I’m Everett V. “Rich” Richardson. I’m from Scottsbluff, NE. where I worked on the family farms as an irrigator, sugar beet thinner, potato picker, combine and tractor operator, and cowboy while attending grade and high school. I was born Jan. 5, 1924.

I enrolled at Colorado A&M (now Colorado State University) in the fall of 1946 and graduated in June ’49. I also received a MSc. in 1960 and Ph.D, in 1964 from CSU. All my degrees included courses I took at Missouri School of Mines (1943-44), Scottsbluff Junior College (45-46), University of Iowa (1952-56) and MIT (1963-64). At MIT I was on a Government Fellowship to attend classes and work with Dr. Arthur Ippen.

I married Billie Ann Kleckner (Colorado A&M 48’) June 23, 1948. We have three children. All graduated from CSU, Gail Lee Richardson Frick, is a teacher in the Poudre School system, Thomas E. Richardson, a MD in Spokane, WA and Jerry R. Richardson, a Prof of Civil Engineering at the Univ. of Missouri at Kansas City. Gail’s husband David Frick also graduated from CSU and is presently Vice president of Ayres Associates, Inc of Ft. Collins. Their son Donny also graduated from CSU in Civil Engineering.

My favorite professors were Civil Engineering Department Head Robert Smith, and Professors Maxwell Parshall and Maurice L. “Maury” Albertson.

Maury came to the Civil department in 1947 after receiving his Ph.D. degree from the University of Iowa. I worked for him in the hydraulics laboratory as an undergraduate. He really invigorated the hydraulic program. Prior to 1947 research in the laboratory, located just west of the present Engineering building, was mostly done by Federal Government Engineers, Ralph Parshall, Victor Cone and Carl Rohwer. The Hydraulics Lab was build around 1912 and was used by the USBR for models studies for Hoover, Grand Coulee and other major dams.

The National and International prestige that exists now for the Hydraulics Program and Laboratory are all based on what Maury did; very little research was going on until he came. He invigorated the Master of Science degree and established the Ph.D. program in Civil Engineering. He attracted a world class faculty of engineers and scientist in fluid mechanics, hydrology, hydraulics and water
resources to teach and do research at CSU. Both degree programs and the research at CSU are recognized as world class. I can’t speak more highly about Maury and what he has done for the Civil Department and CSU. He was one of best hydraulics engineers at that time in the world.

I was drafted into the Army on April 5, 1943. I had a deferment to attend the University of California in the fall of 1942. I dropped out after a month because I witness a drunk driver kill my father. My father pushed me away from the speeding car. I was deferred so as to testify at the trial.

I entered the Army at Fort Logan, CO. Test & shots then to Jefferson Barracks near Saint Louis, MO for more test, shots and basic training in the Air Force. But I qualified for ASTP at Missouri School of Mines. Little did I know we were General Eisenhower’s infantry reserve! In February 1944 the ASTP unit at MSM joined the 44 Infantry Division on maneuvers on the Sabine river Texas/Louisiana. Then Prior Overseas Movement at Camp Phillips near Salinas, Kansas. Home leave, then P.O.E. at Boston, Mass. Left the Boston Sept. 5, 1944 arrived at Cherbourg, France, Sept. 15. Train ride (40 Hommes ou 8 Chevaux) from Valogens to Nancy on October 14 and then on line (Combat) nr. Embermenil in Alsace on Oct. 24, 1944. The next morning watched and shouted warnings to our Col. Thacher Nelson as he and 3 others walked into a mine field while walking to visit our position and were blown up into the air and killed.

I was a messenger in Co. H, 2nd Battalion 327 Infantry, 44th Division, 7th Army. A WWII Infantry Division had support groups and 3 Regiments, A regiment had support groups and 3 battalions. Each battalion had 3 line companies, a head quarters company and a heavy weapons co. Line companies for 2nd Battalion are E, F, & G and H is the heavy weapons Co., which is in support, as needed, of the 3 line companies. The objective of the 44th Division was Saareburg, Germany. However, on November 23 my battalion was attached to the Second French Armored Division and together we captured Strasbourg.

Our regiment was the left flank of the 7th army and during the battle of the Bulge we took over Patton’s 3rd Army area and were spread out very thin. On New Years eve we were hit by German Panzer and Infantry Divisions in Germany’s drive to retake Strasbourg. But after during 6 days (Jan 1-6, 1945) of stiff fighting we held.

I was wounded in the right leg and left arm on March 29, 1945 while crossing the Neckar River near Heidelberg, Germany. The slight wound kept me in the hospital until after VE day May 8.

I rejoined my outfit after VE day at Rosenburg, Germany. In June the division went to Rheims, France, I by Jeep, to return to the U.
S. to train for the invasion of Japan. We traveled to London, then Scotland, then by the Queen Elisabeth to New York and ended up at Fort Smith, Ark. With VJ day I was Honorable Discharged on November 6, 1945. I received a Combat Infantry Badge, Bronze Stare and Purple Heart along with the customary good conduct and other awards.

After Graduation in 1949 I went to work for the Quality of Water Branch of the U.S. Geological Survey as a P-1 Engineer. The salary of $2,400/year was huge. I worked in the Wind River Basin at Riverton, Wyoming until '52, as part of the Pick/Sloan plan for the Missouri River Basin. The Pick/Sloan plan was for the Corps of Engineers to construct the big dams and navigation works on the main stem of the Missouri River and USBR would build the smaller dams and irrigation projects on the other rivers in the basin. The USGS work in the Wind River Basin was to determine the source of sediment inflow into Boisin Reservoir.

We (Mervin Peterson, Walter Scot, Bruce Regan, Bruce Colby and others) measured the water and sediment discharge in the Rivers of the Wind River Basin. Also, we maintained the upper Sweetwater River Station. We had beautiful clear water streams, such as the Sweetwater, Wind and Popo Agie Rivers, Bull Lake Cr, and etc. And the muddy streams, such as Poison Cr., Muddy Cr. Badwater Cr. Five Mile Cr. and etc.

Dr. Maury Albertson came to Riverton in the summer to help in our studies to determine the total sediment discharge of our streams. He, I and USBR construction equipment and people, using large rock (some as big as 8X3X3 ft) narrowed Lower Five Mile Cr. from 80 ft to 15 ft wide for 200 ft. The swift and turbulence flow allowed us to measure the total sediment discharge. We also used the narrow gorge at Middle Five mile to measure total sediment discharge. These measurements were used by Bruce Colby to develop the Modified Einstein method of calculating total Sediment discharge using measure suspended sediment discharge.

Our work determined that the major source of sediment inflow into Bosin Reservoir was the return flow from the irrigation projects into Five Mile and Muddy Cr. Using our studies, Wit Borland (USBR) developed channel control methods that reduced the sediment inflow from Five Mile Cr from around 3,000,000 to 250,000 tons/year.

In the fall of 1952 I was transferred to Iowa to be in charge of the Quality of Water Branch's small watershed program to measure the sediment discharge from the different geomorphic areas in the state. My office was in the Hydraulics Laboratory at the University of Iowa at Iowa City. While there I took graduate classes from Dr. Hunter Rouse and Professor Posey. I also gave invited lectures on stream gaging and sediment measurement at the University of Iowa and prepared a publication with R. J. Longfield, titled “Quality

Tony Ciaceio and EVR(26)

Middle 5 mile Cr. Station (27) (28), Lower muddy Cr. Station (29), Badwater Cr. Station (30).

Photo MLA & DBS at Powder River (31) from Mary Joe dedication CD. Or from Mary Joe Simons
of Surface Water of Iowa 1886-1954.” It was published by the Iowa Geological Survey as Bulletin #5.

In the fall of 1956 I transferred from the Quality of Water Branch to the Surface Water Branch of the USGS and moved back to Fort Collins to work with Daryl Simons. We were to determine resistance to flow and sediment transportation characteristics in Alluvial Sand Channels. We (Billie, I and family) were very glad to be back in Colorado and at CSU. How lucky can you get?

Daryl Simons was teaching at Wyoming at that time (1956-57), and working on PhD under Dr. Albertson. Using data he collected on many irrigation canals he developed equations for design of stable channels for irrigation. From his work and dissertation he was on a select committee for the design of the Link Canal in Pakistan. The Link Canals were an integral part of the Indus Basin Plan which the World Bank finance and prevented war between Pakistan and India. (*Michel, Aloys A., 1967, “The Indus Rivers- A Study of the Effects of Partition.” Yale Univ. Press*)

Paul Benedict, Roland Carter and Luna Leopold of the Water Resources Division, USGS needed somebody to undertake a study of resistance to flow and sediment transport in alluvial sand channels. The reason was that Norman Brooks as a result of his PhD dissertation at California Institute of Technology had written that there was not a relation between discharge, velocity, slope and depth in alluvial sand channels. If true, this would cast doubt on much of the water and sediment discharge investigation in the world (*Brooks, Norma, 1957. “Transactions ASCE”). Maury Albertson sold them on the use of a long and wide flume he had at the hydraulics laboratory on the main Colorado A&M campus.

Maury recommended to Paul Benedict, Roland Carter and Luna Leopold that Simons would be an excellent project leader. They agreed. They needed someone else from the Surface Water Branch. Paul Benedict knew my work. and that I had taken classes from Rouse and Posey recommended me to Rolland Carter and I was selected.

We moved back in fall 1956. Daryl and I met with Leopold and discussed project goals, objectives and mythology. The first school year (1956-57) Daryl had to finish his teaching contract at Wyoming. So I carried on the research along with the aid of two graduate Students. Rom Garde from India and Hubert Morel Seytox from France. Daryl would meet with me monthly to discuss and plan the research. One of my first items was to assemble Maury Albertson’s 100 foot flume. It was in two sections, without a pump, head and tail box, piping system, and water and sediment measurement instrumentation. This, with the help of Ralph Asmus, shop foreman, was accomplished by the middle on November 1956.

| DBS(31) |
| DBS on Link Canal Pakistan (32). |
| OB LINK CANAL(33), |
| Flow regimes (34), |
| Dune bed (35), |
| Plane bed (36), |
| Antidunes (37). |
Our research for the USGS at CSU determined that Norman Brooks was wrong. In our research, which was internationally recognized, we defined the different bed forms that can occur in alluvial sand channels and determined that if you knew the bed form there was a relationship between discharge, slope of the energy grade line, depth and velocity. We classified the bed forms into a lower and upper flow regime on the basis of the similarity of the magnitude of the resistance to flow and sediment transport. The lower flow regime had large resistance to flow and low sand transport concentrations. Whereas, the upper flow regime had smaller resistance to flow and large sand transport concentrations. Richardson, E.V., and D. B. Simons, 1967. “Resistance to Flow in Sand Channels.” Proc. XII Cong. Inter. Assoc. Hydr. Res, Vol. I, No. A 18, Fort Collins, Colorado, p. 141, CE6768EVR62.

Daryl and I produced a film called Flow in Alluvial Channels. It featured our research in the laboratory and field research on the Rio Grand River near Albuquerque, New Mexico. The film was widely acclaimed and shown many times in the US and the world. Dr. Ippen was so impressed by the film that he took my bulky 16 mm copy to show in Germany. CSU was prominently credited as the source of the laboratory study.

Daryl and I worked together until 1964 when he transferred to CSU as Professor of Civil Engineering and Associate Dean for Research for the College of Engineering. As Associate Dean he was instrumental in obtaining the funds to move the Hydraulics Laboratory from the main campus to the foothills campus at the end of Laport Avenue. In the move he established the Engineering Research Center (ERC), which served the graduate research programs for all the College of Engineering Departments. Including Atmospheric Science, until Dr. Herb Riehl obtained funding for their building.
I took over the USGS project and with the help of Carl Nordin continued the research. We moved our office and research out to ERC. We needed a new and enlarged tilting sediment transport flume. With the exception of the structural support, I designed this flume. It is 200 ft. long, 8 ft. wide and 4 ft deep. It has a discharge capacity of 100 cfs of sand and water and the slope can range from 0 to 3.0%. The structural design was by Associate Professor Dr. Jack Nath of the Civil Department. I designed the head and tailbox, the capacity of the pumping system, the water and sediment measuring instrumentation, and the moving measuring and observation platform. Most of the material, aluminum and plastic panels, steel etc I obtained as surplus property from the Federal Government.

In 1968 I accepted a professorship in the Civil Engineering Department and Dr. Carl Nordin took over the project. In 1968 the USGS was going to transfer me to Washington D.C. to become a manager. This I did not want. So I was negotiating for a job as Professor of Civil Engineering at Louisiana State University when Daryl Simons and Bill Fead offered me the position of Administrate Engineer for the Engineering Research Center and Professor of Civil Engineering.

The Water Resources Division (WRD) of the USGS closed the project office at CSU sometime in 1970’s. During the time at CSU (1956 to the 1970’s) the USGS supported many graduate students, some were WRD employees but many were regular CSU graduate students. At least two graduate students were supported by the project each year. Many CSU graduate students (project supported or not) became employees and leaders of the WRD and enriched its water resource research program.

One of my first research job as a Professor was field manager for the hydrology part of Dr. Herb Riehl and Dr. Daryl Simons Venezuelan International Meteorological and Hydrological Project (VIMHEX). They had an Army contract to study the interaction between meteorology and hydrology. It was a large project, over $2M. As field manager I was front-man and went to Venezuela with Walt Records from NCAR, in ’68. To arrange for housing, locate offices, stream gaging stations, ground water observation wells and metrological stations. During the field research season in ’69 and ’70, Daryl and I alternately spent the summer months working in Venezuelan.

The first field site was northwest of the Oronoco River Delta with headquarters at Anaco. For the second field site we wanted to use an area on the Rio San Francisco west of Recife, Brazil. I made two trips to the area to set up the field site. But we could not get permission to bring in our radar equipment and airplane.

Research Center (38),
C. Nordin & Family(39)
Photo of Hydraulic Engineering Laboratory with 200 ft flume (39A)

Ernesto Iba,
Venezuela Mythologist for Caracas’s International Airport, Project in Country expeditor. Dr. Herb Riehl, Walt Records, NCAR, Dr. Goldstein, Civilian Chief of Venezuela Metrological Service (40).

Dr. Michael A.
Permission for this equipment had to be approved by the President of Brazil. So back to Venezuela we went to a site around El Sombrero south of Caracas.

All equipment was air lifted to Venezuela by the Alabama and Georgia Air National Guard at no cost to the project. The Venezuela Ministry of Public Works, Air Force Metrological Service, and the Engineering College of the University of Caracas were cooperating parties for the project. The MOP constructed any needed additional stream gaging stations and furnished engineers to operate them and help collect the other hydrological data. The Metrological Service constructed and operated the Met. Stations. We flew in a radar trailer and system.

Dr. Michael A. Stevens, Research Assistance at CSU, was our in country Chief of Party for the hydrology work. He supervised the data collection and where needed supervised the building of gaging stations. Ernesto Iba, Venezuela Mythologist for Caracas’s International Airport, was Project in Country Expeditor. He coordinated the cooperation with the cooperating parties and expedited the importation of our equipment.

At the end of the 2nd field season I received a phone call from General George Doster, Commander Alabama Air National Guard, he offered, if I requested it and as training flight for his group, to fly myself and representatives of the University to Venezuela to thank those cooperating organizations and people for the help they provided to the success of the project. He would have room for eight persons in his C54 aircraft. After discussions with Dean’s Baldwin and Simons and President Chamberlain and correspondence with our Venezuelan cooperators it was decided that President Chamberlain, Dean Baldwin, I and our wife’s would make the trip.

General Doster and 3 other guardsmen flew us to Venezuela. We flew from Buckley to Montgomery, Alabama, stayed overnight, then to Puerto Rico, where we stayed overnight at the officer’s bachelor quarters, then to Caracas. We made the rounds to the President of MOP, Air Force Ministry and the University of Caracas to thank them. On our visit to the President of the University we were accompanied by the U. S. Ambassador who presented the University a gift of books. The U. S. had been trying for years to give these books but the communist leaders in the university had refused to see the Ambassador.

We returned by way of Barbados, Puerto Rico, and Montgomery to Buckley Field.

General Dozer trained and was in charge of the Cuban flyers that took part in the Bay of Pigs invasion of Cuba. Many of these flyers were killed. General Dozer and the air crew told us many of the details of that operation. They were very bitter about how they and the Cubans were used.

As the result of the project I had several Venezuelans engineers attend CSU and obtain Msc. degrees. These were Jesus A. G. Medina, Jose I. Sanabria, Jose M. Perez, Rafael E. Abreu-Burelli and Hector A. Trujillo-Herrera
In 1968 Dr. Omar Kelly, Chief of the Agriculture unit of the U. S. Agency for Development (AID) called President A.R. Chamberlain and asked if CSU would be interested in a research project to improve food production from irrigated agriculture. Omar, a CSU Agronomy graduate, who had a distinctive career with the U. S. Department of Agriculture before joining USAID observed that food and fiber production from the irrigated farms in the developing world was too small. For example in Egypt with perfect climate, water, fertilize and seeds, yields of wheat and corn were only 10% of U.S. yields. He wanted an inter-disciplinary research project to solve the problem. Chamberlain asked Simons if engineering would prepare a pre-project proposal which I did. Omar liked the pre-proposal and Maury Albertson went to Washington and finalized the project.

Later Omar using the 211-D section of USAID’s organic Act, which allowed USAID to inter into contracts with US Universities to increase their ability to serve AID’s mission, negotiated with Maury a 2 plus million dollar contract to do just that. In addition, Omar negotiated similar contracts with Utah State University, University of Arizona, University of Calif. at Riverside and Texas Tect. To better serve USAID, CSU and these Universities joined together to form the Consortium for International Development (CID).

Maury Albertson did a great job for the project. He established an interdisciplinary team of agronomist, economist, sociologist and agricultural engineers to do on-farm research in Pakistan. Dr. Gile Cory was in-country Project Leader and Dr. Wayne Clyma was the principal Agriculture Engineer. The project made significant contributions both to Pakistan’s agriculture production and the science of On-Farm Water Management.

Somehow Maury came at cross purpose with USAId personnel in Pakistan and had to give up leadership of the two projects (ON-FARM Water Management and 211-D). Dr. Scogerbown in Agricultural Engineering took over the On-Farm Water Management Project and I took over the 211-D Project.

I made two trips to Pakistan. First with a group organized by Maury Albertson and the other at the request of USAID for the Pakistani Government. My purpose was to determine if soil conservation could decrease the sediment inflow into Tarbela Reservoir. On these trips I would stop at Bangkok Thailand to visit friends and the Asia Institute of Technology. A University that Maury established under an USAID contract.

| MLA GROUP (D. B. Simons, Della Laura, M. L. Albertson, E. V. Richardson, Sara Albertson. (62) | Indus River, (63). |
| Pakistan On-Farm Water Management Research, (60) | Pakistani Mosque, (61) |
The Indus Basin Plan called for the construction of a Dam on the Indus River. The site chosen was at Tarbela. However, It was know that the site and type of dam, that the reservoir would fill with sediment in about 80 years. The reason being that the type of dam required for the site would trap all the sediment. And, although the Indus was not a dirty river (sediment concentrations seldom exceeded 2,000 ppm), the reservoir storage capacity was only 0.13 of the average annual flow of the Indus. My conclusion after both trips was that sediment inflow into Tarbela was from the bed and banks of the river. Soil Conservation would benefit Pakistan but would not significantly decrease sediment inflow. I proposed an engineering method to decrease sediment inflow but it was not accepted.

CSU had a significant role in the development and construction of the Indus Basin Plan. Dr. Simons was a major consultant in the design of the Link Canals, and design of the Barrages. Dr. S. Karaki and Prof. Jim Ball did major model studies at CSU’s Hydraulic Laboratory of the outlet works for Tarbela Dam. These outlets controlled some of the largest discharges of water of any dam in the world. Dr. Albertson’s on-farm water management project, with the work of Dr’s Gile Cory, and Wayne Clyma improved farm production and more efficient water use. Dr. Art Cory’s tube well research improved irrigation drainage and water use. I contributed to better understanding of the source of sediment in the Indus river and the need of a new dam on the Indus.

I made over 30 trips to Egypt from 1975 to 1989. My first trip was in the spring of 1975 at the request of the National Academy of Science. Shortly after Nixon and Kissinger made their historic agreement with Anwar Sadat, the National Science Academy, sent team of Scientist and Engineers to Egypt to show the sincerity of the United States. We spent a month meeting with the top political figures, engineers, scientist, economic planners, bankers etc.

Egypt was in bad shape. Infrastructure in need of repair and a change to a market economy. I concentrated on the Ministries of Agriculture and Irrigation. I had the pleasure of meeting both ministers and their top under secretary’s, engineers and scientist. We traveled extensively in the field. I was shocked by how bad the agriculture sector was and the low moral of the people we meet.

The Ministry of Agriculture didn’t interact with the farmers except to police them. They made sure the farmers sold their major produces (Wheat, Corn, and Cotton) to the Government at low prices. Then the Gov. sold them at world prices. The Ministry of Irrigation didn’t interact with the farmers but delivers water on the Ministry schedule not when the farmers needed or wanted it. Therefore the farmers either stole water or pumped water from the drains. There was a love hate relationship between the farmers and the personnel in the two ministries. The farmers hated how they were
treated by the people in the Ministries but though the Ministry’s people and Egypt’s agricultural and irrigations system were the best in the world. Ministry personnel said their farmers were the best in the world but were thieves and difficult to work with.

The total irrigations system was based on controlling how much water the farmer used by making him work for it. The English designed the farm delivery system below ground so that the farmer had to lift it using Sahdul (water bucket on a Stick), Saquia (water wheel), Tambouri (Archimedes Screw) or mechanical pumps. As a result agriculture production of food and fiber, except for cotton, were the lowest in the world. From my observations I knew that an on-farm irrigation management project, modeled on our Pakistan project would help Egypt. From this observation I arranged to be asked to by the Ministries of Agriculture and Irrigation to return to Egypt. This I did using CSU’s AID’s 211-D funds. I came to the conclusion that the most progress could be made in improving agriculture by working with Dr. Abu Zeid, Chairman of the Water Research Center of the Ministry of Irrigation. I prepared a report and left it with USAID and the Dr. Abu Zeid. A short time later USAID asked if I would put a team together to develop a Project Paper to implement my recommendations. This I did. The team consisted of Dr’s W. Schmehl from Agronomy, W. Clyma from Agricultural Engineering, R. W. Shaner from Mechanical Engineering. We were aided by R. S. McCandliss from USAID. We were furnished an apartment, two cars, drivers, secretaries and a Nubian cook. We stayed a month and working with Dr. Abu Zeid and his WRC staff of Scientist and Engineers prepared a feasibility report and Project Paper in AID’s Format.

Using the project paper I negotiated a 17 million dollar contract for 5 years. It was later extended to 7 years and an additional 8 million dollars. We put in country an interdisciplinary team consisting of Dr. Alex. Dotzenko, Agronomy, Royal Brooks, Agricultural Engineering, John Wolf, Agricultural Engineering, Ed Knop, Sociology, David Marretella, Economist, Harold Golas, Agronomist, Nancy Adams, Agricultural Engineer, Erwin Nielson, Engineer and Farmer. We established 3 field sites. Kafr El-Sheik in the delta with Nancy Adams stationed there. Mansuriya near Cairo, with Harold Golas stationed there. And Minya in upper Egypt with Erwin Nielson stationed there. Not all were from CSU. For example, Brooks and Wolf were from Oregon State University. In order for Oregon State University to release Brooks, Dr. Art Cory moved there to take up Brooks duties.

Dr. Roy Brooks was the in-country Project Technical Director, Dr. Hassen Wahby was Project Director under Dr. Abu-Zeid and I was Campus Project Coordinator. Later Dr. Eugene Quenemoen, Economist, became Project Technical Directo when Roy left for another AID project. Also, Eldon Hanson. Agricultural Engineer replaced John Wolf. Thomas W. Ley, Civil Engineer, replaced
Nancy Adams, Gene Quenemoen replace Brooks as Technical Director, Richard Tinsley, Agronomist, replaced Alex Dotzenko. And James Layton, Sociologist, replaced Ed Knop.

Over 110 Egyptian engineers, sociologists, agronomists, economists, chemists, etc worked for the project. And 56 Americans worked in Egypt on temporary Duty. (TDY). By 1984 the project had written over 72 reports.

This First Project was called Egypt Water Use and Management Project (EWUP). In addition to improving the delivery system, and farmer’s irrigation and farming practices, a major objective was getting MOI engineers to work with the farmers. So we developed a training program bringing Egyptians to tour irrigation projects in the U.S. and to obtain graduate degrees. We got the MOI to organize an Irrigations Advisory Service to work with and advise farmers served by a single canal.


As an out growth of the success of EWUP I obtained a 35 million dollar contract for CID/CSU It was for 4 years. It had two components. 1) To improve irrigated agriculture in the old lands and 2) to strengthen the research capabilities of the Water Research Center. This project utilized two CSU in country Engineers and relied almost extensively on short term persons working in Egypt. Dr. S. Karaki was in country Technical Project Director and Dr. S. Sritharan was his in country assistance.

Working with Dr. Dan Sunada we were able to obtain a third 30 million dollar USAID contract with Dan as Campus Coordinator. I worked on this project until retirement.

By all measures CSU’s work in Egypt was a success. We improved irrigated agriculture, and significantly increased the research ability of the Water Research Center. The Water Research Center is now a National Center not just a MOI Center. Many of the different Discipline Branches are staffed and headed by CSU graduates. Dr. Abu Zeid is now Minister of Public Works and Water Resources (the renamed Ministry of Irrigation). Many of his under secretaries and chief aids worked on the project and/or received degrees from CSU.

One final note. The staff in any discipline in the Water Research Center and students in Egyptian Universities were approximately 50 % women. In Engineering 48 % were women whereas in Medicine 54 % were women.

EWUP, 1984, “Improving Egypt’s Irrigation System in the Old
In 1972 or 93 Frank Johnson, Chief Hydraulics Engineer for the Federal Highway Administration in Washington, D.C., was concerned about highway bridge engineers lack on knowledge about the streams and rivers that flowed under their bridges. He gave me a $15,000 contract to prepare a training manual and short course to educate them. I pulled a team together consisting of Drs. S. Karaki, K. Mahmoud, D. B. Simons, and M.A. Stevens. We each wrote a chapter or section, which was then reviewed and edited by the rest of us. The Manual was titled “Highways in the River Environment, Hydraulic and Environmental Design Considerations. It contained chapters on Open Channel Flow, Fundamentals of Alluvial Channel Flow including Sediment Transport, Fluvial Geomorphology, River Mechanics, River Stabilization, Bank Protection and Scour, Needs and Sources of Data, and Hydraulic and Environmental Considerations of Highway Crossing and Encroachments. With the help of Dr. P. Julian I revised it in 1983. Then in 2001 Dr. Peter Lagasse and I made a major revision and it was published by FHWA as a Hydraulic Design Series No. 6.

We incorporated in each edition or rewrite of the manual the latest research. Much of it from the results of research at CSU. For example Dr. Stevens develop an equation to predict local scour at bridge piers. As will be described later. It was determined by FHWA as the best equation. The equation calculated the smallest scour depths of any of the existing equations but did not under predict existing data on local pier scour depth. It became known as the CSU equation.

Dr. D.B. Simons and I taught the course 45 times in 24 states from 1974 to 1998. Since that time Ayres Associates have taught the course.


I became an Emeritus Professor of Civil Engineering in 1988 when I retired and joined the firm of Resource Consultants, Inc., which was later bought out by Ayres Associate, Inc., as a Senior.
Associate. A position I presently hold.

At RCI and Ayres I worked on in many Civil Engineering consulting jobs. In 1987 I was asked by the U.S. Transportation Board (NTSB) to help them in their investigation into the cause of the I-90 bridge failure near Albany, New York, which caused 8 deaths. Working with Dr. Peter Lagasse of RCI, field research and a model study by the CSU’s Hydraulic Laboratory staff, we prepared a report showing that scour at Pier 3 as the result of faulty design and inspection of the bridge foundations, caused the failure. Movies of CSU’s model study were shown on national TV.

The I-90 bridge failure resulted in the Federal Highway Transportation Administration (FHWA) issuing in 1988 a Technical Advisory requiring the States to evaluate all their bridges over water as to their vulnerability to failure by Scour. The advisory included an “Interim Procedures for Evaluating Scour at Bridges.” which was written by me, as senior author, and Stan Davis Chief of FHWA Hydraulic. This was the first publication that gave a comprehensive design procedure for evaluating scour of bridge foundations. In the procedures CSU’s pier scour equation was given as the best available. The publication was later, with major modifications as new knowledge became available, issued as FHWA’s Hydraulic Engineering Circular 18. The 4th Edition written by myself and Stan Davis was issued in May 2001.

Ayres Associates, Inc., with my participation, developed and presented training courses on bridges in the river environment, scour, stream stability and scour counter measures for FHWA. These courses have been presented to engineers in all 50 States and many foreign countries.

The bridge scour, sediment transport, and river mechanics teaching and research by CSU’s Civil Engineering Faculty, myself and Ayres Associates, Inc engineers, has resulted in an international reputation.


In 1975 I was a member of a CALTRANS team to investigate the 1995 I-5 bridge failure near that killed 7 persons. We determined that inadequate bridge length and poor inspection resulted in contraction scour, which caused the failure. As a result CALTRANS settled out of court with the victims families.

CSU, under Presidents Morgan and Chamberlain, built an international reputation as a teaching and research University. Morgan and Chamberlain both said that with the right Professor CSU could build any Internationally recognized program. They took risks and allowed the colleges and departments to take risks. With an entrepreneur spirit they allowed the colleges and departments to tenure faculty on research contracts and grants (so called soft money). Deans Baldwin and Simons ran with it. After the first year my entire salary came from contracts. Herb Riehl came from Chicago (he liked the weather changes in Colorado) to the Civil Department. Using research funds he built the Atmospheric Department. Dr. Y. Yevjevich built the stochastic hydrology program on soft money. These are only a few of the programs that were built under President Morgan and Chamberlain.

Finally, It’s about time I shut up; the University Departments worked together and supported each other in their teaching and research programs. I got campus wide support in my Interdisciplinary search projects. I got support from other departments, such as sociology, agronomy, and economics, in my development work in Pakistan, and Egypt. I think it’s unique, that CSU’s faculty were so supportive and worked so hard with the Civil Department.
RÉSUMÉ
EVERETT V. RICHARDSON, Ph.D., P.E., Hon.D.WRE, F.ASCE

PRESENT POSITION

Senior Associate, Ayres Associates, Inc. Fort Collins, Colorado
Professor Emeritus of Civil Engineering, Colorado State University, Fort Collins, CO

EDUCATION:

Missouri School of Mines, Rolla, Mo. Army Specialized Training Program (ASTP). (General Eisenhower’s Infantry Reserve). 1943-44. Freshman Engineering then to 44Inf. Division.

Scottsbluff Junior College 1945-46

B.S. Civil Engineering, Colorado State University, 1949
Graduate Work in Hydraulics, Iowa Institute of Hydraulics, 1953-1956

M.S. Civil Engineering, Colorado State University, 1960
U. S. Government Graduate Fellowship, Hydraulics, Massachusetts Institute of Technology, 1963-64

Ph.D. Civil Engineering, Colorado State University, 1965

PROFESSIONAL SOCIETIES AND NATIONAL COMMITTEES:

Fellow, American Society of Civil Engineers
Past Chairman, Sedimentation Committee, Hydraulics Division, ASCE
Past Chairman, Executive Committee, Waterways, Harbors and Coastal Engineering Division, ASCE
Past Chairman, Research Committee, Waterways, Harbor and Coastal Engineering Division, ASCE

Member and Secretary of the Board of Directors, U.S. Committee for
Irrigation and Drainage, and American Water Foundation, 1983 - 1990

Member, Committee on Hydrology, Hydraulics and Water Quality, Transportation Research Board, National Research Council, National Academy of Science, 1981 - 1996.

Member, U.S. - Egyptian Joint Consultation Committee on Nile River, U.S. Academy of Science, 1978 - 1979

AWARDS AND HONORS:

Member of Sigma Xi, Chi Epsilon and Gamma Sigma Delta (National Honor Societies for Engineering, Civil Engineering and Agriculture Engineering, respectively).


In 1961, received the American Society of Civil Engineers' J. C. Stevens Award.

In 1963, granted a government fellowship to study under Dr. A. T. Ippen at the Massachusetts Institute of Technology.

In 1986, Received the College of Engineering Abell Faculty Research and Graduate Support Award for outstanding achievement and Professionalism in Education, Research and Service to students.

In 1993, as Chairman, received the ASCE Hydraulics Division's Task Committee Excellence Award for work of the Task Committee on Bridge Scour.

In 1996. Received the ASCE Hydraulics Division's Hans Albert Einstein award for his contributions in Sedimentation and Scour.


Registered Professional Engineer, State of Colorado.

PREVIOUS POSITIONS:

Professor-in-Charge of Hydraulics Program and Director of Hydraulics Laboratory, Civil Engineering Department, Colorado State University, Fort

Professor of Civil Engineering and Administrator of Engineering Research Center, Colorado State University, Fort Collins, Colorado, 1968-1983.

Director of CSU’s 211-d Program sponsored by the U.S. Agency for International Development (USAID) to increase CSU’s international development work, 1973-1977.


EXPERIENCE:

Dr. Richardson has conducted a broad range of water resource investigations in the U.S. and abroad on sediment transport, resistance to flow, bridge scour, and analysis of programs for measuring water and sediment discharge in natural streams, theoretical and applied studies of turbulence and diffusion in open channels, irrigation, and design of hydraulic structures. He has served as a consultant to the World Bank, Federal Highway Administration, State Departments of Transportation, foreign governments, and consulting firms on problems of alluvial channel flow, water management, sedimentation, river mechanics, highway and pipeline river crossings, irrigation, and erosion. As a consultant on erosion, sedimentation, and irrigation, he has worked on many rivers and river basins around the world, including Rio Orinoco, Han, Bamputra, Padma, Nile, Indus and the Rio Puerco, Missouri, Colorado, Mississippi, Rio Grande, and Yellowstone Rivers in the United States. He has served as an expert witness in court cases related to his expertise in hydraulics, sedimentation, river mechanics, irrigation, and water resources.

Dr. Richardson was principal investigator for a 1973 to 1977 project to develop a training manual and short course for training state, county and federal highway bridge and hydraulic engineers the fundamental hydraulics, river mechanics, and sedimentation needed for the design of highway bridges.
crossing of or encroaching on rivers. The manual and course gave methods for determining scour at bridge crossings, design of riprap for bank protection, and other countermeasures for hazards at highway crossings. Case histories were presented in the manual and short course. The title of the manual was "Highways in the River Environment, Hydraulic and Environmental Design Considerations." An instructor's manual, lesson plans and visual aids were developed for the short course. Since 1977 Dr. Richardson, aided by Dr. Simons, has presented the course to highway bridge and hydraulic engineers in various parts of the country sponsored by National Highway Institute (NHI). He is the Principal Author for the revised 1990 and 2001 manuals to include recent material on river mechanics, sedimentation, geomorphology and assessment of stream-related hazards and countermeasures. The 2001 revision was made into a Federal Highway Administration Hydraulic Design Series Number 6 (HDS 6) and titled River Engineering for Highway Encroachments- Highways in the River Environment.

Dr. Richardson has been actively engaged in research, teaching and consulting on erosion and sedimentation, river mechanics, hydraulics of open channel flow, water resource and development, and irrigation since 1949. His work included the research and teaching on hazards and countermeasures at bridges. From 1949 to 1953 he was with the Water Research Division of the U.S. Geological Survey in Riverton, Wyoming where he eventually was in charge of the Sedimentation and Chemical Quality of Water Data Collection Program. During this time he worked with Bruce Colby and Chuck Hembree in the development of the modified Einstein procedure for prediction of the total bed material discharge of a stream.

He was placed in charge of the Water Quality and Small Watershed Program in Iowa in 1953. While at Iowa City he studied under Dr. Hunter Rouse and took part in studies of scour at bridges and became familiar with Dr. E. Larsens bridge scour work.

From 1956 to 1964 he was Associate Director and Director 1964 to 1968 of Alluvial Channel Research for the U.S. Geological Survey at Fort Collins, Colorado. He conducted field studies on diffusion characteristics of the Colorado River and Missouri River; resistance to flow and sediment transport on the Rio Grande, South Platte River, and Missouri River; dye dilution measurement techniques; movement of radioactive particles in the lower Columbia River; and scour at bridge crossings and encroachments. He conducted laboratory studies of sediment transport and resistance to flow in channels, model studies of water and water and sediment measuring flumes, turbulent characteristics of open channel flow, scour, design of riprap and scour at bridge crossings and encroachments. He was principal advisor to the Chief of Surface Water Branch, USGS on fluvial hydraulics. As such, advised USGS district engineers on sediment, resistance to flow, water measurement, scour at waterway crossings and water measurement problem. He served as USGS consultant to U.S. Parks
Service, Kentucky Highway Department and U.S. Bureau of Public Roads on erosion and deposition problems at highway bridges. He conducted many short courses to teach USGS hydraulic engineers the principles of sediment transport, resistance to flow, scour and deposition in open channel flow including highway crossings. His work with Dr. Simons defined the forms of bed configurations that form in sand bed channels and their associated resistance to flow and sediment transport.

From 1968 to 1988 he was Professor of Civil Engineering at Colorado State University. He taught graduate classes in hydraulics, river mechanics, and sedimentation; conducted laboratory, field research and model studies on alluvial channel flow, scour and deposition, design of stable channels, riprap design, beginning of motion of rock particles, irrigation, and fluid measurement. This research and model studies were for private companies, federal and state agencies, and foreign governments. Also, from 1968 to 1983 he was Administrator of Engineering Research Center, at the foothills campus. The duties included overseeing the work of the support staff for the research center. These included the hydraulics laboratory shop, the secretarial pool, the electronics shop, computer center, and the photography center. During this time he secured the funding of several additions to the Center such as the structures testing facility (smash lab.) and the solar village. From 1984 to 1988 he was Professor in Charge of the Hydraulics Program and Director of the Hydraulics Laboratory at Colorado State University.

Dr. Richardson was very active in international development. From 1973 to 1976, he was Director of CSU's 211-D Program sponsored by USAID. In this program he worked with counterparts at Utah State University, Arizona University, University of California at Riverside, and Oregon State University in developing research programs and response capability at these universities in the fields of Agricultural and Civil Engineering, Agronomy, Economics, Sociology, etc. for use by USAID and other development agencies such as FAO and World Bank. He helped establish the Consortium for International Development (CID) which has eleven western universities cooperating together to furnish technical assistance to the developing world. He was a Trustee from 1973 to 1987. From 1976 to 1988, he was project director of three AID-sponsored irrigation and water research projects in Egypt. The first project was entitled Egypt Water Use and Management Project (EWUP), the second was entitled Egypt Irrigation Improvement Project (EIIP) and the third was Egypt Water Research Center Project.

In 1989 Dr. Richardson became emeritus Professor of Civil Engineering at Colorado State University and became a Senior Associate at Ayres Associates, Inc. A position he continues to hold. At Ayres he was, as a consultant, Principal Hydraulic Engineer for the U.S. National Transportation Safety Board’s investigation of the 1987 failure of the I-90 Highway bridge over Schoharie Creek in up state New York and the 1997 BNSF Railroad Bridge Failure near
Kingman, Arizona. He, also was hired by CALTRANS to investigate the cause of the 1995 California I-5 bridge over Arroyo Pasajero failure.

In 1988 he co-authored with Stan Davis, Chief Hydraulic Engineer for the Federal Highway Administration, a publication titled “Interim Procedures for Evaluating Scour at Bridges” that was issued as part of the FHWA Technical Advisory T 5140.20, titled “Scour at Bridges. The Interim Procedures was the first time in the United States that a detailed procedure for evaluating scour at highway bridges was ever written. Subsequently the procedures were upgraded by Richardson and Davis into FHWA’s Hydraulic Engineering Circular HEC 18 titled “Evaluating Scour at Bridges.” The fourth editions with Richardson and Davis as authors was published in May 2001.

Working with Dr. Peter Lagasse he developed a short course to teach State highway hydraulic engineers the methods given in FHWA's HEC 18 to design and evaluate bridge foundations to be safe from scour. The original scour course has now evolved into three courses. These are Evaluating Scour at Bridges, Stream Stability at Highway bridges and Bridge Scour and stream Instability Countermeasures. The courses have been taught to engineers from every State in the Union and also in several foreign countries. As a Hydraulic Engineer with Ayres Associates has also worked on many other engineering jobs, such as the design of a sediment excluder for the Horseshoe Bend Hydroelectric Project, Horseshoe Bend, ID

He has served as a member of various committees and advisory boards of the American Society of Civil Engineers, National Academy of Sciences, Transportation Research Board, United Nations Development Authority, United Nations Food and Agriculture Organization, U.S. Agency for International Development, U.S. Committee for Irrigation and Drainage, and Colorado Water Conservation Board. He conducted river development studies in Colorado, Montana, New Mexico, Wyoming, Nebraska, Pakistan, Bangladesh, Egypt, and Venezuela.

He has authored or co-authored over 200 technical papers, manuals, and reports on water resources, fluid mechanics, open channel flow, erosion, sedimentation, river mechanics, hydrology, bridge waterways, erosion and scour, and hydraulics structures. He has contributed chapters in Engineering Han Books and edited ASCE publications.

Following is a Summary of Professional Activities:


Member and Chairman in 1969, Sedimentation Committee, Hydraulics Division, American Society of Civil Engineers. (ASCE) (1966-70).

Member of Research Team for a combined hydrologic and meteorological field experiment in Venezuela (VIMHEX) (1967-72).

Member of Fort Collins Water Board. The Board provides expert council to the Fort Collins City Council of future water supplies, domestic and waste water treatment and the water delivery and removal system (1963-84).

Member of Review Team to advise International Bank for Reconstruction and Development (World Bank) on morphology and hydrology studies of the Ganges, Brahmaputra and Padma Rivers in Bangladesh, 1970.

Member, and in 1974 Chairman of the Waterways Committee, Waterways Harbors and Coastal Engineering Division (ASCE) 1971-75).

Field trip and report on sediment problems at Tarbella Dam on Indus River for Government of Pakistan, 1972.

Member, and in 1975 Chairman of Research Committee, Waterways, Harbors and Coastal Engineering Division (ASCE) (1972-76).


Member or Alternate Member of the Board of Trustees of the Consortium for International Development (CID) from Colorado State University (1973-87). Member Executive Committee 1983-86.

Member, and in 1975 Chairman of Research Committee, Waterways, Harbors and Coastal Engineering Division (ASCE) (1972-76).


Director, project to develop training manual and put on short courses to train highway engineers on “Highways in the River Environment, Hydraulic and Environmental Design Conditions” (1973-2002). Senior author of training manual.

Member of Executive Committee that organized and implemented ASCE’s International Symposium on Ocean Wave Measurement and Analysis, “Waves,

Member of a joint National Academy of Science - Egypt Academy of Science Workshop on Research Management, 1975 in Cairo Egypt.


Member of ASCE Task Committee on “Procedures for Contract Research (1976-77). Prepared procedures and guidelines for ASCE conducted research.


Campus Coordinator for Egypt water Use and Management Project (EWUP) (1977-84). Team leader of a five-man team that determined the need and feasibility of the project and wrote the project paper for the 13 million dollar Project (1976).

Member, U.S. Department of State special consultancy on Schistosomiasis Strategy. Review and prepared recommendations on USAID program for Schistosomiasis control in the world, 1977.

Participant, discussion seminar on regional science and technology development in the Middle East sponsored by Commission on International Relationship, National Research Council, NAS, 1978.

Member, ad hoc panel formed by Commission on International Relations, National Research Council, NAS to advise U.S. Egyptian Joint Consultative Committee (JCC) on Nile Water and Soils studies, 1978-1979.


Member, Advisory Committee to Egypt Major Cereals Improvement Project, 1980-1983.
Member, Joint USAID and IBRD (World Bank) team to develop a program to improve irrigation in Egypt (1980).

Member, Joint FAO/USDA Beltsville workshop to define needs of on-farm water management in the world (1980).


Member, Steering Committee for Feasibility Study of the Upper Cache La Poudre River Storage Project, Colorado Water Conservation Board (1981-83).

Member, United Nation's Food and Agriculture Organization (FAO) Expert Consultation in Water Management, Rome, 1982.

Member, Planning and Organizing Committee for 12th Congress of the International Congress of Irrigation and Drainage held at Fort Collins, Colorado, May 20 to June 2, 1984 (1982-84)

Director of Hydraulics Laboratory, Colorado State University, and Professor in Charge of Hydraulic Program, Colorado State University, (1983-89).

Member Joint UNDP/FAO/World Bank Mission to review the technical assistance requirements of Egypt's Agriculture and Food Security Sector, 1986.

Member, Board of Directors U. S. Committee of Irrigation and Drainage, (1983-89).

Member, National Academy of Science Committee to review Federal Highway Administration's Research Program on highway drainage and flood protection.

Member and Secretary, Board of Directors of the American Water Foundation, a non-profit foundation established by U. S. Congress of Irrigation and Drainage to encourage and facilitate the transfer of U. S. water resources technology within the international community, (1984-1990).

Campus Coordinator of the Egypt Irrigation Improvement and Water Research Project for CID with Colorado State University as Lead University. Project provided technical assistance to the Egyptian Water Research Center and Irrigation Improvement Program, Ministry of Irrigation. (1985-89).

Member, Joint UNDP/FAO/World Bank mission to review the technical assistance requirements of Egypt’s Agriculture and Food Security Sector.

Principal, as a consultant, of the National Transportation Safety Board's (NTSB) investigating team to investigate the April 5, 1987 New York State I-90 bridge
over Schoharie Cr failure that killed 10 persons (1987).

Expert witness on bridge hydraulics and scour at the NTSB'S June 29 to July 3 hearing into the failure of the New York State Thruway's Bridge over Schoharie Cr. held at Albany, NY (1988).


Member of New York State's Bridge Safety Assurance Task Force. Committee appointed by the Governor and Legislative Budget Office to determine the status of the safety of New York's bridges from hydraulic, corrosion or fracture failure.


Member, CALTRANS, USGS, FHWA investigation of the 1995 I-5 bridge failure that killed 7 persons (1995-97)


Principal, in 2001, as consultant under contract to the National Transportation Safety Board's (NTSB) to investigate the August 9, 1997 BNSF railroad bridge failure near Kingman, AZ (1999-2000).

Invited speaker, 1999, Western Bridge Engineers Seminar at Seattle, WA, Topic "Bridge Inspection for Scour Vulnerability," October

Consultant in 2000 to Los Alamos National Laboratory, Los Alamos, NM, in support of their environmental rehabilitation efforts and to protect laboratory assets after the Los Alamos forest fire.

Invited speaker in December 2001 on stream instability and bridge scour at Portugal's National Civil Engineering Laboratory Conference on Hydraulic Works at Bridges.

Invited speaker, November, 2002, First International Conference on Scour of
Foundations, International Society for Soil Mechanics and Geotechnical Engineering, at Texas A & M University, College Station, TX.

Chairman (August, 2004) of a five person Expert/Peer panel to review the quality, performance and relevance of the research done by the Federal Highway Administration's Turner-Fairbank Highway Research Center's Hydraulics Laboratory. The panel produced a 78 page report, which was very positive of the research (applied and basic) of the hydraulics laboratory.

BIBLIOGRAPHY


Richardson, E.V., 1960, Sediment Transport in Alluvial Channels (examination of Bagnold's 1956 hypothesis), M. S. Thesis, Colorado State University, Fort Collins, CO.


Richardson, E.V. and D. B. Simons, 1961, Studies of Flow in Alluvial Channels, Basic Data from Flume Experiments, Civil Engineering Department, Colorado State University, Fort Collins, Colorado.


Richardson, E.V., and A. C. Miller, 1974, Diffusion and Dispersion in Open Channel Flow, Vol. 100, HY1, Jour. Hydr. Div., ASCE, Reston, VA.


Richardson, E.V., and H. Wahby, 1982, Recommendations for Irrigation System Improvement, Water Research Center, Egyptian Ministry of Irrigation, Cairo, Egypt, July.

Richardson, E.V., R. McConnen, 1982, National Irrigation Improvement Project for Egypt, Egyptian Ministry of Irrigation, ARE, Cairo, Egypt, November.


El Hakim, O., Clyma, W., and Richardson, E.V., 1984, Border Irrigation Performance Parameter Functions by Dimensional Analysis, ASCE Specialty Conference on Irrigation and Drainage, Flagstaff, Arizona, Reston, VA, July.


Sritharan, S., Clyma, W., and Richardson, E.V., 1984, Probability Based Design Evapotranspiration, ASAE Summer Meeting, Reston, VA, Knoxville, TN.


Richardson, E.V., 1986, Summary Report to FAO of Activities on Joint UNDP/FAO/IRBD Mission to Review Technical Assistance Requirements in the Agriculture and Food Security Sector in Egypt; Hydraulic Program Report, Civil Engineering Department, Colorado State University, Fort Collins, CO.


Richardson, E. V., and Richardson, J. R., 1989, "Bridge Scour," Civil Engineering Department, Publication, Colorado State University, Fort Collins, CO., May,


Richardson, E. V., Simons, D. B. and Julian, 1990, "Highway in the River


Lagasse, P.F. and Richardson, E.V., 1996. "Training for Bridge Inspectors in


Reston, VA, p 457.


