COASTAL JEWELS

BY GEORGE P. EDMONSTON JR.

From Astoria to the California line, the bridges of the Oregon Coast sit like jewels on a long necklace.

Though man-made, they relate easily to the landscape. Nothing about them detracts from the awesome beauty and ruggedness of the area. If one suddenly disappeared, the setting around it would be stripped of a vital element.

The Yaquina Bay bridge in Newport. The Siuslaw River bridge in Florence. The Coos Bay bridge. The Umpqua River bridge at Reedsport. The Rogue River bridge at Gold Beach. The smaller spans include the Cape Creek bridge, the Rocky Creek bridge,
the Depoe Bay bridge and the Wilson River bridge.

These and others along Oregon's historic Highway 101 represent what may be the finest continuous set of concrete-reinforced, steel-arched bridges in the United States.

A closer look at the bridges, primarily built during the 1930s, shows engineering and architectural elements unique to a time when bridge designers put a high priority on aesthetic detail. Today, travelers along the coast delight in finding bridges embellished with arch crowns, Art Deco-inspired pylons and obelisks, Gothic piers, towering spires and arched railing panels, each suggesting an earlier time and place, a different work ethic and way of life.

The larger bridges, such as at Yaquina Bay and Coos Bay, offer landscaped waysides at each end, accessed by staircases leading downward from plazas on the main deck.

Underneath, Gothic piers open out in cathedral-like grandeur, leaving the visitor with the feeling there is a sense of purpose and permanence in these bridges, that they were designed and constructed by someone who was building something not only to be used for convenience of transportation, but as something with intrinsic value. A testimonial to engineering as art.

The story of how these bridges came to be built is a fascinating tale involving many personalities, a little controversy, and the genius of an engineer who had a vision for the coast that lives on in the bridges he designed and in the way people experience them.

His name was Conde Balcom McCullough, generally acclaimed to be the outstanding bridge engineer in Oregon's history. During his adult life friends called him "Mac," and on the Oregon State campus in Corvallis, where he was a faculty member during the World War I years, students worshipped him, always hoping to be the next Oregon Stater he would hire and move to Salem to work on bridges.

McCullough was born on May 30, 1872, near Redfield, S.D. His father was a doctor and, by 1891, had relocated the family to be near relatives at Fort Dodge, Iowa. After his father's unexpected death in 1904,
young C.B. had to take odd jobs to help support his family. But he continued his education and enrolled at Iowa State College in Ames in 1906, where he graduated in 1910 with a degree in civil engineering.

While at ISC, McCullough came under the influence of faculty member Anston Marston, one of the nation’s leading engineers. Marston told his students they must be able to do more than crunch numbers and supervise workers. Instead, the old dean pushed for the “well-rounded” engineer, a professional with a respect for the past and an eye for the aesthetic.

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McCullough’s thinking, however, was never far from bridges. When it came time for his senior project at Iowa State, he and a classmate teamed up to research the effects of external temperature variation on concrete bridges, an experience he would later call on again and again in his work on the Oregon coast.

After graduation, McCullough took a job with James Barney Marsh, owner of the Marsh Bridge Company in Des Moines. Marsh specialized in reinforced concrete structures and had patented a “rainbow arch” design incorporated into numerous public works bridges throughout Iowa, Kansas and Minnesota. The Yaquina Bay Bridge and most of the smaller McCullough spans along the coast show one variation or another of Marsh’s design.

His next position was with the Iowa State Highway Commission. In 1916, however, McCullough packed his bags and moved with his family, now a wife and son, to Oregon State College, where he became assistant professor of civil engineering.

He began his college teaching career as the one-man faculty of the school’s structural engineering program. He had moved to the Northwest because he could see endless places that needed bridges. He was also impressed with the work of bridge engineers Sam Lancaster, Major Henry L. Bowlye, C. H. Purcell, K.P. Biller and L.W. Metzger, all of whom had helped create the innovative bridge designs that were constructed at Latourell Creek, Shepperd’s Dell and Moffett Creek along the Historic Columbia River Gorge Highway. It was Lancaster and his colleagues who established the tradition in Oregon that emphasized bridges incorporating both excellence in design and compatibility with the environment.

The year 1919 would change Conde McCullough and the state of Oregon forever. In April, the Oregon State Highway Commission asked the brilliant young engineering professor to move to Salem and become the state’s bridge engineer. He accepted without hesitation. His first responsibility was to hire a staff, and for this he chose the entire graduating class in civil engineering at Oregon State, all five of them, of which four accepted: Ellsworth G. Rickerts; Raymond “Peany” Archibald, who also was captain of the football team; Mervyn “Steve” Stephenson; and Albert Skelton.

In the next six years, McCullough and his staff would design and build nearly 600 bridges around the state of Oregon at a cost of $6.5 million. As the 1920s progressed, projects became smaller in number but increased in size. By the 1930s the time of construction of the bridges of the Oregon coast, McCullough would build his biggest and best bridges and be at the peak of his creative powers.

Ray Archibald became one of McCullough’s favorites. The two joined up to build the last four bridges on the Columbia River Gorge Highway and also helped construct the historic road’s Mosier Twin Tunnels. When McCullough was called to South America to supervise construction of the major spans for the Inter-American Highway in Panama, Honduras and Nicaragua, Archibald took over work on completing the remaining major spans on the Oregon coast. Later he joined Mac in Honduras and took over for him when McCullough had to return to Salem in late 1937. Archibald would later go on to a brilliant career in his own right, designing and building the first Chesapeake Bay Bridge in Maryland.

In 1929, McCullough tapped Oregon State again, this time hiring the best of the civil engineers from the class of 1927.
Ivan Merchant. At the same time, Mac also hired OAC faculty member and longtime friend Dexter Smith.

The two new hires would go on to careers of national acclaim. Ivan Merchant's first project under Mac was the bridge at Gold Beach, today known as the Isaac Patterson Bridge. In 1934, Merchant designed the Yaquina Bay Bridge's center arches. He stayed with the Oregon State Highway Department until 1972 and built, among others, the I-5 Bridge linking Portland and Vancouver, the Rose City's Fremont Bridge, and the four-mile long Columbia River Bridge in Astoria.

**His views were criticized up and down the coast, but in the end Mac got his way.**

Merchant set a Guinness Book of World Records mark with the Fremont Bridge project by hydraulically lifting the 902-foot, 6,000 ton tied-arch midsection as one piece, the heaviest lift ever recorded up to that time. Near Brookings, Merchant's Thomas Creek Bridge also holds a record. It's the highest — at 345 feet — in Oregon.

Dexter Smith is responsible for the deck arch approaches for the Yaquina Bay Bridge and designed the second Tacoma Narrows Bridge, built to replace the infamous "Galloping Gurdy" that twisted its way into the Narrows during a windstorm on Nov. 7, 1940.

As McCullough announced the start of the construction of the coastal bridges that would be his masterpieces, controversy arose almost immediately.

It was 1934, and the state timber industry was deep in depression, with sales in many counties down as much as 90 percent. If McCullough's proposed five large coastal bridges could be built of treated wood, the whole project would give a shot in the arm to an industry and work force in desperate straits. The structures would be replacing the last five ferries operating on the coast. Anything drivable, so the locals felt, even a bridge made of wood, was better than a slow, expensive ferry.
ment would not provide the WPA funds for the bridges unless they were built of the strongest materials available.

After returning to Salem, McCullough became both a consulting engineer and the author of several widely used textbooks and manuals for student engineers and professionals. Ironically, he was not asked to return to the bridge department but was promoted to assistant state highway engineer, a position with heavy administrative duties but few direct responsibilities for designing and building bridges — his real love.

He also authored a number of highly acclaimed technical bulletins for the state on the construction of suspension bridges and always maintained a heavy load of public speaking engagements and community service.

Just before he died in 1946, McCullough helped write Salem's long-range plan for the capital city's planning commission, on which he had been an enthusiastic volunteer for several years.

Conde McCullough's long career with the State Highway Department left a legacy of bridge building in Oregon unequalled in the 20th century.

Many of his bridges are listed on the National Register. One of these, the Wilson River Bridge in Tillamook County, was the first reinforced concrete tied-arch bridge built in the United States. Another historic span is the Clackamas River or McLoughlin Bridge near Gladstone, which received a 1933 Award of Merit from the American Institute of Steel Construction as the "most beautiful steel bridge of its class in the country." The Isaac Patterson Bridge over the Rogue River in Gold Beach was named a Historic National Civil Engineering Landmark in 1982. It was the first bridge constructed in America using the Freyssinet method of stress control.

In 1974, author David Plowden stated in his Bridges: Spans of North America that "McCullough's best examples, representing perhaps the most interesting concentration of concrete bridges in America, are found on the Oregon Coast Highway on the Oregon Coast."

In 1947, a year after his passing, the state honored C.B. McCullough by naming the 5,305-foot Coos Bay Bridge the McCullough Memorial Bridge. Engineering historians generally consider it to be among the best examples of McCullough's genius.

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How to spot a McCullough bridge

The steel bridge over the Marys River in Corvallis. The Highway 20 bridge crossing the Willamette River into downtown Albany. The three-arched, concrete monster that crosses the Santiam River into Jefferson just a few miles east of I-5. The railroad overpass on the old Portland Highway in north Salem. The rainbow-arch bridge across the Willamette River off 99E in Oregon City. The Crooked River Bridge near Terrebonne.

From 1919 to 1936, C.B. McCullough and his colleagues in Salem designed and constructed hundreds of bridges throughout Oregon, showcased by the bridges of the Oregon coast. If you look around, you might see a McCullough bridge where you live.

Mac's favorite construction materials were concrete and steel. As a general rule, his smaller bridges are concrete, the larger spans a combination of the two. McCullough built his bridges to make motorists feel secure, and many of his creations, particularly those of reinforced concrete, are massive, arch-shaped structures impossible to ignore.

Pylons or obelisks decorating both ends of a bridge (and sometimes in the middle) are McCullough's "signature" design features. Some are round and fat, others tall and skinny, but all are unmistakably McCullough. Many appear as Art Deco embellishments and a few are Egyptian-inspired.

Gothic or Romanesque arches ... another McCullough trademark. From handrails, to the design for the foundation of the bridge underneath, Mac had a real sensitivity for architectural history. Smaller bridges of 20 feet or less tend to feature Gothic-arched side rails, while the larger ones sport handrails and side rails with rounded, Romanesque arches. But Mac liked to mix it up, so the opposite is also to be found. If safe to do so, don’t forget to look on the underside of a McCullough bridge. It’s half the show.

Pedestrian walkways with Romanesque-arched handrails are characteristic of many of Mac’s bridges, allowing use of the span by those with little need for speed. McCullough’s largest structures feature archways, stairways leading from the road deck to the beach and pedestrian plazas.
Above: 1936 — Umpqua River (Reedsport) Bridge; Right: Reflected elegance — Umpqua River Bridge

Other McCullough Gems

Albany — Highway 20 Bridge over Willamette River
Astoria — Young's Bay Bridge and Lewis and Clark River Bridge
Corvallis — Marys River Bridge on 99W
Estacada — Clackamas River Bridge
Gold Hill — Rogue River (Gold Hill) Bridge
Grants Pass — Rogue River (Caverman) Bridge
Hood River — Hood River (Tucker) Bridge
Maupin — Deschutes River Bridge
McMinvillle — North Yamhill River Bridge
Otter Crest — Rocky Creek (Ben Jones) Bridge
Scottsburg — Umpqua River Bridge
Umatilla — William Duby Bridge
Winchester — North Umpqua River (Winchester) Bridge
Winston — South Umpqua River Bridge
Yachats — Cummin's Creek Bridge

Gold Beach

Robert W. Hadlow's "C.B. McCullough's Master Bridge Builder of the Pacific Northwest" and Dwight A. Smith's (et. al.) "Historic Highways Bridges of Oregon" were both consulted in the preparation of this article.

Left: 1936 — Coos Bay (McCullough Memorial) Bridge