After many decades of almost rigid separation, observations and simulations are being brought together to dramatically increase the scientific understanding of complex ecosystems, and to change how society views, preserves and manages such ecosystems. When appropriately used, visualization is a key “unifier” within this iterative and transformative process, providing a common ‘language’ across the many and very diverse audiences involved. I will draw on many years of experience in coastal observation and prediction to (a) illustrate novel understanding of complex ecosystems through both simple and complex visualization strategies, and (b) identify critical remaining challenges at the interface of observations, simulations, databases, and visualization.

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His early research (1978-82) focused on scale models of maritime systems – at a time and place where graphical printers were a one-per-institution luxury, and users needed to face multi-day long queues to recover their plots. Through his MIT work (1982-87) and early OGI career (1987-95), Baptista’s interests migrated progressively to complex ecosystems, large computational problems, unstructured mesh generation and applied scientific visualization.

In the early-1990s, Baptista was co-Principal Investigator of the interdisciplinary team studying the Columbia River’s estuarine turbidity maximum as part of National Science Foundation’s Land-Margin Ecosystem Research program. His research identified a fundamental limitation of the nation’s scientific infrastructure: the lack of progressively improving capability to observe and predict the coastal margin environment.

To address this limitation, Baptista has since 1996 developed a multi-disciplinary research program that resulted in the creation of CORIE. Arguably the first river-to-ocean coastal margin observatory, CORIE was designed as shared, multi-purpose infrastructure for science, education and management in the Columbia River estuary and plume. CORIE tightly integrates an array of observation stations, a river-to-ocean unstructured-grid modeling system, and an advanced data storage and information products system. CORIE users include biologists, computer scientists, oceanographers, and federal and state natural resource management agencies. Conservation and management applications of CORIE include long-term partnership with federal and regional stakeholders to investigate fisheries issues (e.g., salmon survival and habitat opportunity) and to assess ecosystem impacts of navigation improvements and flow regulation.