



Humble Oil Building with its open plaza and podium base. *From Author's Collection.*

Building Houston's Petroleum Expertise: Humble Oil, Environmental Knowledge, and the Architecture of Industrial Research

By B. Jack Hanly*

In a 1956 speech to the American Petroleum Institute, noted geologist and geophysicist M. King Hubbert made a series of predictions that would shake the oil industry to its core. Hubbert, a research scientist at Shell Oil, laid out his forecasts for global and domestic crude oil production, calculated via logarithmic functions. Hubbert observed that the industry had done a fairly good job of charting past progress and near-term market conditions. But oil's long-range future remained a riddle. In an effort to solve it, Hubbert used a method of extrapolation drawn from the studies of mining district life cycles by the British economic geologist D. F. Hewett. Hubbert's model found that coal and oil exhibited increasing rates of production for a period before leveling off and then decreasing at a similarly accelerating rate of decline—a bell-curve shape that would become known as “Hubbert's peak.” Hubbert's prediction estimated that domestic oil production in the United States would peak in 1970, while global production would do so around 2000. Hubbert's clarion call did not stifle the post-war gospel of plenty; instead, it triggered vehement resistance by the industry that funded his research. Hubbert shared few peers in resource forecasting at this time, but those who did claim to be experts in his field declared market mechanisms and technological innovation would sustain the nation's resources for decades to come.¹

*B. Jack Hanly is a doctoral candidate in the History, Theory, and Criticism of Architecture at MIT. His dissertation looks at the rise of the American environmental movement against the transformation of architectural practice in the 1960s and 70s, specifically around the emergence of interdisciplinary “environmental professionals.” Hanly has a Master of Environmental Design from the Yale School of Architecture, and a bachelor's degree in Environmental and Urban Studies from Bard College.

¹ M. King Hubbert, *Nuclear Energy and the Fossil Fuels* (Houston: Shell Development Company, 1956), 2; Tyler Priest, “Hubbert's Peak: The Great Debate over the End of Oil,” *Historical Studies in the Natural Sciences* 44 (Feb. 2014): 37-79. See also Mason Inman, *The Oracle of Oil: A Maverick Geologist's Quest for a Sustainable Future* (New York: W.W. Norton & Company, 2016). On the failure of resource estimation efforts at the onset of the energy crisis, see Rüdiger Graf, *Oil and Sovereignty: Petro-Knowledge and Energy Policy in the United States and Western Europe in the 1970s* (Berlin: Berghahn Books, 2018).

While the story of Hubbert's peak oil prediction and subsequent vindication are well known, less attention has been paid to the broader urban dynamics and architectural supports that set the stage for his insights. Hubbert carried out his research within a landscape of burgeoning Sunbelt oil research centers. By the 1970s, Houston became the prime location for all manner of oil industry research activity due to executive oversight and the proximity of extraction points. Indeed, the city transformed into a global capital of energy research and expertise, even as the tremors of resource scarcity began to puncture its cornucopian imagination. This paper addresses the architectural and urban configurations of the postwar oil industry in and around Houston, Texas with particular attention to structures for knowledge production. If Hubbert's thesis presented an existential threat to industry leaders anticipating a future of incredible prosperity, this paper analyzes the buildings and landscapes that mediated or resisted his uncomfortable reality.² It therefore primarily looks at one of Hubbert's staunchest opponents: Humble Oil Company. Humble Oil's president, Morgan J. Davis, published many vehement retorts to the peak oil thesis and was, in the words of Hubbert himself, a "chauvinistic Texan [who] proposed increasing crude reserves by definition, arbitrarily." Although Davis appeared to Hubbert a willfully ignorant player dismissing the rigors of science, the company he oversaw was in fact carefully attuned to the business opportunities afforded by the burgeoning culture of postwar technoscience.³

Examining three scales of spatial development by Humble Oil, it appears that the manifold research laboratories, corporate office towers, and town developments rising in and around Houston reflected a growing interest in both the material and immaterial dimensions of oil. The paper argues that, for the oil industry, architecture functioned as both the administrative site of extractive activity and an epistemological landscape of oil-based environmental knowledge. In other words, these new facilities firmly planted oil production in urban space while generating information assets in pursuit of the industry's long-term viability. Oil research centers such as the one led by Hubbert can be seen as important parts of what climate historian Paul Edwards referred to as the industry's knowledge infrastructures. For Edwards, these are "the robust networks of people, artifacts, and institutions that generate, share, and

² "Shell Oil to Centralize Research," *Wall Street Journal*, Oct. 8, 1971; "Shell Oil Data Units Will Shift to Houston in Centralization Step," *Wall Street Journal*, Feb. 14, 1972. On contemporaneous discourses of "limits to growth" and Neo-Malthusianism see Robert Golub and Joe Townsend, "Malthus, Multinationals, and the Club of Rome," *Social Studies of Science* 7 (May 1977): 201-222; Fernando Elichirigoity, *Planet Management: Limits to Growth, Computer Simulation, and the Emergence of Global Spaces* (Evanston, IL: Northwestern University Press, 1999); and Thomas Robertson, *The Malthusian Moment: Global Population Growth and the Birth of American Environmentalism* (New Brunswick, NJ: Rutgers University Press, 2012).

³ Interview of M. King Hubbert by Ronald Doel on Jan. 27, 1989, Niels Bohr Library & Archives, American Institute of Physics, College Park, MD, www.aip.org/history-programs/niels-bohr-library/oral-histories/_5031-7. I here use the term "technoscience" as employed by scholars such as Bruno Latour to describe the blend of practical and theoretical research that defined mid-century research and development apparatuses, as well as the social and political entanglements of scientific research. See Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Cambridge: Harvard University Press, 1987).

maintain specific knowledge about the human and natural worlds.” While some environmental and energy historians depict the effect of industry and extraction on the natural world as rapacious, they overlook a parallel tendency that made the environment, and ecological awareness, integral to the continued prosperity of fossil fuel development. As discussed in Leah Aronowsky’s fine history of the Gaia hypothesis sponsored by Shell Oil, environmental knowledge has always been a flexible discourse that justifies as much as it impedes industrial activity.⁴

In the story that follows, Humble Oil, among other companies, developed a pastoral vision of its extractive activity and transmitted it through architectural design. This vision of the affected environment, however, was not merely ecological in character, and instead included all the natural, social, and economic conditions of extracting and producing oil. The paper builds on scholarship tracing the rise of post-industrial cities—work that has similarly emphasized the ways in which high-technology industries shaped the built environment with the aim of attracting educated workforces and new “information economies.” To this end, sources come from an interdisciplinary spectrum of scholarship touching urban history, architectural history, environmental history, energy history, and the history of science in order to explain Houston’s position as a post-industrial “energy capital” of the world by dint of its converging innovations in knowledge, extraction, and environment.⁵

The work of architecture firm MacKie & Kamrath for Dow Chemical, Schlumberger, and Humble Oil offers some of the earliest good examples of an emerging knowledge-based industrial landscape, and thus it serves as a great initial case study. Next, the paper discusses the construction of Humble Oil’s headquarters in downtown Houston. Its architecture mirrored the oil industry’s philosophy of “total knowledge,” embodied and projected the optimism of industry forecasts, and integrated the firm’s growing business of petrochemicals. Lastly, the paper narrates Humble Oil’s real estate development activities in the

⁴ Paul Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge: MIT Press, 2010), 17; Brian Black, *Petrolia: The Landscape of America’s First Oil Boom* (Baltimore: Johns Hopkins University Press, 2003); Nancy Lee Peluso and Michael Watts, eds., *Violent Environments* (Ithaca: Cornell University Press, 2001); Hannah Appel and Arthur Mason, eds., *Subterranean Estates: The Lifeworlds of Oil and Gas* (Ithaca: Cornell University Press, 2014). Leah Aronowsky, “Gas Guzzling Gaia, or: A Prehistory of Climate Change Denialism,” *Public Culture* 47 (Winter 2021). The Gaia hypothesis is a theory of earth systems that posits biological organisms in self-regulating homeostasis. For a visual point of reference, see the work of Edward Burtynsky a Canadian photographer and artist noted for his large images of industrial landscapes. On the place of “decentrationist” narratives in environmental history, see William Cronon, “A Place for Stories: Nature, History, and Narrative,” *Journal of American History* 78 (Mar. 1992): 1,347–1,376.

⁵ Margaret O’Mara, *Cities of Knowledge: Cold War Science and the Search for the Next Silicon Valley* (Princeton: Princeton University Press, 2005); Stuart W. Leslie, “Cold War Suburbs: Thinking about the Unthinkable in Style,” *Southern California Quarterly* 102 (2020): 24–56; Alex Sayf Cummings, *Brain Magnet: Research Triangle Park and the Idea of the Idea Economy* (New York: Columbia University Press, 2020); Patrick Vitale, *Nuclear Suburbs: Cold War Technoscience and the Pittsburgh Renaissance* (Minneapolis: University of Minnesota Press, 2021); Joseph Pratt, Martin Melosi, and Kathleen Brosnan, eds. *Energy Capitals: Local Impact, Global Influence* (Pittsburgh: University of Pittsburgh Press, 2014); Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge: Harvard University Press, 2016); Eve Blau, *Baku: Oil and Urbanism* (Zurich: Park Books, 2019); Carola Hein, ed., *Oil Spaces: Exploring the Global Petroleumscape* (London: Routledge, 2021); Dolly Jørgensen and Finn Arne Jørgensen, “Aesthetics of Energy Landscapes,” *Environment, Space, Place* 10 (Spring 2018): 1–14.

1960s and 1970s, including its support of the National Aeronautics and Space Administration's Manned Spacecraft Center, its adjacent new town venture, and subsequent establishment of a University of Houston satellite campus. Humble Oil sought to cultivate land as a resource to combat its declining domestic production while at the same time it patronized educational institutions to supply the company the knowledge-based workforce upon which it increasingly relied.

Founded in 1911, Humble Oil and Refining Company began as a partnership between a lawyer, a railroader, a merchant, a printer, and a farmhand, among others. Like many pioneering oil businesses of the time, Humble developed through highly leveraged explorations that were generally just shots in the dark. Companies like Humble had to rely on blind luck, surface manifestations, or a comparison of soil characteristics in successful wells at a time when very little was known about subsurface oil deposits. Soon after incorporation, Humble began an affiliation with Standard Oil Company of New Jersey that infused it with capital and created a nationally integrated operation. This marked a transition from techniques derived from direct oilfield experience to the application of advanced knowledge of scientists and engineers supplied by Standard. One important move was establishing the Baytown refinery complex, built from 1920 to 1924 east of Houston. Humble's development department, dedicated to finding new sources of oil, shifted in the 1930s and 1940s in response to changes in industry technology and the exigencies of wartime. The advantage afforded by this diminished after World War II as utilization of such knowledge expanded across the industry. Humble thus had "to give increasing attention to its employee policies and training, particularly . . . in maintaining a stable and productive operating organization."⁶ Turning its attention to internal labor management and the intricacies of organizational management, Humble devoted increasing resources to the immaterial dimensions of its business. Houston-based architecture firm MacKie and Kamrath became central in helping Humble achieve new goals.

Frederick J. MacKie Jr. and Karl Kamrath, who both graduated from the University of Texas, were active from the mid-1940s through the 1960s, designing many buildings for Houston's industrial and commercial elite. The partners both worked for large corporate firms in Chicago, where they gained experience in the machine-like environments of such companies before returning to the comparably slow clip of pre-boom Texas, where they established a practice in 1937. Among its most notable and loyal clients were local petrochemical and oilfield services companies DuPont, Dow Chemical, and Schlumberger Well Surveying Corporation, all of which commissioned the firm multiple times. The firm's relationship with Dow Chemical, which served as an entry to the firm's roster of industrial clientele, emerged out of an admiring necessity, when Kamrath approached the architect-scion of the conglomerate, Alden Dow, to

⁶ Henrietta M. Larson and Kenneth W. Porter, *History of Humble Oil & Refining Company: A Study in Industrial Growth* (New York: Harper & Brothers, 1959), 201, 208.

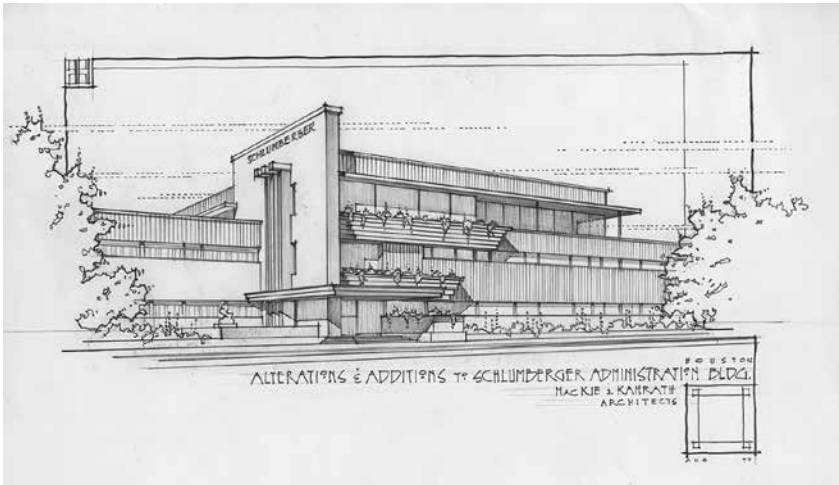


Lake Jackson housing. *Insured Mortgage Portfolio*, 1944.

oversee his in-progress projects after he was drafted in 1942 for World War II. Dow, the son of the company's founder, had settled in Houston as he prepared a master plan for a new town adjacent to its plant facilities in Freeport, Texas. His plan for Lake Jackson, the site of a former plantation, called for homes for five thousand people fifty miles southwest of Houston. It subsequently served as a model for corporate planning practices in the extractive industry in the region. The town merged real estate and chemical manufacturing in a seamless web of mutual benefit, while portraying the development as a salubrious environment for workers tucked into a pastoral setting not too far from the Dow facilities. MacKie and Kamrath continued to provide planning assistance for Lake Jackson through the 1950s, and the firm designed a Dow Chemical plant in 1953. Dow even introduced the duo to their chief architectural influence, Frank Lloyd Wright, showing the mutual value this relationship brought to the other.⁷

MacKie and Kamrath's Schlumberger Administration Building, part of the company's larger Well Surveying Complex of 1953, provides a useful precedent for understanding the architecture firm's "organic modernism," a philosophy of architecture drawn from Wright that emphasized holistic unity and harmony with nature, in service to the oil industry. Schlumberger itself was a pioneer in the kinds of petroleum expertise that would define Houston's economy in the decades to come, and so too did its building foreshadow the diffusion of corporate offices into the suburbs. Where previously oil companies had been involved in the extraction and production of petroleum commodities, Schlumberger provided services for oilfields, including construction and pipeline consulting, engineering expertise, and reservoir estimation for governments and private firms alike. Exporting petroleum expertise to far-flung sites of extraction,

⁷ Gerald Moorhead, "Wright Face: The Work of MacKie and Kamrath," *Cite* 21 (Fall 1988): 19; Alden Dow, "A New-type Town for a New Industry," *Insured Mortgage Portfolio* 8 (First Quarter 1944): 11, 12; Scott Reagan Miller, "The Architecture of MacKie and Kamrath" (Master's Thesis, School of Architecture, Rice University, 1993), 82. See also "Dow Chemical Dedicates Research Center," *Chemical Engineering News* 31, (Oct. 26, 1953): 4-438.

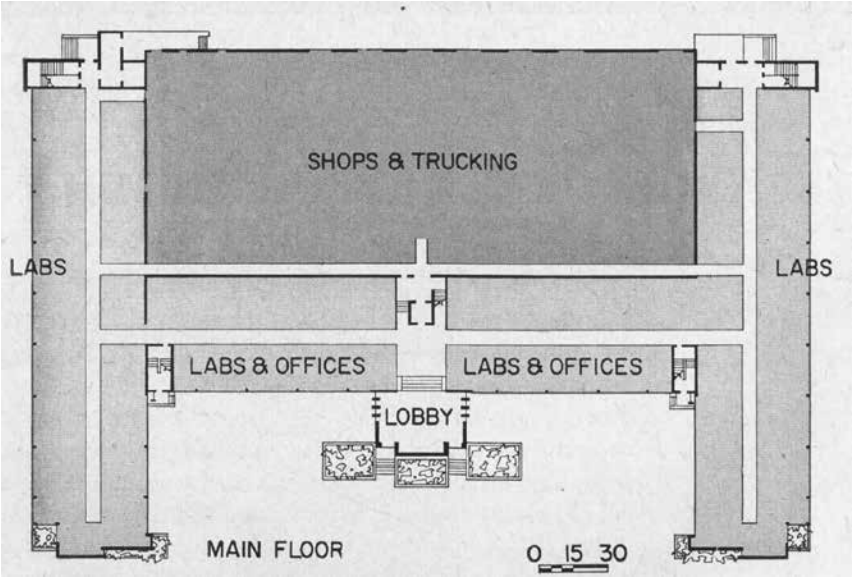


Schlumberger Headquarters, MacKie and Kamrath, 1950. *Courtesy of Architectural Archives, University of Texas at Austin.*

the Schlumberger Well Surveying Complex's program was global and nimble, "serv[ing] the industry throughout the world, wherever oil men operate." As Geoffrey Bowker has pointed out, Schlumberger's competitive advantage lay in transportable knowledge, one that transformed the oil field and even the world into a laboratory for the management of information. The company's electrical coring techniques allowed exploration parties to "see" underground reserves without drilling expensive test holes to determine viability—a kind of "science on the run" that differed from the controlled conditions of laboratories it later established. According to Bowker, Schlumberger exerted strict control over the flow of information in and out of the oilfield, building infrastructural networks through "a process of convergence" so "there was no distinction between the act of organizing humans and that of organizing nonhumans [mud, landscapes, geology]: both sets of entities had to be aligned within a single network."⁸ From this perspective, the designs for the Well Surveying Complex reveal how MacKie and Kamrath's organic modernism was fitting for a company focused on social construction of the natural world.

MacKie and Kamrath's Humble Oil Research Center of 1955 solidified the firm's patronage by oil and chemical interests, while building a Wright-influenced environment for the management of knowledge workers and petroleum

⁸ Louis Allaud, *Schlumberger: The History of a Technique* (New York: Wiley, 1977); "Schlumberger Completes \$6,000,000 Oil Exploration Plant Here," *Houston Chronicle*, Apr. 17, 1953; Geoffrey Bowker, *Science on the Run: Information Management and Industrial Geophysics at Schlumberger, 1920-1940* (Cambridge: MIT Press, 1994): 46. On corporate headquarters moving into the suburbs, see Louis Mizingo, *Pastoral Capitalism* (Cambridge: MIT Press, 2011).



Humble Oil Research Center, MacKie and Kamrath, in *Architectural Record*, 1955.

expertise. Located on the Buffalo Speedway in Houston, near Rice University and the upscale River Oaks suburban community, the building merged various aspects of Humble's research on exploration and production at a single location. Research activities for the company had up to that point been spread across multiple sites and teams of individuals. Its new location consolidated these activities and linked their efforts under a single corporate program, facilitating interdepartmental exchange between employee scientists working on different stages of the production process. Innovations conceived at the site would enhance company methods from initial field prospecting to downstream refinery and product applications, as Humble devoted itself to exploration and production research that would ensure the future viability of its business. The architecture enhanced these practices in "an environment calculated both to increase their efficiency and to provide as much amenity as possible."⁹ The Humble Oil Research Center continued in the manner defined at the Schlumberger Complex in its formal composition and programmatic effects. Three hundred and fifty feet long and arranged in a diagrammatic H-plan, the building housed labs and offices in a two-story, 112,000-square-foot space on fifteen acres. Framed in concrete and steel, it featured Roman brick and cream-colored stone with slat-like ribbon windows running across its facade. *Architectural Record* noted that it was designed for a possible future third floor and that a separate service center provided for field storage, a cafeteria, and "certain labs." A 1966 press photograph reveals significant alterations to the structure described in 1955, with an aerial view showing additions to either side of the H-plan as well as an extension of the inner horizontal bar. The façade seamlessly connects the additions, making the two phases indistinguishable to the casual passerby yet almost doubling the Research Center's square footage. As historian William Rankin has argued, the planner of the laboratory used a model of the individual research unit as a spatial generator, building the laboratory into a reflection of the individual researcher's needs. Corporations took pains to emphasize the anthropocentric design of the lab, which architects derived through a scrupulous study of employees' daily needs. At the same time, architects linked their buildings to the psychological morale of the researchers, demonstrating a managerial calculation balancing freedom and control.¹⁰

Such architectural and corporate strategies were of course not unique to Humble Oil. Recollections by a research scientist at the nearby Bellaire Labs of Royal Dutch Shell, an Art Deco modernist campus built in 1948, provide insights into the kinds of research that exploration and production laboratories such as Humble's were undertaking. The author, James M. Parks, calls the period from 1947 to 1980 the "golden age" of oil research, when companies drew top geological scientists from across the country by offering unlimited budgets

⁹ "Houston Research Center for Humble Oil Co," *Architectural Record* 117 (Mar. 1955): 157.

¹⁰ Ibid.; William Rankin, "The Epistemology of the Suburbs: Knowledge, Production, and Corporate Laboratory Design," *Critical Inquiry* 36 (Summer 2010): 771-806.

and open research agendas. As Parks demonstrates, the explicit purpose of this growing laboratory network was to counteract the doomsaying predictions of Hubbert by identifying new areas of production, but their “unintended consequences” entailed flourishing innovation in academic geological research.¹¹

Unintended consequences also extended to environmental externalities, as Humble scientists produced research exploring the environmental effects of fossil fuel abundance. In a 1957 report by the Production Research Division located at the Buffalo Speedway facility, Humble researchers determined the per annum dilution of carbon dioxide from the burning of fossil fuels within the greater carbon cycle. Scientists measured the radiocarbon dating of tree rings, as well as marine shells, to determine the difference in ocean and atmospheric rates of deposition. The purpose of such a study was to discover the ultimate fate of the massive amount of carbon dioxide emitted since the beginning of the Industrial Revolution. The turnover rates for atmospheric and oceanic dilution demonstrated that a miniscule amount of overall emissions were finding their way back into natural carbon sinks and that “a much greater amount” would accumulate “from the combustion of fossil fuels.”¹² Produced internally long before scientists began ringing the alarm in earnest, this Research Center report inadvertently furnished evidence of the devastation its industry would create and implicated Humble in the incipient problem of climate change. MacKie and Kamrath's building was designed to enhance petroleum production and reserves, yet it also produced powerful evidence of the potentially devastating environmental consequences of the relentless drive for extraction.

By the late-1950s, Humble Oil had over seventeen thousand employees and assets totaling \$1.5 billion. It was affiliated with Standard Oil of New Jersey, but Humble operated according to its own plan and comparative advantages. Humble reported to the parent company while maintaining independent operations in exploration and development. Each domestic affiliate of Standard Oil of New Jersey conducted activities in isolation over its own geographic territory, utilizing the available infrastructure and their own marketing approaches. This organizational model proved feasible until a duplication of functions and related customer confusion led to a need for change. Humble Oil restructured and consolidated Standard Oil of New Jersey's domestic affiliates under centralized management. Humble then oversaw the entirety of the nation's domestic exploration, production, refining, and transportation processes, with a combined workforce of forty-one thousand. One of the first orders of business in this reorganization scheme, Davis declared, was to “develop men with the

¹¹ James M. Parks, “Unintended Consequences of Oil Company Research Laboratories,” *Oil Industry History* 4 (2003): 32-41.

¹² H. R. Brannon Jr., A. C. Daughtry, et al., “Radiocarbon Evidence on the Dilution of Atmospheric and Oceanic Carbon by Carbon from Fossil Fuels,” *Transactions: American Geophysical Union* 38 (Oct. 1957): 648. This and other documents were released by the International Center for Environmental Law in 2016 as part of litigation against ExxonMobil that sought damages for cities to mitigate the costs of climate change. Humble Oil Research Center was demolished in August 2017. Its land was prepared for sale in the aftermath of ExxonMobil's real estate sell-off as it consolidated its headquarters at a corporate campus north of Houston.

vision to attack the petroleum industry's problems based on a knowledge of all its aspects."¹³ That is, oilmen were needed whose knowledge of their industry extended beyond their realm of specialization to encompass a holistic view of the petroleum universe.

As its national profile grew, Humble Oil endeavored to make its mark on the Houston skyline with a bold new skyscraper. Humble began planning a forty-five story, 750-foot office tower designed by Welton Becket and Associates in 1958. Completed in 1959, the same year as Humble's reorganization, it was the tallest building west of the Mississippi until 1972, when it was bested by Shell Oil's tower by architects Skidmore, Owings, and Merrill. In choosing Becket, Humble Oil had its headquarters mirror its reorganizational ethos at the level of the design process, as well as in the philosophy of its architects. Furthermore, the building embodied both the company's projections for its domestic oil production and its petrochemical research activities. Becket had gotten his start in a small Los Angeles architectural firm in 1929 after graduating from the University of Washington, and by the 1940s he held a number of international commissions and large-scale military housing projects. His firm's first office building commission, a low-rise tower for Mobil Oil in Los Angeles, came in 1946. Becket secured the project by recounting his roadside rescue by a Mobil Oil service tanker and expressing his abiding preference for the company's gasoline thereafter.¹⁴

Welton Becket and Associates continued to land lucrative contracts through the 1950s, including international hotels for Hilton, and it became one of the most profitable architecture firms in United States history. The complexity of its projects meant the company needed to adopt an organizational structure that could manage the entire spectrum of architectural production, much like oil companies such as Humble aspired towards vertical integration of all oil services. The firm developed the concept of "total design" to offer the suite of services expected by clients in a market increasingly driven by construction conglomerates and design-build firms. In a total design process, architects were engaged in all aspects of a project, save for construction and finance. In a 1972 monograph, however, Becket and Associates rejected the label of "corporate architecture" foisted upon it by the press, while acknowledging a certain cultural affinity between the architects and their clients. Indeed, the firm "understood," "thought like," and was "very much at home" with these folks. Total design services became a process of adopting the knowledge paradigms of the client as the architect's own and transmitting their ethos into built form. The firm

¹³ Morgan J. Davis, "The New Humble — A Study in Organization," *Journal of Petroleum Technology* 16 (Apr. 1964): 396.

¹⁴ William Dudley Hunt Jr., *Total Design: Architecture of Welton Becket and Associates* (New York: McGraw-Hill, 1971), 12. Additional Becket projects of note for energy and oil concerns are the General Electric Pavilion at the New York World's Fair (1964); Phillips Petroleum Building, Bartlesville, OK (1964); Fluor Headquarters (a refinery and petrochemical plant contractor), Irvine, CA (1978); interior design for Exxon in its New York headquarters (1972); and the Shell Information Center (1972), the centerpiece of Shell's Plaza del Oro development in Houston, for which Becket provided a master plan.

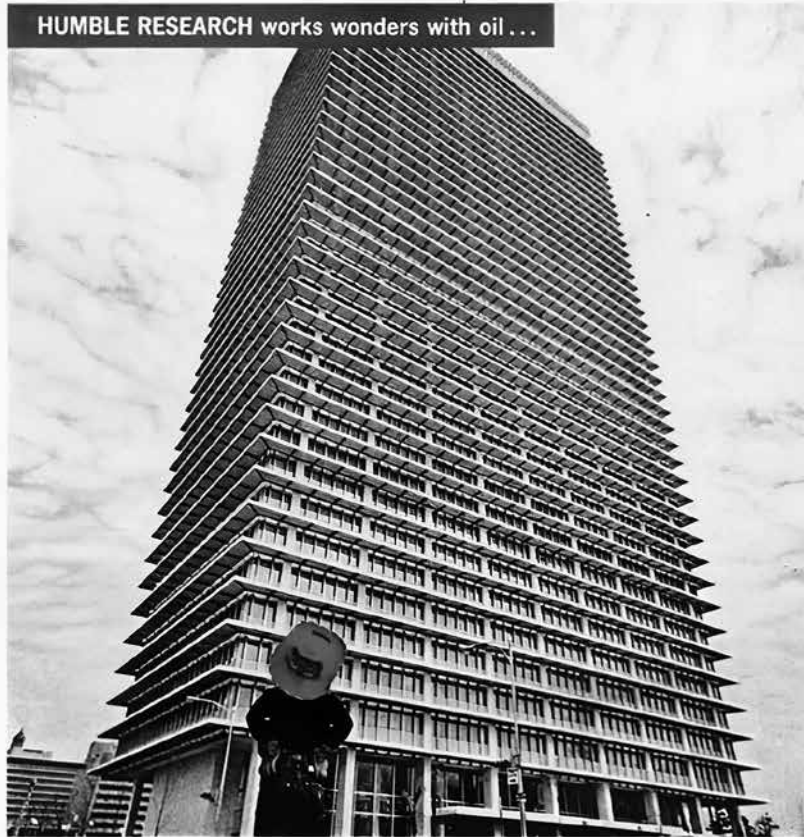
even established its own division of knowledge production, the Welton Becket Research Center, along with an office in Houston, demonstrating the parallel tendencies of oil and architecture to prize information and research as essential inputs to their respective businesses in the emerging global oil capital.¹⁵

Becket and Associates demonstrated a thorough understanding of Humble Oil's frame of mind throughout the design process by channeling predictions of oil production into their building. In contrast to other corporate showpieces in the area, the edifice was a speculative investment financed with the Humble Employee Retirement Fund, with two-thirds of its interior space devoted to offices for the company and a third reserved to lease. Feasibility studies examined the market conditions of area real estate, traffic patterns, and parking measures. Most important, however, were the "projected requirements" of future production that determined the tower's volume and spatial allocation, which appears to have prompted disagreement between architect and client. Becket and Associates culled figures on oil production in the United States and compared it to Humble's market share to determine the correct proportion of office employees. It "projected into the future" these imaginary oil workers and multiplied this number "by space allowances per worker to arrive at net floor area required." Humble had previously used "an extrapolation of past experience" in line with its booming early history for internal space requirements, while Becket instead studied "pertinent external factors."¹⁶ Nonetheless, the two sides ultimately came to the same conclusion: one million square feet of space. If the company was aware of its exposure to leveling domestic production, it made no mention of it. Instead, it projected a confidence in its own historically grounded vision of progress. The mathematical calculation of production estimates and attendant worker populations indicates the degree to which oil influenced the three-dimensional growth of Houston's suburbs and skyscrapers, while also governing the design process. The Humble Oil Headquarters makes evident the relentlessly optimistic energy forecasts that directed Houston's development, as well as a belief in the transposability of oil and office life. By building these calculations into the headquarters, Becket and Associates channeled petroleum knowledge into corporate imagery, transforming oil production into the minimum requirements for maximum labor efficiency.

Humble Oil not only regarded crude oil as a fundamental material in the construction of its headquarters, but also a burgeoning array of petrochemical products that were expanding the firm's market reach. In announcing the building in 1959, the company emphasized innovations in synthetic rubber since World War II, and the expected increase of brand recognition after its reorganization with Standard Oil affiliates. The combination of value-added petrochemical

¹⁵ Hunt, *Total Design*, 22, 121. For a discussion of these hotel projects as a diplomatic instrument of cultural colonization, see Annabel Jane Wharton, *Building the Cold War: Hilton International Hotels and Modern Architecture* (Chicago: University of Chicago Press, 2001).

¹⁶ Hunt, *Total Design*, 175.



High and dry...

The new Humble Building stands high and dry with its brim brushing the clouds and its feet wrapped snug and secure in a very special Butyl rubber blanket, 36 feet below Houston's water table. It's the tallest building west of the Mississippi.

Floating proudly on its own island of concrete, this great building resists the persistent attack of hydrostatic pressures (and will for the life of the building) by means of a thin Butyl rubber blanket

that lies between it and the treacherous water-bearing sands.

Like the shock-absorbent Butyl safety tires or an improved gasoline for your car, the Butyl for this blanket is just one more exclusive development of Humble, leader in petroleum research, whose products are available to you in your own neighborhood under the Enco sign of "Happy Motoring®". It's America's First Choice. Make it yours.

HUMBLE . . . America's Leading Energy Company
OIL & REFINING COMPANY



Humble Oil Advertisement, circa 1962. *From Author's Collection.*

products and geographic extension would further cement its role as a leading oil and gas company, with its new headquarters visibly marking this connection. The forty-five-story facility towered above the city as Humble Oil proffered “a beautiful array of plastics products in many colors [that] might have come originally from the earth in the form of colorless natural gas.”¹⁷ Humble promoters asserted this progressive perspective on petrochemical research through the dissemination of images of its headquarters in print media. A 1960s advertisement proclaimed that “Humble Research works wonders with oil,” while a young boy in a cowboy outfit stared at the vertiginous tower. The advertisement juxtaposed architecture against environment and geology with the protective agent of petrochemical products maintaining the integrity of each: while the tower reached upward to the atmosphere, its base was “wrapped snug and secure in a very special Butyl rubber blanket, 36 feet below Houston’s water table.” The building “resists the persistent attack of hydrostatic pressures” by having this oil-based barrier between it and the surrounding “treacherous water-bearing sands.” Architecture thus incorporated oil research into a foundation material to thwart negative environmental effects, thereby presenting petrochemical products as a desirable outcome of oil’s natural bounty. In addition to concrete, glass, and steel, such materials would be part of architecture’s environmentally safe future.

Humble Oil continued to expand its material and immaterial support for its primary oil business during the 1960s, with clear impacts on the real estate and research industries of Houston. In the late 1930s, the company had bought land and mineral rights at the Friendswood and Clear Lake cattle and oil fields, part of West Ranch, just at the city limits of Houston. This land had been under the ownership of James M. West, a lumber, banking, cattle, and real estate magnate, since the early 1920s. The fields proved to be productive for Humble Oil, but by the 1950s they had reached a plateau. Company leaders considered what to do with 23,000 acres outside its extraction zone and decided to donate a portion of it to Rice University, with the stipulation that the institution establish a unit for the furtherance of earth sciences. Earth sciences in this context might be taken to mean, among other disciplines, geology — an essential field of knowledge for the oil and gas industry. As historian Alex Beasley has recently shown, oil companies partnered with educational institutions to fund domestic and international programs in engineering and geology in order to train many future generations of oilfield workers. These programs acted as a form of expert exporting, spreading the gospel of petro-capital across the globe and solidifying Houston’s place as the world’s energy capital through the production of knowledge.¹⁸ Humble’s proposal mirrored this general trend, hoping to draw potential employees into a closer relationship with the company by sponsoring their education at an institution close to it.

¹⁷ Bicknell Eubanks, “Humble Oil Symbol to Rise Across U.S.,” *Christian Science Monitor*, Sept. 22, 1959.

¹⁸ Amy Bacon, “The West Ranch: From Cattle to Space City,” *Houston Review* 17 (1995): 73; B. Alex Beasley, “At Your Service: Houston and the Preservation of U.S. Global Power, 1945–2008” (Ph.D. Diss., Yale University, 2016).

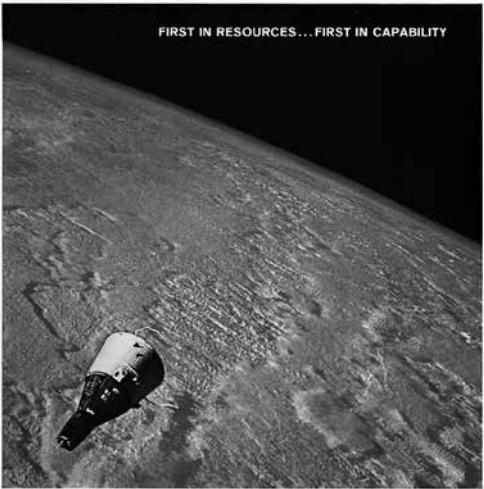
Although Humble's proposed earth sciences institute was never built at Rice, the National Aeronautics and Space Administration (NASA) chose Houston for the site of its Manned Spacecraft Center (MSC) in 1961, thus establishing a symbiotic relationship between "space age" industries and the petroleum business. MSC served as the command-and-control center, research laboratory, and operational headquarters for NASA spaceflights on a thousand-acre campus twenty-five miles south and east of the central business district. Houston won the honor by a combination of institutional and corporate lobbying by Rice University Board of Regents president George R. Brown, who was a close associate of then-Vice President Lyndon B. Johnson, and Humble president Morgan J. Davis. The previously established philanthropic alliance between Rice and Humble proved to be crucial for the city's urban boosters: Brown, with the blessing of Davis, promised NASA a sizable chunk of ranchland for its facilities through a land transfer. Charles Luckman, in partnership with MacKie and Kamrath, designed the facilities, while Brown's Houston-based construction firm, Brown and Root (itself a key player in the oil industry's expansion into harsh environments offshore), undertook the contracting in 1962.¹⁹

Houston's \$3 billion petroleum economy got a windfall from NASA's selection, which brought a highly skilled workforce and new scientific and technological dimensions. However, its existing economic strengths also had much to do with the agency's decision: administrators regarded the city's refineries, petrochemical plants, and oil research laboratories as assets for their agency's energy-intensive lunar missions. Two Humble Oil advertisements from the late 1960s speak to the mutual benefit of this development. In one, a space capsule floated before earth's gently cresting horizon, clouded in atmosphere, as the copy teased readers about "a drop of oil you can't buy." Astronauts, it said, depended on tiny amounts of the company's specialized lubricant, which the government had reserved in its entirety. What customers back on earth *could* buy, however, were Humble's products infused with "the accumulated skill of the world's leading petroleum research organization." In another advertisement, a pair of astronauts roamed a lunar landscape in front of a large vehicle that could endure the extreme fluctuations in space temperatures thanks to Humble's hydraulic oils. Again, the highly specialized oils had "down-to-earth payoffs" for consumers, who would benefit from other research-driven products Humble had developed.²⁰

¹⁹ See Joseph A. Pratt, *Offshore Pioneers: Brown & Root and the History of Offshore Oil and Gas* (Amsterdam, NL: Elsevier, 1997).

²⁰ Stephen B. Oates, "NASA's Manned Spacecraft Center at Houston, Texas," *Southwestern Historical Quarterly* 67 (Jan. 1964): 350-375. Humble here echoed the broader mandate of NASA, which increasingly faced pressure to reorient its technology away from space and down to problems on earth. One of its most celebrated spinoffs, the LANDSAT program, was promoted as an aid to global environmental management, while at the same time being seen by extractive interests as a revolutionary technology in exploration and prospecting. See Michel T. Halbouty, "Application of LANDSAT Imagery to Petroleum and Mineral Exploration," *American Association of Petroleum Geologists Bulletin* 60 (May 1976): 745-793; Megan Black, "Prospecting the World: Landsat and the Search for Minerals in Space Age Globalization," *Journal of American History* 106 (June 2019): 97-120; Neil Maher, *Apollo in the Age of Aquarius* (Cambridge: Harvard University Press, 2017).

FIRST IN RESOURCES... FIRST IN CAPABILITY



There goes a drop of oil you can't buy
(But we'll give you the one thing that makes it different.)

To find his way through space, an astronaut depends on a gyro- guidance system lubricated by less than one drop of a special oil. Humble has provided the only oil approved for this use—**Transvac® V-75**—but we developed it for industry and not space!

As one of our premium industrial oils, it was remarkably well suited

for the critical gyro bearings. It works so well, in fact, that aerospace researchers have never permitted any substitution. Now the government is reserving it all for special aerospace applications.

But we can still give you the one thing that makes it unique: the accumulated skill of the world's leading petroleum research organization. It costs you nothing extra. But it makes a real difference in many products you may take for granted — fuels, solvents, waxes, lubricants. A difference big enough to show up even in one drop! Let our local sales representative tell you more.

HUMBLE
OIL & REFINING COMPANY... THE PEOPLE WHO PUT A TIGER IN YOUR TANK



Humble Oil advertisements, circa 1967. From Author's Collection.

FIRST IN RESOURCES... FIRST IN CAPABILITY



Hitch a ride
(Developing super oils for space has a down-to-earth payoff.)

When a moon vehicle crawls from sunlight into lunar shadow, it will go from 200°+ heat into 250° below zero cold.

Too much for any oil? Maybe. But Humble makes hydraulic oils to take the extremes of current aerospace hardware... and we're working on one for the moon.

Meanwhile, you can hitch a ride. We have space-type oils for industry now. They offer the widest range of high and low temperature performance ever available from any petroleum oil.

The world's leading petroleum research organization is constantly coming up with better oils,

greases, fuels, solvents and waxes. So if it's down-to-earth results you want, give our local representative a call.

See what Humble's far-out research can do for you!

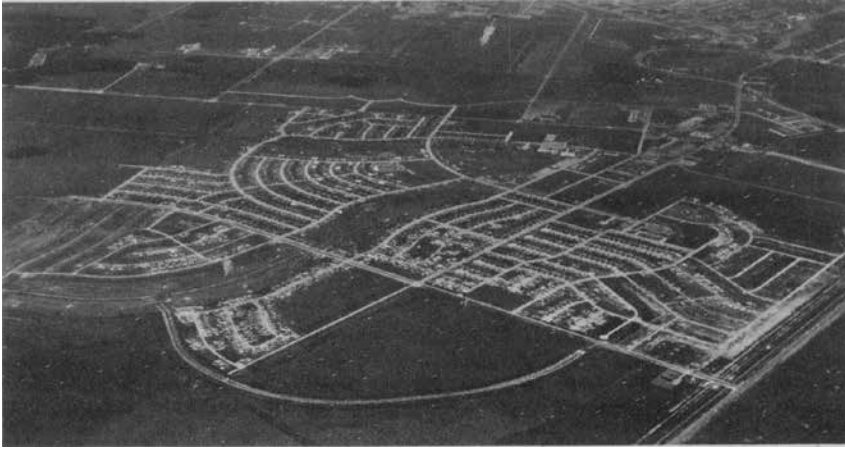
HUMBLE
OIL & REFINING COMPANY... THE PEOPLE WHO PUT A TIGER IN YOUR TANK



The construction of NASA's MSC prompted Humble Oil to capitalize on the real estate opportunity presented by the potential population of knowledge workers employed at the facility. Expecting a captive, highly skilled workforce, Humble Oil began to move forward with a plan to build a new town and industrial district on a portion of its unproductive holdings. Towns like those planned by Humble, descendants of the "garden city" model of late nineteenth-century England, were a reaction to both the rapid growth of urban centers and the subsequent sprawl of suburbia. These developments sought to preserve open greenspace within self-sufficient communities that integrated light industry and commercial activity. The plan for Clear Lake City, as it was originally known, was originally drawn by New York investment banking firm Lehman Brothers before the announcement of the MSC. It provided for a community of 100,000 residents and a simultaneous industrial development. The industrial district would furnish jobs to make the housing development economically viable, and provide markets for Humble Oil products, highlighting the synergistic dependencies of real estate and oil. Humble partnered with homebuilder Del E. Webb to form the Friendswood Development Company, which became one of Houston's biggest developers. Noting that this was, for an oil business, a "convention-shattering move," reports alluded to development's position within Humble's larger corporate restructuring and petrochemical diversification: it was "a calculated move to add one more than one string to Humble's bow in the face of production and price troubles in the nation's oil business."²¹ Though it was not as precedent-setting as these reports claimed, Clear Lake City was the opening salvo in a rash of oil companies investing in real estate for diversified use against the backdrop of declining production.

Critics wondered whether the new town panacea gaining steam in the early 1960s was not just a restyled suburbia dressed up in the rhetoric of open space and "master-planning." Aerial views of Clear Lake City certainly do not contravene such a notion, with the plan's tract-style housing and bare landscaping indistinguishable from the endless Levittown copies multiplying across the country. Though they needed the revenue and employment, new towns risked sully their pastoral image by granting excessive concessions to large corporations—a trend that could lead to distasteful company town associations. These new towns preferred to rely on the ancillary benefits of adjacent industry (such as MSC for Clear Lake) and "to ban anything but high-paying think factories." For Humble Oil, Clear Lake City encapsulated the company's efforts to promote the next phase of its extractive enterprise, a "total environment" of city, nature, and industry that would trade its polluting image in favor of a knowledge-based urban economy. Despite this, neighboring residents sued Friendswood in 1973,

²¹ Richard W. Helbock, "New Towns in the United States," *Professional Geographer* 20 (1968): 242-246; James H. Winchester, "Humble Oil Splinters Tradition," *Christian Science Monitor*, Jan. 2, 1963. For a history of the new town movement globally, see Rosemary Wakeman, *Practicing Utopia: An Intellectual History of the New Town Movement* (Chicago: University of Chicago Press, 2016).



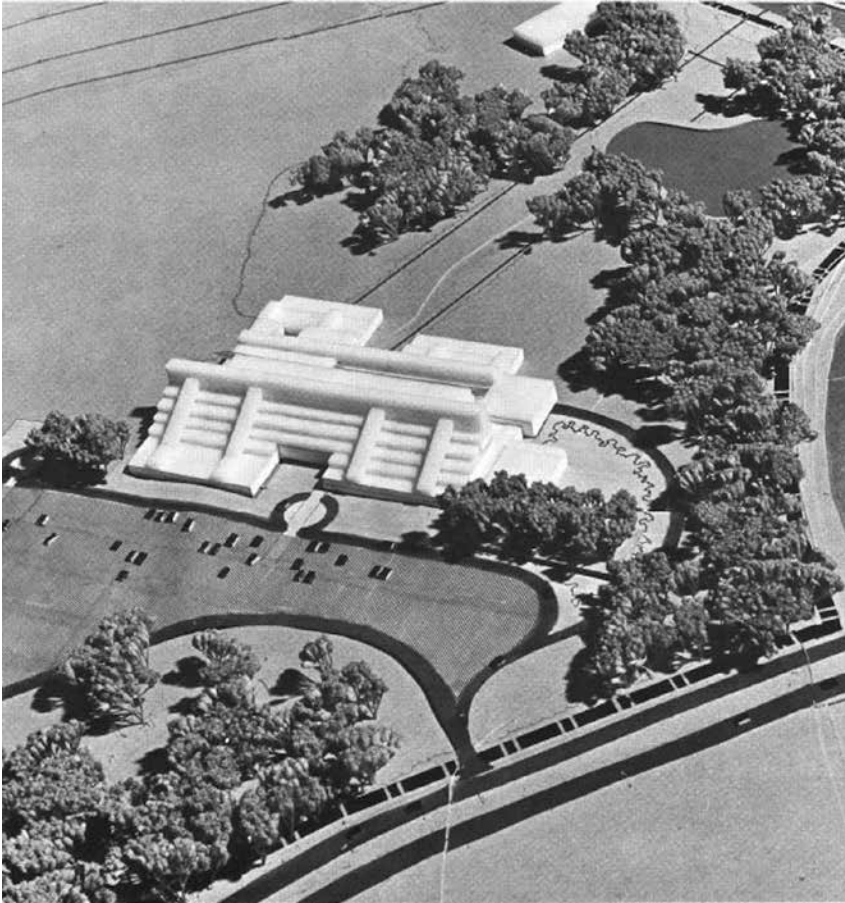
Clear Lake City, arranged in typical tract-style layout, in *Progressive Architecture*, 1969.

accusing the company of withdrawing vast quantities of groundwater for sale to industrial users, destabilizing the land on which their property stood.²² Such incidents certainly did not help companies such as Humble in their efforts to be seen as more environmentally progressive.

Humble did eventually succeed in helping establish an educational institution on its holdings at Clear Lake with a program that called to mind its earlier aspirations to link industry and university through research and instruction. In Texas, the links between extractive activity and education were obvious. While its land grant universities were established during the second half of the nineteenth century, they gained little from the leasing of grazing and mineral rights before the second decade of the twentieth century. Then the discovery of oil under some of the land reserved for the support of the universities greatly enhanced their operating budgets, prompting officials and others to promote acquiring more knowledge about what remained an imperfect science. Harnessing this desire for “mineral expertise,” the legislature approved the State School of Mines and Metallurgy in 1913 to transform its lands into “valuable and revenue producing” holdings and stimulate “the diffusion of mineral knowledge through the State.”²³ Thus, the university buttressed its cash flow by ensuring that, in addition to petrochemical facilities, a model for knowledge production was set in place.

²² Frank Lalli, “New Towns: Are They Just Oversized Subdivisions, With Oversized Problems?,” *House and Home* 29 (June 1966): 95; *Bayport*; *Nation's Most Carefully Planned Industrial Development*, Friendswood Development Company/Humble Oil Land Development Division, Reference Section, Houston Public Library; “Humble Oil to Develop Industrial District,” *Chemical Engineering News* 42, (Feb. 1964): 24; Joseph William Singer, *Entitlement: The Paradoxes of Property* (New Haven: Yale University Press, 2000): 19. The majority of companies that purchased plots at Bayport were, in fact, petrochemical manufacturers.

²³ Chapter 178 (S.B. 183), quoted in Berte R. Haigh, *Land, Oil, and Education* (El Paso: Texas Western Press, 1986), 117.



Architectural concept model of University of Houston-Clear Lake, William L. Pereira Associates, circa 1974. *From Author's Collection.*

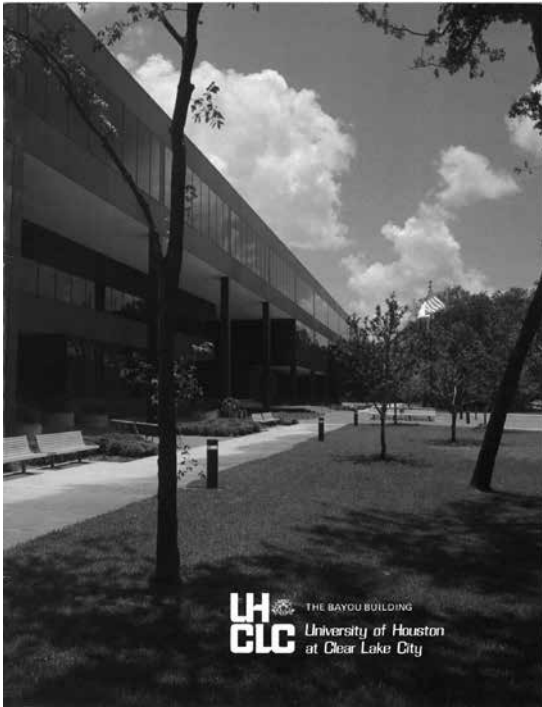
In presenting the University of Houston with lands for the construction of a new Graduate Center in Clear Lake City, the Friendswood Development Company drew on this legacy of land grants, petro-capital, and mineral expertise, updated for the age of petrochemicals and moonshots. Six months after opening a temporary building for some five hundred students, the Texas legislature approved a plan for a satellite commuter campus, to be known as the University of Houston at Clear Lake City (UHCLC). A Long Range Development Plan for UHCLC, developed by a special advisory committee of area representatives, introduced the broad strokes of the new campus's academic prerogatives with the question of "interfaces:" it would avoid duplicating the programs found at its main campus and instead direct resources towards programs "distinctly adapted to the needs of the region being served and which interface directly

with the institutions and constituencies which generate those needs.” Listing the potential futures for its pupils, authors noted that “the industrial plant manager, the scientist, the steelworker, the housewife”—all would prosper from exchanges with the nearby business and industrial community. Physical planning derived from the principle that the site was a “laboratory for the testing of academic programs.”²⁴ Echoing the language of experimental knowledge production that defined the area’s research laboratories, the UHCLC sought to educate students specifically for the petroleum industry, those “institutions and constituencies” that pervaded the landscape around it.

The architectural concept of the campus both reflected and shaped this new academic program. It was planned to be a megastructural facility carefully inserted into its environment. This project continued the distinctive melding of natural and engineered landscapes that characterized the oil industry’s buildings at this time. Indeed, promotional documents for the campus described the surrounding “business environment” and the site’s ecological factors as combining to determine the campus’s form and program. Synthesizing information on site characteristics such as the area’s soils, subsidence, flooding, and topography, designers proposed a single enclosure containing all academic departments, both as a hedge against potential natural disaster and as a way to push interdisciplinary programming. Site planners considered three kinds of physical “plants:” the educational structure; the region’s many petrochemical facilities; and the local flora that made the campus an instructional arboretum. Designed by three firms in a joint-venture partnership, the Bayou Building, as UHCLC dubbed its primary facility, officially opened to students in 1976, just two years after groundbreaking thanks to innovations in construction management. Although it is unclear what influence, if any, Humble Oil had in the creation and construction of UHCLC, its foundational support of the new institution shows how education might have been embraced as a promising immaterial resource in sustaining the oil industry. UHCLC therefore represents a distinct phase in the spatial evolution of Houston’s knowledge infrastructures as the conduit for a new generation of suburbanized and professionalized oil workers.

Humble Oil continued its investments into these dual material and immaterial spheres of development throughout the 1970s and 1980s. In May 1972, after seven years of market study and research, Humble Oil and Refining Company changed its name to Exxon Company U.S.A. This change came at a formidable time for the oil business: its profits continued to increase but declining domestic production after a peak in 1970 indicated that demand would likely keep outpacing the supply. Government representatives and corporate executives alike seemed to agree that information might be the most promising resource to substitute for uncertain oil reserves as the next driver of industrial productivity, and oil executives jumped at the opportunity to meet this challenge. As William

²⁴ Long Range Development Plan, n.d. (10657.1/348), pp. 6, 14, and *Brochure for the Bayou Building at the University of Houston at Clear Lake City*, 1981, Vertical Files, Archives, University of Houston at Clear Lake.



Bayou Building at the University of Houston-Clear Lake, S.I. Morris, 1974. *Courtesy of Alfred R. Neumann Library, University of Houston-Clear Lake.*



Knox, director of the National Technical Information Service (NTIS) and a former Exxon official, said in 1973, information was a “marketable commodity” whose price distortions were having real-world effects; the public had to learn that it had to pay for such resources or risk further runaway inflation. At the same time, Exxon greatly increased its real estate ventures through the Friendswood subsidiary, with revenues topping \$100 million dollars per year in the early 1980s—a rare bright spot in the oil-based downturn of Houston’s economy. The key to its success? It took “the same approach to developing a cow pasture or a timberland as [it did] an oilfield—slowly, methodically and with focus on big, long-term payoffs.”²⁵ Each of these efforts show how the oil industry responded to what, in the early 1970s, appeared to be the validation of Hubbert’s peak oil thesis from two decades earlier. In its newest incarnation as Exxon, Humble Oil turned to both land and information as the twin strategic poles of weathering a prolonged industry-wide downturn.

If Hubbert threatened the future of the oil industry in the 1950s and 1960s, the architecture of industrial research offered a limited albeit highly visible way of denying potential scarcity, and it ultimately became a means of financial salvation for some companies. This paper has argued that the efforts by Humble Oil to counteract Hubbert’s model of growth and decline helped spur Houston’s transformation into a capital of petroleum expertise. The three spatial scales of this transformation—research laboratories, corporate headquarters, and new town developments—reveal the importance of knowledge, or immaterial resources, in the corporate imagination of oil. Furthermore, the degree to which questions of ecology appeared in these projects shows the ways in which the environment itself became a flexible discourse for oil companies engaged in their industry’s apparently careful interventions in the natural world as part of holistic “total” enterprise. The history of Humble Oil’s architectural and urban innovations at this time are instructive for the ways in which the company successfully navigated an existential risk to the future of its business. For historians, citizens, and activists, this narrative might provide insights into the tactics by which corporations use aesthetics and program buildings and landscapes to achieve key organizational ends.

²⁵ Thomas Grubisich, “Federal Agency Puts Price on Information,” *Washington Post*, Dec. 6, 1973; James Tanner, “Unlikely Gusher: Exxon Strikes It Rich Developing Its Lands for Homes and Offices,” *Wall Street Journal*, Dec. 11, 1986.