A Vision that Took Root: Commemorating 20 Years of the Conjugate Basins, Tectonics, and Hydrocarbons (CBTH) Consortium

By Lucía Torrado with contributions from Paul Mann, Alejandro Escalona, Ruth Beltrán, Kyle Reuber, Adam Goss and Jeff Storms

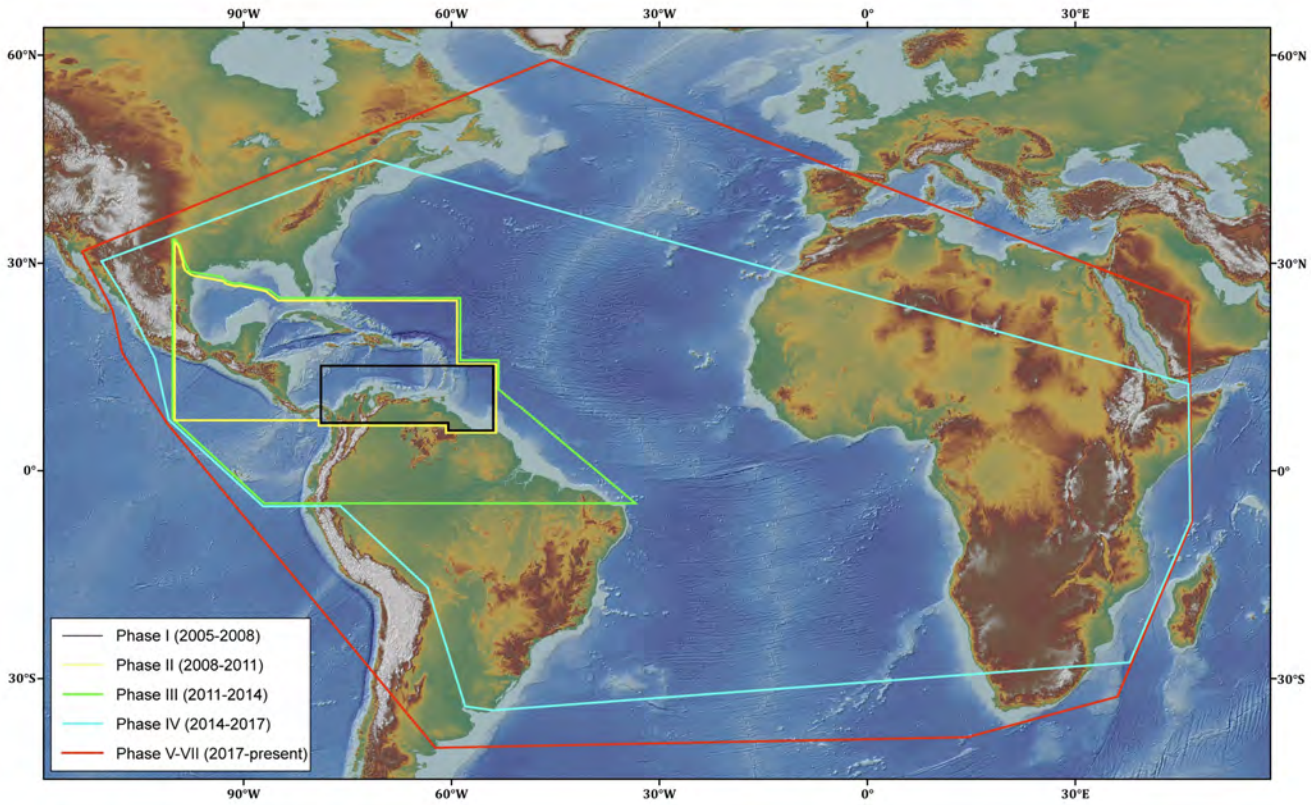

Figure 1. *Map illustrating the primary research focus areas of each CBTH consortium phase since 2005.*

The first time I met Paul Mann (Principal Investigator of the CBTH consortium) was on a rainy Tuesday afternoon in Houston, during one of those classic Gulf Coast downpours that seem to fall sideways. By the time I made it to the University of Houston's Earth and Atmospheric Sciences building, my umbrella had already surrendered to the wind, turning inside out in defeat. Stepping into the lobby, I was just a little unsure of what to expect… I was there to meet who I was hoping would be my thesis co-advisor. We had exchanged a few emails in the weeks before; I had shared that I was working in the Llanos Basin in Colombia under the supervision of Janok Bhattacharya, and he was in the process of relocating the CBTH consortium from the University of Texas at Austin to Houston. The conversation felt half like an interview, half like an unexpected opportunity unfolding. A conversation that ultimately led to an eight-year collaboration that shaped the course of my career.

Through the CBTH consortium, I completed both my master's and doctoral research, presented our work at numerous conferences -including AAPG and SEG annual meetings and multiple Sheriff Lectures- and contributed to peer-reviewed publications. My experience, which mirrors that of many others in the project, offered the opportunity to engage with a community that bridges rigorous academic science and applied industry insight. In this article, you will also hear directly from my colleagues, whose experiences further illustrate the impact of the CBTH on both scientific and professional geoscience communities, including the Houston Geological Society.

Even after several years, I still keep in touch with Paul and consortium current and former members. Writing this article to commemorate the CBTH's 20th anniversary is both a professional milestone and a personal reflection. It feels especially meaningful to share these stories in the September issue of the *Bulletin*— the same month where two decades ago, a PhD dissertation became a regional basin research powerhouse.

WHAT IS THE CONJUGATE BASINS, TECTONICS AND HYDROCARBONS (CBTH) CONSORTIUM?

The Conjugate Basins, Tectonics and Hydrocarbons (CBTH)

Figure 2. *Paul Mann (CBTH Principal Investigator) together with CBTH graduate researchers and sponsors at the year-end sponsors' meeting hosted by Woodside Energy in September 2024*

project at the University of Houston is an industry-funded research consortium that creates GIS-based digital and atlas syntheses of seismic and well data to evaluate the regional hydrocarbon potential of vast areas shaped by the Mesozoic breakup of Pangea. Since its inception on September 1, 2005, the project's geographic scope has spanned (**Figure 1**):

1. The known hydrocarbon basins of onshore regions and the lesser-studied offshore basins of the Caribbean and northern South America (including Venezuela, Colombia, Trinidad, Suriname, Guyana, and northern Brazil);

2. The U.S. and Mexico sectors of the Gulf of Mexico;

3. The rifted-passive margins of Central America, eastern North America, and western Europe; and

4. The South Atlantic conjugate margins in South America and West Africa.

The roots of the CBTH trace back to the three-year DM2 industry consortium led by Dr. Lesli Wood (UT-BEG) and Paul Mann (UTIG). From the start, Paul brought a clear vision for building an international research network that could bridge academic science and industry exploration. Over time, the project -organized in three-year phases- has evolved in focus, responding to the needs, feedback and interests of its sponsoring companies. Paul emphasized that sponsor feedback is critical, noting that it helps guide the project's direction so the team can produce work that directly supports exploration efforts.

Since 2005, the CBTH has received funding from 31 oil and gas companies, including current sponsors CNOOC International, Chevron, Petrobras, TotalEnergies, and Woodside Energy (**Figure 2**). The project's academic impact is substantial: 23 PhD dissertations, 47 Master's theses, 12 Bachelor's theses, 853 conference presentations, and 151 peer-reviewed publications: numbers that reflect both research productivity and his commitment to training the next generation of geoscientists.

The CBTH's data library -built and expanded under Paul's oversight- includes 2D and 3D seismic, well logs, outcrop measurements, and an extensive archive of published studies. These datasets are integrated into structural, isopach, and paleogeographic maps, all available in digital format to sponsors. While the Caribbean and Gulf of Mexico remain major areas of focus, the CBTH continues to advance projects in Brazil and West Africa, cementing its reputation as a globally recognized resource for hydrocarbon basin research.

THE BEGINNINGS: FROM ALEJANDRO ESCALONA'S PH.D. DISSERTATION TO A REGIONAL BASIN RESEARCH POWERHOUSE

When I reached out to Alejandro Escalona (former co-Principal Investigator of the CBTH consortium) about collaborating with this article, he replied almost immediately. His eagerness to contribute, even years after his formal involvement ended, speaks volumes about the project's lasting impact and continued significance in his life and career.

The Conjugate Basins, Tectonics, and Hydrocarbons (CBTH) consortium -previously known as the Caribbean Basins, Tectonics, and Hydrocarbons- was born from a vision shaped at the intersection of academic curiosity, tectonic complexity, and the underexplored potential of the Caribbean region.

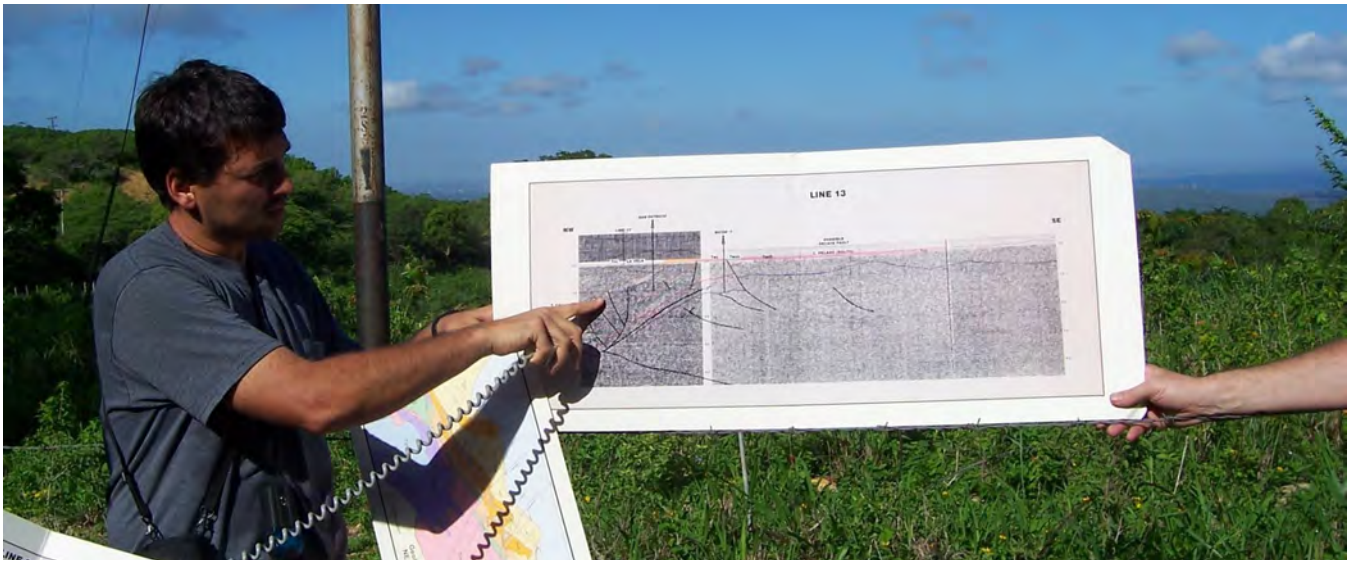

Figure 3. *Alejandro Escalona (former CBTH co-Principal Investigator) at a field trip in his native Venezuela in 2004.*

The idea of the consortium emerged in late 2003, shortly after Alejandro completed his PhD at The University of Texas at Austin under the mentorship of William Fisher and Paul Mann. His dissertation focused on regional-to-reservoir scale characterization of Eocene reservoirs in Venezuela's Maracaibo Basin, where a significant component of this work involved revisiting Caribbean Plate models initially developed by the UT Institute for Geophysics and the PLATES consortium (**Figure 3**).

"At the time, Paul Mann was collaborating with Lesli Wood on mass transport complexes in offshore Trinidad," Alejandro recalled. "That work got us thinking: why not build a regional basin project for the Caribbean? One where plate tectonic and paleogeographic models were fundamental to better understand the relationship to the hydrocarbon-rich onshore basins of northern South America, and the underexplored offshore basins of the Caribbean."

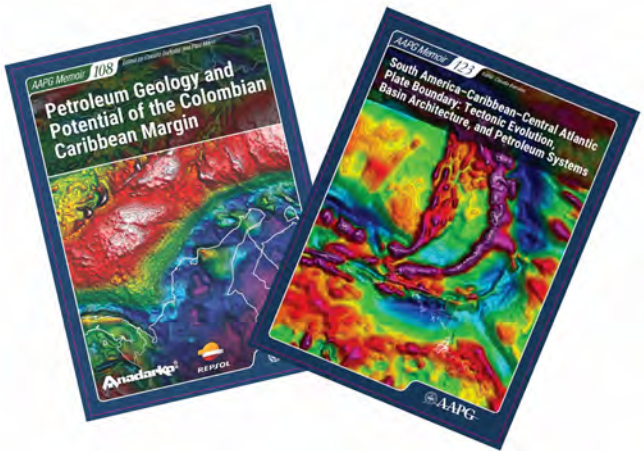

Figure 4. *Covers of AAPG Memoir 108 (left) and Memoir 123 (right), featuring contributions from CBTH researchers.*

Armed with conceptual models derived from Alejandro's dissertation and Paul's regional expertise, the team embarked on a three-day trip to Houston. They knocked on doors at nearly 20 oil and gas companies in a bid to secure sponsorship. Six sponsors were needed to launch the consortium with sufficient momentum. "To our surprise, when we returned to Austin, six faxes were waiting for us," Alejandro said. "It was a clear signal that the industry was hungry for high-resolution, integrative regional work."

From there, the CBTH consortium rapidly evolved. The team reprocessed legacy Gulfrex data, compiled unpublished research, and relied heavily on digital tools like ArcGIS and Landmark to create integrated maps and databases. Support from the PLATES consortium proved essential in refining the Caribbean tectonic model.

"We weren't just building a research project: we were building applied geoscience infrastructure," Alejandro explained. Slowly, the CBTH started to obtain more sponsorship and collaboration with government agencies, and national oil companies in the Caribbean. "Students got deeply involved too, and many went on to work with sponsors directly. That was a huge part of our success."

In 2007, Alejandro relocated to Stavanger, Norway, to help establish geosciences education and research at the University of Stavanger (UiS). This move indirectly helped the CBTH project transition from the University of Texas to the University of Houston, where it continued under the leadership of Paul Mann. Over the next 15 years, Alejandro remained involved as co-principal investigator, collaborating closely with students and faculty on both sides of the Atlantic. GIS specialist Lisa Watson also moved to UiS, extending

Figure 5. *Paul Mann (CBTH Principal Investigator) at the 2007 AAPG Annual Convention and Exhibition.*

her contributions, and the CBTH benefited from the expertise of Ian Norton – former ExxonMobil scientist and key PLATES contributor–, who frequently visited Stavanger to collaborate.

"Our work on the Caribbean plate model and paleogeography is now published multiple recognized journals such as AAPG's Memoirs 108 and 123," Alejandro noted (**Figure 4**). "It's one of the most complete syntheses we've ever produced."

Today, Alejandro is no longer formally involved with the CBTH project, but he remains closely tied to Caribbean tectonics. His current focus is the Norwegian continental shelf, but the roots of that first regional initiative still run deep. "My heart still lives in the Caribbean," he said. "Whenever I get the chance, I return to those questions. They never really let go."

THE EVOLUTION OF THE CBTH: IN THE WORDS OF PAUL MANN, PRINCIPAL INVESTIGATOR

Paul recalls the early years of the CBTH, which formally began at UT Austin during the 2005-2008 startup phase with co-leader Alejandro Escalona. Their initial focus was on Venezuela and Trinidad and Tobago, coinciding with the Bolivar offshore survey. Even in this early stage (**Figure 5**), Paul's leadership style was hands-on: coordinating seismic data access, guiding student projects, and ensuring results were delivered in a form that industry partners could immediately apply.

In the second phase (2008-2011), the focus shifted westward to Colombia as exploration expanded from mature onshore basins to the slope and deep-water of the Caribbean Sea. With Alejandro's move to the University of Stavanger in Norway, Paul oversaw the CBTH's operations across two universities, fostering international collaboration and maintaining consistent research momentum.

The third phase (2011-2014) marked the CBTH's relocation to the University of Houston, where Paul strengthened ties with company sponsors, data providers, and the Houston Geological Society, capitalizing on Houston's position as a global hub for the energy industry. "Being in Houston gave us unparalleled access to industry expertise and datasets," he noted. This period also showcased his ability to secure high-value seismic and well data, greatly expanding the scope of Caribbean studies and extended its reach into the rifted margins of the Gulf of Mexico.

During the fourth (2014-2017) and fifth (2017-2020) phases, the CBTH completed major projects in the Caribbean and both the Mexican and U.S. sectors of the Gulf of Mexico. Paul encouraged the team to look outward, initiating studies on the conjugate rifted margins of the South Atlantic in South America and West Africa. This expansion prompted a formal name change from its original Caribbean-focused title to "Conjugate Basins, Tectonics and Hydrocarbons," while retaining the CBTH acronym that had become well known to sponsors and collaborators.

The sixth (2020-2023) and current seventh (2023-2026) phases, Paul has guided the CBTH's concentration on the South Atlantic conjugate margins, with research targeting productive and emerging basins in Guyana, Equatorial Brazil, Campos-Santos, Uruguay, Argentina, Morocco, Mauritania, Liberia, Nigeria, Equatorial Guinea, and Namibia. Throughout these shifts, he has remained focused on the CBTH's core mission: integrating seismic, well, and geological data into a unified GIS database to deliver tectono-sequence analyses, depositional models, petroleum system evaluations, paleogeographic reconstructions, and plate reconstructions.

Recent work under his leadership includes the development of regional basin models for Guyana and the Campos-Santos basin, designed to help de-risk deep-water exploration. "Our goal is to provide science-based, region-wide syntheses that directly improve exploration outcomes," Paul said. His approach blends scientific rigor with practical application, ensuring that the CBTH's research remains relevant and impactful.

Under Paul's leadership (**Figure 6**), the CBTH has thrived not only because of its technical capabilities, but also because of his ability to connect people, ideas, and data sources across continents. Colleagues note his skill in building lasting collaborations between academia and industry, creating an environment where graduate students can work directly with world-class datasets and learn from active exploration challenges. His commitment to training the next generation of geoscientists is evident in the project's strong academic output and in his personal mentorship style, which blends scientific rigor with a clear vision for applied impact (**Figure 7**).

Figure 6. ***(A)*** *Thanksgiving celebration at the CBTH lab in 2017;* ***(B)*** *Researchers at the CBTH lab in Fall of 2016. Left: Delaney Robinson. Right, from back to front: Lucia Torrado (HGS Editor), Pin Lin, and Lily Zhang;* ***(C)*** *Visit by Paul Mann (CBTH Principal Investigator) and the CBTH consortium to TotalEnergies' offices in 2018; and* ***(D)*** *CBTH annual year-end sponsor meeting held at the University of Houston, September 2015.*

Figure 7. ***(A)*** *The University of Houston team, champions of the 2017 AAPG Imperial Barrel Award, supervised by Paul Mann. From left to right: Delaney Robinson, Walter Reed, Eric Lunn (former CBTH researcher), Andrew Steier (former CBTH researcher) and Leiser Silva;* ***(B)*** *First-place poster award at the 2017 AAPG Annual Convention and Exhibition. Left: Lucia Torrado, former CBTH researcher and HGS Editor; Right: Paul Mann, CBTH Principal Investigator;* ***(C)*** *First, second and third-place poster award winners at the 2013 AAPG Annual Convention and Exhibition. From left to right: Bryan Ott (former CBTH researcher), Paul Mann (CBTH principal investigator), Luis Carlos Carvajal (former CBTH researcher), and Lucia Torrado (former CBTH researcher and HGS Editor); and* ***(D)*** *From left to right: Paul Mann, and first- and third-place poster awardees Henry Campos and Rocio Bernal (both former CBTH researchers), at the 2011 AAPG Annual Convention and Exhibition.*

Figure 8. ***(A)*** *Kyle Reuber (former CBTH researcher) at a the CBTH year-end sponsor meeting, September 2012;* ***(B)*** *Former CBTH researchers Rasheed Ajala (left) and Andrew Steier (right) at the 2016 HGS-PESGB Africa Conference;* ***(C)*** *CBTH researcher Ruth Beltrán at the 2024 Sheriff Lecture; and* ***(D)*** *Former CBTH researcher Luis Carlos Carvajal (right) presenting to industry sponsor Adam Goss (left) at the 2015 GCAGS Conference (now GeoGULF).*

RUTH BELTRAN'S STORY AS A PHD CANDIDATE WITH THE CBTH

When Ruth began her PhD studies with the support of an oil company scholarship, one of the key requirements was joining a world-class research group. For her, the choice was clear. The CBTH (Conjugate Basins, Tectonics, and Hydrocarbons) consortium stood out, not only because of its strong reputation in the oil and gas industry, but also for the kind of high-impact, data-driven research it is known for. Since joining in the Fall of 2022, Ruth has been part of a highly technical and collaborative team working at the frontlines of Earth science and energy exploration.

"The CBTH helped me ask the right questions and apply the right tools to answer them," Ruth reflects. The consortium's focus on understanding some of the world's most important oil and gas basins, many of which contain globally significant fields, aligned closely with her research goals. The group is known for its scientific output, including peer-reviewed publications and frequent presentations at major geoscience conferences: clear signs of the strong mentorship and training it provides.

Through the consortium, Ruth has received hands-on experience working with state-of-the-art seismic data, well logs, gravity and magnetic datasets, and advanced basin modeling tools. This training has deepened her understanding of extensional basin systems around the world and prepared her to contribute meaningful research to both academia and industry.

She admits that she entered the program with limited experience in deep-water exploration. But working alongside Dr. Paul Mann and the CBTH team helped her quickly find her footing. The group's collaborative culture- marked by open discussions, brainstorming sessions, and constructive critique- shaped her approach to research. "We constantly test our ideas through peer review and industry feedback, which pushes the quality of our work and keeps it grounded in real-world relevance," she says.

Her current research centers on the deep-water Campos Basin offshore Brazil. The first chapter of her dissertation, currently under review for the journal Tectonics, focuses on the deep crustal structure of this rifted-passive margin. Ruth integrated 3D seismic

data with gravity and magnetic datasets to examine the thinning of the continental crust and its transition to oceanic crust. She has already presented this work at several key conferences, including the Sheriff Lecture (**Figure 8**), IMAGE, and GEOGULF 2023.

Looking ahead, Ruth is eager to return to the industry and apply the knowledge and experience she's gained through the CBTH. She values the power of open collaboration, not just within companies but across the broader scientific and energy communities. "I believe in sharing knowledge, not just within companies, but across the wider scientific and energy communities," she says. Her experience with the CBTH consortium has reinforced her belief in what's possible when academia and industry work together toward a shared goal.

A STORY OF SCIENCE, COLLABORATION, AND DISCOVERY: KYLE REUBER'S PATH THROUGH THE CBTH

During his time as a University of Houston PhD candidate with the CBTH, Kyle experienced significant learning, collaboration, and growth as a scientist. This opportunity allowed him to explore complex geological systems while working closely with a global network of geoscientists and mentors.

From Kyle's perspective, the CBTH program offered a unique environment that blended academic rigor with applied research. Under the guidance of experienced faculty and through feedback from industry collaborators, he had the chance to evaluate hypotheses related to regional tectonics and basin evolution in some of the most geologically dynamic regions on Earth. The support Kyle received from Paul and his employer at the time, ION Geophysical, enabled him to focus his research on seismic interpretation, geospatial analysis, and subsurface modeling: tools vital to understanding petroleum systems and the tectonic histories of conjugate margins.

Paul placed strong emphasis on the development of presentation skills, a critical ability cultivated by all consortium students. Kyle described how these skills were honed through weekly tectonics seminars, consortium meetings, and industry sponsor presentations (**Figure 8**). "These opportunities allowed me to test my research hypotheses, think more broadly, and stay up to date with the latest advances in both academia and the energy sector," he explains. The interdisciplinary collaboration and the process of defending his ideas became one of the most rewarding aspects of his time in the CBTH.

Moreover, Paul actively encouraged students to engage in events that included student-focused networking, industry exposure, and professional development. As a result, Kyle co-chaired technical sessions, served as a committee member, and presented student posters at several Houston Geological Society conferences. He also participated in the HGS International Explorationists dinners, events he valued for their combination of strong technical content and networking opportunities.

Reflecting on his experience, Kyle expressed gratitude for his tenure in the CBTH consortium. "It introduced me to an industry-based community of mentors and peers, laid a foundation for scientific excellence, and gave me a clear vision of how research can bridge academia and industry," he said.

INDUSTRY PERSPECTIVE: A DECADE-LONG COLLABORATION WITH THE CBTH

Adam Goss' involvement with the CBTH consortium began more than a decade ago, when he served as technical lead for BHP's Mexico and later Trinidad exploration programs. At that time, BHP was a corporate sponsor during the consortium's early research phases, which focused on Caribbean and Gulf of Mexico tectonics (**Figure 8**). These studies challenged long-standing paradigms of crustal and basement architecture, heat flow, and terrane boundaries, laying the groundwork for new internal concepts regarding source rock distribution and maturation, reservoir provenance and quality, and the timing of structural trap formation.

As Adam advanced to New Ventures Manager and later Director, his team relied heavily on the steady stream of technical innovation generated by the CBTH. He also benefited directly from the program's talent pipeline, hiring several of its alumni into BHP's Exploration teams. On the value of the program, Adam stated, "The CBTH's research consistently provides insights that shape our exploration strategies."

When Adam later joined CNOOC International, he collaborated with leadership in London and Beijing to reestablish the company as a primary CBTH corporate sponsor, a decision motivated by his strong appreciation for the consortium's contributions. Over the last several years, he has observed firsthand how the CBTH deliverables provide a sustained technical competitive advantage. As reflected in the perspectives of principal researchers, students, alumni, and long-term partners, the consortium continues to track evolving trends and deliver research that provides the oil and gas industry with valuable insights for exploration. Regarding the CBTH's broader impact, Adam emphasized, "The technical knowledge and deliverables from the CBTH give our teams a clear advantage in decision-making and project execution". ■