alternative sources to meet future essential needs resulting from global warming.
- Communities that may be faced with significantly increased rainfall should start developing back-up shelf plans for increasing urban storm drainage capacities and flood control facilities required to prevent urban flooding. They should evaluate the need to develop plans for the protection of dams and rivers from increased rainfall, severe storms, and floods.
- Communities must evaluate now, potential environmental impact of increased floods on pollution and quality degradation of water supply systems.

It is beyond the scope of this paper to discuss the need for massive engineering projects to ameliorate the possible effects of rising sea levels. But many seaside communities in the United States and other countries may, within the next 30-50 years, be faced with rising sea levels and flooding of extensive portions of their communities or countries. In some areas, this may involve massive displacement of populations and needs to resettle "climate change refugees". A need for population transfers from one country to another may be inevitable. Changing rainfall patterns may turn some previously fertile areas into barren ones while some previously desert areas or "frozen" areas of the world may become fertile and habitable and a place to resettle "climate change refugees." Changing rainfall patterns may result in serious food shortages in some previously fertile areas while new fertile areas of the world may develop.

Conclusions

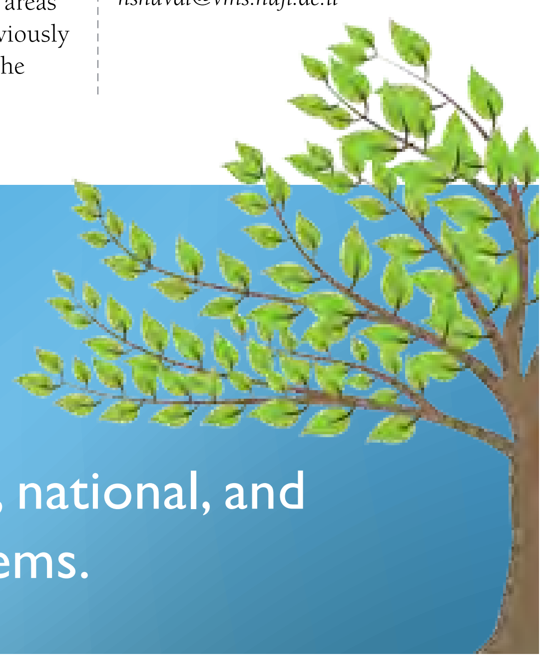
Serious national and international planning agencies must start developing prevention, control, and amelioration plans to deal with global warming and its possible consequences. Such massive global problems cannot be solved by individuals alone or simple inventions as in the days of Malthus. We now will need national and global planning and initiatives to promote global warming prevention and ameliorate its effects if the world fails to prevent them in time. The environmental engineering and sciences professions can play a key role in working as leaders and advocates for local, national, and global solutions to these problems.

That is our challenge and that is our mission for the future. EE

Footnotes:

Head, Department of Environmental Health Sciences, Hadassah Academic College-Jerusalem, and Lunenfield-Kunen Emeritus Professor of Environmental Sciences, The Hebrew University of Jerusalem, Israel, Email: *hshuval@vms.huji.ac.il*

The environmental engineering and sciences professions can play a key role in working as leaders and advocates for local, national, and global solutions to these problems.



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Volume 13, Summer 2011

Environmental Engineer: Applied Research and Practice

Instructions to Contributors

PURPOSE AND SCOPE

Environmental Engineer: Applied Research and Practice, is a peer-reviewed journal focused on practical research and useful case studies related to the multi-disciplinary field of environmental engineering. The journal strives to publish useful papers emphasizing technical, real-world detail. Practical reports, interesting designs and evaluations of engineering processes and systems are examples of appropriate topics. Papers relating to all environmental engineering specialties will be considered.

MANUSCRIPT REQUIREMENTS:

Manuscripts should follow the general requirements of the ASCE authors' guide (*http://www.pubs.asce.org/authors/index.html#1*) and should be submitted electronically in WORD format to the Editor and Assistant Editor.

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REVIEW PROCESS

All papers submitted to the journal are subject to critical peer review by three referees, who have special expertise in a particular subject. The Editor will have final authority over a paper's suitability for publication.

CATEGORIES

Papers may be submitted in the following areas:

Applied Research

Original work presented with careful attention to objectives, experimental design, objective data analysis, and reference to the literature. Practical implications should be discussed.

Review

Broad coverage of an environmental engineering application or a related practice with critical summary of other investigators' or practitioners' work.

Practical Notes

Novel methods that the author(s) have found to be sufficiently successful and worth recommending.

Case Studies

Recently completed projects or studies in progress that emphasize novel approaches or significant results.

Design/Operation

Conceptual or physical design or operation of engineering systems based on new models or techniques.

Management

Papers describing novel approaches to problems in environmental management, or to the global, sustainability or business asects of environmental engineering.

ABSTRACT

An abstract of up to 200 words should be provided, including a statement of the problem, method of study, results, and conclusions. References, tables, and figures should not be cited in the abstract. Up to six key words or terms should be included for use by referencing sources.

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ENVIRONMENTAL RESEARCH IN CINCINNATI: A CENTURY OF FEDERAL PARTNERSHIP

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INTRODUCTION

Over the past century, the federal environmental research laboratories located in Cincinnati, Ohio, have played a major role in advancing engineering knowledge and practice related to public health, water and wastewater treatment, and management of solid wastes and hazardous wastes. These efforts were aided by early state-sponsored research such as that at the Lawrence Experiment Station (McCracken and Sebian, 1988) in Massachusetts. As the knowledge base grew, the Federal management structure evolved from the United States Public Health Service (USPHS) to the Environmental Protection Agency (EPA). The purpose of this paper is to review and document some of the significant developments and achievements of the Cincinnati environmental research program from 1910 to 1980.

1910 - 1925

In 1912, Congress authorized the first US water pollution study, an "investigation of sewage pollution as it relates to the diseases of man." The USPHS's Water and Sanitation Investigations Laboratories, located in Cincinnati, Ohio, led the study. Housed in the local Kilgore homestead, shown in Figure 1 with C.T. Butterfield an early chief of the Cincinnati Station, the study employed physicians, sanitary engineers, chemists, biologists and bacteriologists.

The primary task of this brand-new Pollution Investigation Station was to develop the first comprehensive study of Ohio River pollution and natural stream purification characteristics. By 1925, the investigative team had compiled the first Ohio River Survey and documented it in a report that is illustrated in Figure 2 (Streeter & Phelps, 1925). These stream pollution investigations were concerned with the biochemical oxygen demand (BOD) characteristics of wastes, the capacity of streams for natural oxidation, and methods of treatment for industrial sewage. The studies on the biochemistry of sewage and of industrial wastes, as well as on the treatment and disposal of industrial wastes, were under the direction of Earle B. Phelps, Chief of the Division of Chemistry at the Hygienic Laboratory. Phelps believed that industrial wastes as well as human wastes required attention because they constituted "an indirect menace to the public health in so far as they may draw upon the stream's natural purifying power, thereby delaying or preventing the ultimate disposal of directly infectious matter."

The Streeter and Phelps studies resulted in the formulation of the 'oxygen sag' curve, by which the self-purification characteristics of streams were understood in terms of the measurable phenomenon of dissolved oxygen (DO) concentration and the biochemical oxygen demand (BOD) characteristics of various wastes under certain conditions of time and temperature. The Streeter-Phelps 'oxygen-sag' curve provided the first quantitative model available for the analysis of changes in water quality. Their approach is still used to determine what and where minimum oxygen concentrations will occur in a stream that receives sewage effluents. Studies were also made and reported for removal and inactivation of bacteria from polluted source waters by rapid sand filtration at water treatment plants (Streeter, 1930).

In addition to the BOD test, the staff also developed another fundamental measure of stream pollution that is still in use today: the *Coliform Bacteria Index,* which indicates when bacteria concentration in drinking water is too high (Streeter, 1951; Theriault, 1927). This early research laid the groundwork for improved design and operation of sewage treatment plants.

1925 - 1955

Over the next 30 years, the Station's researchers evaluated various sewage treatment process designs for biochemical oxygen demand and pathogen reduction characteristics. Key researchers included C.C. Ruchhoft, C.T. Butterfield, Graham Walton, Shi Lu Chang, Sam Weibel, and others (Butterfield et al., 1937; Ruchhoft et al., 1938; Weibel et al., 1949).

Development of tools like the Coliform Bacteria and BOD tests enabled ground breaking evaluations and identification of specific streams and lakes as safe sources for public drinking water. Further, a second survey of the Ohio River established pollution controls for

Figure 1
USPHS' Kilgore Homestead Labs, 1912, Cincinnati, Ohio, & Dr. C.T. Butterfield

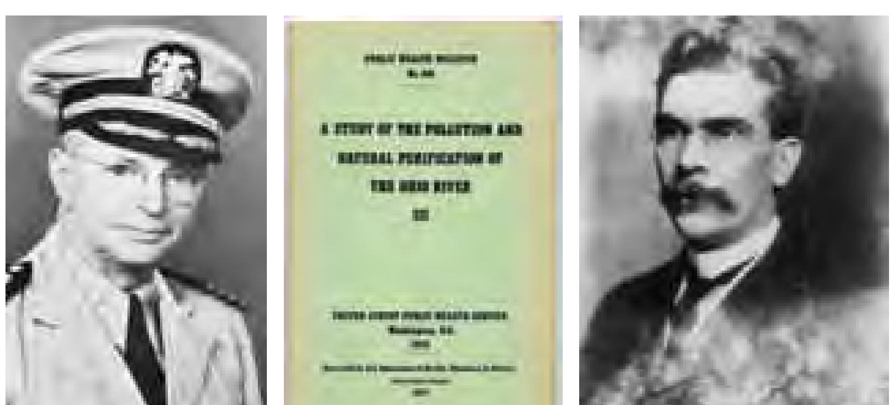

Figure 2
Streeter & Phelps Stream Pollution Report with Photos of H.W. Streeter (L) and E.B. Phelps (R).

the entire Ohio River system and added fish and aquatic life protection.

During World War II, the Cincinnati Station made important contributions to the war effort, including methods and measurement of the treatment and disposal of munitions and the testing of munition waste effluents on streams. The research team also developed water disinfection methods for military field operations. A major project and infusion of funding for the Station were provided by the National Housing Agency in 1946 to study septic systems that would service the millions of homes financed by the federal government for veterans of WWII. Data collected over the next decade led to the development of a *Manual of Septic Tank Practice* (USPHS, 1957). Figure 3 shows the manual and a septic tank being studied. This document remained the most widely-used guidance/reference in the field until its upgrading by Cincinnati USEPA in 1980. Three additional major USPHS reports resulted from the studies on household sewage disposal systems (Weibel et al., 1949; Bendixen et al., 1950; and Weibel et al., 1954). With a realization that a large proportion of the US population used onsite treatment systems, and that this trend was likely to continue, studies were performed to make available factual information on which improved design and installation standards might be based. Additional reports resulted from subsequent studies of sewage purification by soils that culminated in the late 1960s. Other notable outputs from the Station summarized results of major efforts studying the influence of pH and temperature on the survival of coliforms and enteric pathogens when exposed to free chlorine or chloramines. These reports also discussed subjects like the minimum requirements for individual water supply and sewage disposal systems (Butterfield et al., 1943; Butterfield et al., 1946; Federal Housing Administration, 1947).

With the passage of the 1948 *Water Pollution Act,* the functions of the Cincinnati Station were broadened to cover other responsibilities, and in 1949, the Water and Sanitation Investigations Station was officially renamed the "Environmental Health Center" with divisional status in the Bureau of States Services of the USPHS. The Center was the focal point for the USPHS in the field of environmental health. As such, it was responsible for (1) developing new methods and procedures for use in the field; (2) conducting laboratory studies in the biological, toxicological, physical, chemical and engineering aspects of environmental health; (3) making field investigations of special problems; (4) conducting training courses for health personnel in the operating procedures of environmental sanitation; (5) furnishing consultation services to governmental agencies, health authorities, and other organizations on specialized problems; and (6) disseminating the results of research investigations and special studies.

Figure 3
USPHS Manual of Septic Tank Practice and Sam Weibel studying a septic tank in the Environmental Wing of RATSEC.

To accommodate all of its responsibilities, a new facility was needed to provide special facilities for (a) experimental animal studies; (b) isolating disease producing agents to prevent their spread to other personnel; (c) study of radiological health hazards associated with radioactive wastes; and (d) drinking water and wastewater pilot plant space and equipment. It would also include bacteriology, biology, physics, chemistry, toxicology, radiation, and engineering laboratories specifically designed to perform environmental health research. Factors considered in locating the building near Grandin Road and Columbia Parkway in Cincinnati were: availability of a sewer line carrying representative city sewage for studies of sewage treatment, availability to a source of river water for water treatment research, and availability of public transportation. With completion of the new building shown in Figure 4, the Environmental Health Center building was renamed the Robert A. Taft Sanitary Engineering Center (RATSEC) and dedicated by Oveta Culp Hobby, Secretary of Health, Education, and Welfare, on April 8, 1954.

The Center was dedicated to research, field investigations, and training in the sanitary sciences as related to man's contact with air, water, food, wastes, and ionizing radiations. At the time, it was the only laboratory in the nation to attempt a coordinated study of the health significance of physical, chemical, radiological, and biological factors in the environment. Of particular professional interest was the center's training program for state and local health workers in advanced sanitation and radiological health subjects. During one five-year period,

Figure 4
USPHS' Environmental Health Center, renamed the Robert A. Taft Sanitary Engineering Center. Shown left to right in the inset photo taken during the center's dedication are Cincinnati Vice Mayor, Dorothy N. Dolby, Secretary Hobby, and USPHS Surgeon General Leonard Scheele.

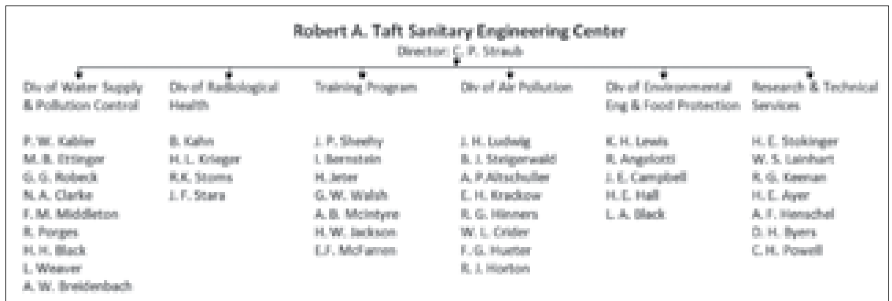

Figure 5 RATSEC Organization Chart (1960s).

160 training courses were conducted and attended by more than 6,300 public health specialists from the United States and many foreign countries. Many of the new laboratories were equipped as 'classroom labs' to facilitate the participation of the trainees. These courses proved invaluable in providing the Center with another way of making research results available to sanitary engineers and allied professional workers for practical and widespread use in controlling health hazards. A brief organization chart for RATSEC with names of some researchers is shown in Figure 5. Here, over the next 30 years, Cincinnati's water researchers would continue to gain national and international recognition for their work in water pollution control and drinking water research, while other areas of expertise would move on to new quarters in the next 10 to 20 year period. Research activities included removing bacteria from water by filtration through a molecular filter membrane and studying the occurrence of methemoglobinemia in infants due to nitrate-contaminated water (Jeter et al., 1950; Walton, 1950). The membrane filter shown in Figure 6 allowed rapid, accurate counting and identification of bacteria in water. Bacteria are caught by the filter, which is removed and placed on a pad of nutrient material so that bacteria may develop into colonies. After incubation, each organism trapped on the membrane filter grows into a visible colony. These can be counted to determine the number of bacteria in a water sample.

Procedures for sampling and measuring industrial wastes were developed and included bioassay methods for the evaluation of acute toxicity of wastes to fish (Black, 1952; Ettinger, 1950; Doudoroff et al., 1951). The all-too-familiar experimental jar test laboratory stirring device was developed during this period (Straub et al., 1951).

Some early solid waste research work analyzed the garbage-refuse in a sanitary landfill for its solids, acidity, alkalinity, pH, ammonia, total N and BOD content, thus setting the stage for further work (Setter et al., 1950). Other solid waste management research beginning in the 1949-1950 time period was funded by the United States Public Health Service (USPHS) and performed in cooperation with the State of North Dakota Health Department and the City of Mandan, ND. A methodology was developed for using a sanitary landfill method of refuse disposal in cold climate, and recommended guidelines were established by a joint committee for refuse collection and disposal practices in small communities (Weaver et al., 1952; USPHS-APWA, 1953).

1955 - 1970

In the 1950s, as noted above, RATSEC microbiologists such as Shi Lu Chang, Paul Kabler, Norman Clarke, Cecil Chambers, William Bridge Cooke, Gerry Berg, and C. Mervin Palmer were responsible for developing several analytical techniques. They included use of the *Millipore filter,* which remains a standard of the water industry. Pioneering studies were begun in viral pollution and virus enumeration and the removal of viruses by water and sewage treatment unit processes. At the same time, RATSEC's Training Program utilized its expertise to gain worldwide recognition as the most advanced program of its time.

Palmer's algae identification photos and slides were published in the book shown in Figure 7, are classical, and are still used today and included in the latest edition of Standard Methods (Palmer, 1959). Cooke's guide on the role of fungi in wastewater systems, too, is still a standard on the topic (Cooke, 1963). Other RATSEC programs began addressing the effects of the emerging chemical and plastics industries in the US. Researchers and practitioners from all over the world visited the RATSEC for training and exchanges of ideas.

Industrial growth along with the population explosion of the 1950s, posed two major challenges/questions to researchers for drinking water safety. What is a safe level for chemicals in our

Figure 6 Membrane Filtration of Water Samples

Figure 7
Algae in Water Supplies by C. Mervin Palmer, Robert A. Taft Sanitary Engineering Center, Cincinnati Ohio, PHS Pub. 657, 1959

drinking water and what new methods are needed for removing chemicals, bacteria, and viruses from drinking water supplies? Richard Woodward and Gordon Robeck led a team of researchers including Kabler, Clarke and Chang in the early 1960s to determine the ability of a variety of water treatment processes to remove radioactive, biological, and chemical contaminants (Robeck et al., 1962; Robeck et al., 1965). Their studies also looked at the removal of viruses and pesticides.

In parallel wastewater studies, RATSEC microbiologists evaluated the role of viruses in raw wastewater and removal in treatment facilities (Berg, 1967; Clarke et al., 1961; Clarke et al., 1964). The work of Berg and his colleague's work laid the basis for the science of measuring virus content in contaminated water and wastewater. Published research papers reflecting the extensive work by personnel of RATSEC's Microbiological Activities were compiled by Geldreich (Geldreich, 1966). All of these efforts clearly showed that traditional primary treatment alone was inadequate for the nation's industrial and municipal wastewater.

RATSEC's Division of Water Supply and Water Pollution Control became very process oriented during the 1960s, and several studies were undertaken to evaluate the impact of wastewater constituents such as heavy metals and phenols on treatment processes and the development of new approaches to wastewater treatment and reuse and to residuals management issues (Barth et al., 1965; USPHS, 1965). Even space travel waste disposal was addressed (Rich et al., 1959). The first biological nitrogen removal enhancement work was undertaken and still remains one of a handful of designs available to modern designers seeking to remove that nutrient (Ludzack et al., 1962).

The primary water-oriented emphasis of this transitional decade was related to the concept of advanced wastewater treatment, which essentially was a marriage of the drinking water and wastewater treatment activities for which RATSEC was best known. Motivations for this program were the water shortages in the arid western states and recognition that water was a single entity and its reuse was vital to the long-term sustainability of the country (Weinberger et al., 1966). The advanced waste treatment (AWT) program lasted from 1962 through 1967 and produced numerous reports on the effectiveness of several unit processes and treatment trains with detailed cost analyses, in addition to continuing activities on microbiological studies of disinfection, biological treatment, independent physical-chemical treatment, and large-scale pilot studies. Most of the experimental work was done in the experimental wing of the RATSEC and in an experimental treatment plant like that shown in Figure 8.

The entire set of AWT program outputs are captured in two summary reports (USPHS, 1965; USDI-FWPCA, 1968). The USPHS report was divided into ten families of separation processes, including adsorption, foam fractionation, electrodialysis, reverse osmosis, distillation, freezing, ion exchange, solvent extraction, and oxidation. The subsequent FWPCA report was organized around classes of wastewater constituents to be removed. There also were a number of studies of disinfection conducted during this decade that investigated alternative disinfectants and different microbial constituents. These studies provided the field with basic data that helped propel the practitioners to a greater understanding of the viability of many alternative methods that still exist today (Kabler et al., 1961; Chambers, 1961). The RATSEC wastewater treatment studies led to the eventual adoption by the Federal government of a minimum of secondary treatment for any wastewater discharge.

One of the first RATSEC studies on landfill soil covers was performed in 1956 and basic sanitary landfill principles were discussed in a 1957 paper (Black et al., 1956; Eliassen et al., 1957). In 1961, the USPHS developed a set of standards for sanitary landfill operations. (Black et al., 1961). These standards evolved from a set of 1953 Sanitary Landfill practices and showed the dramatic evolution of sanitary landfill science in just a few short years. Tsivoglou's parallel work on industrial wastes addressed radioisotope methodology to measure contamination in streams receiving wastes from uranium mines provided the most accurate understanding of these issues (Tsivoglou et al., 1956; Tsivoglou et al., 1958; Tsivoglou et al., 1965).

In late 1965, the water pollution activities of the USPHS were first transferred within the Department of Health, Education and Welfare to a newly created Federal Water Pollution Control Administration and later to a newly created Federal Water Quality Administration within the Department of the Interior. RATSEC was removed from the USPHS and signaled a change in the research emphasis of the Center. The former cross-cutting work with other researchers of different backgrounds that were all housed in Cincinnati was curtailed, owing to the physical removal of some researchers and their activities to new facilities in North Carolina, Oregon, Oklahoma, Alabama, Georgia and other US locations. Programs such as groundwater research, aquatic biology, air pollution, food protection, radiological health, and interdisciplinary training were either totally or partially removed from Cincinnati over the next several years.

In response to existing solid waste problems, Congress passed the Solid Waste Disposal Act (SWDA) in 1965 with two primary purposes in mind: (1) to initiate a national research and demonstration program for new and improved methods of solid waste disposal, and (2) to provide financial and technical expertise to state and local governments for the planning and operating of solid waste disposal programs. This work was conducted under a newly created Bureau of Solid Waste Management (BSWM) within the USPHS's Environmental Control Administration. The BSWM planned, conducted and promoted research, investigations, demonstrations, surveys, and studies relating to the conduct of solid waste programs and development and application of new and improved methods of solid waste storage, collection and disposal (USPHS, 1968a; USPHS, 1968b; USPHS, 1968c). Figure 9 shows research underway on landfill liners. The BSWM deployed new and improved methods of reducing the amount of solid waste requiring ultimate disposal through reuse, recycling and source reduction, and provided technical and financial assistance to appropriate agencies and organizations in planning, development and conducting solid waste management programs (USPHS, 1968d). A major output was how to properly incinerate solid wastes (DeMarco et al., 1969).

Figure 8
Photo shows Francis Middleton (2nd from right), Director of Advanced Waste Treatment Research Laboratory, giving a tour of the experimental wing with its model activated sludge processes.

1970 - 1980

The U.S. Environmental Protection Agency (EPA) was created on December 2, 1970, and when the Agency began searching for a site to house its research programs, Cincinnati was once again chosen, in part because of its historic record of environmental research. The new $28-million facility shown in Figure 10, located near the campus of the University of Cincinnati, was dedicated by President Gerald R. Ford in 1975 as the EPA Environmental Research Center (and was later renamed the Andrew W. Breidenbach Environmental Research Center [AWBERC] to honor its first director). With movement of environmental research activities from RATSEC to AWBERC, the Taft Center became a major location for the USPHS' National Institute of Occupational Safety and Health.

EPA launched a multi-billion dollar construction grants program in 1977 under the *US Clean Water Act* to build new wastewater treatment facilities for handling increasing pollution due to industrial and population growth. Cincinnati researchers, building on earlier work at RATSEC, added studies of refined methods to characterize and manage storm water and combined-sewer overflow problems. These studies showed ways to reduce overloads from ineffective wastewater treatment plants by application of standard procedures that could be used at any facility. Cost models of wastewater management systems were developed for a wide range of systems and treatment trains (Smith et al., 1974). Studies of water reuse experiences in drought-plagued regions of the US were initiated. Numerous biological treatment

Figure 9
Landfill synthetic membrane liner exposure to MSW leachates.

characterization studies and the impact of biological treatment on a contaminant's physical, chemical, and structural changes were conducted (Bunch, 1970; Mulbarger et al., 1969). Parallel evaluations of physical-chemical treatment systems were also undertaken (Westrick et al., 1976; Kreissl et al., 1973). These studies provided some of the fundamental design details for treatment by these approaches. New comprehensive studies of sludge management were also initiated in that decade (Dean, 1969; Dotson et al., 1971; Farrell et al., 1970; Farrell et al., 1974; Olexsey et al., 1974; Smith, Jr. et al., 1975). They examined sludge conditioning, dewatering, stabilization, land application, and incineration methods. Photos of some major researchers during the 1960s and 1970s are shown in Figure 11.

This period offered an additional transition from primarily in-house studies by federal staff to the new paradigm of staff oversight of extramural contractors and grantees. Thus, a very different water-related research era began, as directed by the Congress in the *Clean Water Act*

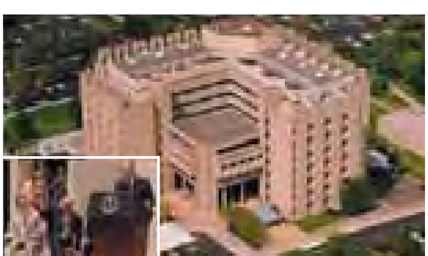

Figure 10
Photos of AWBERC & its dedication by President Gerald Ford. Andrew W. Breidenbach (far left) and University of Cincinnati President, Warren G. Bennis, are seated next to him.

of 1972, which created the golden era of the construction grants program. This era also launched a well-financed effort of transferring the knowledge gained from this expanded research work to the practitioners in the field. This technology transfer effort enjoyed great popularity, as measured by the overflow crowds drawn by the hundreds of seminars conducted throughout the US, and by the number of Agency output documents ordered by field personnel. The primary thrust in the latter part of the 1970s and forward, however, was due to the *Clean Water Act* amendments of 1977 that created the innovative and alternative (I/A) technology program. This program was created to prod the consulting engineers who drove the construction grants program to move the profession forward through incentives/bonuses to adopt newer and more promising collection and treatment technologies over the traditional technologies which had changed little in nearly a century. The Cincinnati laboratory's role was further enhanced to support these basic changes through plan reviews, demonstrations, and post-construction evaluations of these innovative and alternative wastewater technologies. This work was done in close partnership with the Office of Water and the EPA Regional Offices.

With the increased funding of wastewater research, numerous research summary documents in the form of manuals and handbooks were produced to help with the design, upgrading and operation and maintenance of wastewater collection and treatment facilities. Process design manuals were created for nitrogen control, phosphorus removal, sulfide control in sewerage systems, upgrading existing wastewater treatment plants, use of carbon adsorption and sludge treatment and disposal. Other manuals considered municipal solid wastes as well as municipal sludge landfills. Many Technology Transfer publications produced in the 1970s, 1980s, and 1990s can be obtained from *http://www.epa.gov/ncepi/* and located in the EPA/625 series.

As populations expanded into the suburbs of US cities, these areas of low population density needed alternatives to expensive sewer systems and central water pollution plants. EPA Cincinnati research on low-cost collection, treatment, and dispersal systems for small communities and on individual home systems brought advances in pollution abatement that were more economically, ecologically, and socially attractive to these areas. The resulting research reports and technology transfer documents were in great demand for the rest of the century (USEPA, 1977).

The water supply researchers evaluated and published data on waterborne-disease outbreaks periodically throughout the 1960s and 70s (Weibel et al., 1964; Craun et al., 1973). They also addressed cost relationships in water supply and control of microbes in these delivery systems (Clark, 1976; Chang et al., 1960). Water supply research during this period was diverse and included several treatment technology studies to determine what utilities needed to do to meet the interim primary drinking water regulations for inorganics. This work was done by Sorg and colleagues and reported in several issues of the *Journal of the American Water Works Association.* The collection of published papers was later published by EPA as a manual (USEPA, 1977). Studies of formation of disinfection byproducts (DBPs) and evaluation of techniques to reduce or minimize DBP concentration in finished drinking water were also performed (Symons et al., 1981). Field studies of granular activated carbon (GAC) were initiated for control of organic contaminants (DeMarco et al., 1983). Studies on health effects of lead in drinking water resulted in reduction of MCL for lead in drinking water (Bull et al., 1975). Removal of *Giardia lamblia* by water filtration was researched, as was inactivation by chemical disinfectants (Logsdon et al., 1981; Hoff, 1986). A systematic review of the studies on chemical inactivation of viruses, bacteria, and *Giardia cysts* was performed, and led to the development of contact time (Ct) tables (Hoff, 1986). Research was also undertaken on corrosion control in water mains (Gardels, et al., 1981). Control of *Cryptosporidium* oocysts by chemical inactiva-

Figure 11
Top Row (left to right) D. Ballinger, E. Barth, R. Bunch, J. Cohen, J. Farrell & E. Geldreich.
Bottom Row (left to right) P. Kabler, L. McCabe, G. Robeck, J. Stara, J. Symons & L. Weaver

tion and filtration was also studied (Hoff, 1986). Research on water quality changes in distribution systems provided the basis for the later development of programs like EPA Net program to model water quality (Clark et al., 1982). Microbial indicators for recreational water quality assessment were also developed (Cabelli et al., 1979; Geldreich et al., 1969).

In 1970, Congress amended the *Solid Waste Disposal Act (SWDA)* with the *Resource Recovery Act (RRA)*. This new act expanded upon the SWDA by (1) enlarging existing programs by including training grants, research and development grants and financial assistance for states and local planning; (2) promoting sanitary landfill as an alternative to open dumps by promoting strict guidelines and by providing grants for construction of new or improved disposal facilities; and (3) extending the federal focus to include conservation, recycling and resource recovery. Two initial documents related to sanitary landfill and the collection of solid waste were released (Sorg et al., 1970; Marks et al., 1970). At the time, too, numerous training manuals were developed for use in training courses. Some topics covered were elements of solid waste management, open dump closures, sanitary landfill principles and design, recycling, resource recovery and source reduction, composting, incineration, and disposal of hazardous waste.

In 1976, the passage of the *Resource Conservation and Recovery Act (RCRA)* entirely revised and superseded previous solid waste legislation through its new focus on hazardous waste. Under RCRA, the Office of Solid Waste (OSW) was established within EPA to implement a comprehensive "cradle to grave" system for managing hazardous waste. OSW was moved to Washington D.C. from Cincinnati, but the solid waste research division remained in Cincinnati. Significantly, documents summarizing energy recovery from municipal solid waste and the economic impact of regulating hazardous waste were made available (USEPA, 1979b and 1979c). A listing of the available solid waste management publications from 1966 to 1979 is available (USEPA, 1979a). If not available from EPA, many of these documents can be obtained from the US Department of Commerce's National Technical Information Service (NTIS).

SUMMARY AND CONCLUSIONS

Federal environmental research in Cincinnati from the early 1900s through the 1970s achieved vast improvements in public health and the environment. A small number include:

- Determination of a stream's assimilation capacity for wastes and the oxygen sag curve
- Development of the BOD and Coliform Bacteria Index
- Identification of useful and not so useful algae and fungi in streams
- Guidance on management of household wastes in a septic tank
- Safeguarding drinking water with the use of different disinfectants, along with development of the necessary analytical methods
- Filtration of surface waters to insure potability
- Wastewater treatment studies using various biological processes to maximize reduction of contaminants including nutrients
- Proper management of solid wastes so as not to create dumps but proper disposal systems including development of how to design and operate a sanitary landfill

The environmental health research performed in Cincinnati leading up to and including that done at the Robert A. Taft Sanitary Engineering Center was one of, if not the, most outstanding program in the world at that time. Its training program, which was conducted by those who develop methods and concepts, was very effective. Many progressive countries learned from the work done in Cincinnati and duplicated some of the successful ideas back home.

One key finding was that the concentration of different disciplines in one location was extremely productive, and that was likely because they all were directed to achieving improvements in public health and the environment as goals in themselves.

In conclusion, contributions made by individuals and group efforts at the federal research laboratories in Cincinnati were prescient, have been of enormous and lasting value in protecting our nation's public health. The people in the labs and the wealth of knowledge they discovered have provided a marvelous resource for answers to nearly any question that those in the profession could dream up. That this source of talent and information grew up and became available to those in the field through training programs, seminars and publications has substantially benefited our society.

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