

A close-up photograph of a woven basket, likely made of reeds or bamboo, with a dark, possibly black, background. The basket's weave is visible, showing a pattern of light-colored, elongated strips. The text "the Humble Way" is overlaid in a white, serif font, with "the" in a smaller size above "Humble" and "Way" below it. Below the title, the text "THIRD QUARTER 1972" is printed in a smaller, white, sans-serif font.

*the
Humble
Way*

THIRD QUARTER 1972

Bringing Back the Basketmakers

FIRST WAS FIRE. Then, weapons and tools of wood and stone and bone. And the next fundamental advance of mankind was containers—for storing food, for fetching water, for keeping house.

"These vessels could be called the 'great civilizers,'" says Dr. Spencer Rogers of the Museum of Man at San Diego. "It's difficult to imagine our own modern society functioning without cans, bottles, bags or boxes."

Thus, Naoma White is invited to sit in the foyer of the Smithsonian Institution at Washington D. C., to demonstrate skills handed down



Over the centuries, Arizona Indians have developed the craft of basketweaving into an intricate art form.

through countless generations. Mrs. White, a Pima Indian from Arizona, is a weaver of baskets. The people who pause to marvel at her craftsmanship seem instinctively to share a respect for this New World art that long ago made it possible for hunter to become farmer, for nomad to become homemaker, for savage to become citizen.

And the doing of it, says Mrs. White, is "more than something you do for

of Northern Arizona at Flagstaff. "The miracle is that the craft survives at all."

The time required—in some cases, months—for producing a good basket for home use no longer can be justified. Baskets made for sale must be priced too low to compensate for the long hours of meticulous work. Ironically, today, with the accelerating interest in American native crafts, the markets are being flooded by cheap, counterfeit imports.

With its own kind of technicians—geophysicists, geologists, and petroleum engineers—afield in Arizona in recent months, Humble Oil & Refining Company set out to assemble an exhibit of one of man's oldest technologies, basketry. Assisted by Dr. Danson, tribal crafts centers and Indian leaders, Humble collected 22 baskets representing contemporary weavers of eight Arizona tribes. The exhibit is being offered to museums and other public institutions for display with an educational message: Here is a heritage deserving of wider recognition and financial support.

The dim beginning of basketry can only be inferred. At some moment long ago, primitive man thought to fashion together a few leaves for a wrapping or a sling or a cloak. Unlike durable stone, the organic materials of genesis baskets decayed to dust.

But indirect evidence is strong that baskets predated pottery; that pottery originated as clay lining of baskets. Older potsherds bear impressions of the long-disintegrated weaving.

People without baskets—what were they like? What was the lifestyle of those first human beings who crossed a land bridge from Asia to Alaska, and pressed southward some 11,500 years ago?

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Irene Thomas, of Bapchule, and Eva Miguel, of Gila River
Reservation, employ classic Pima designs in coil work.



Papagos weave a split-stitch basket of yucca fibers over
a foundation of bear grass.



Eva Stevens, a Chemeheuvi, wove this bowl of white willow,
black devil's claw, and tan juncus.

Stella Preston, of Kiakochomovi, uses only natural dyes to
add color to her lively Hopi designs.



game did he shift his diet to wild plant foods, and, in time, to cultivated crops of corn, squash, and beans. And for this move to agriculture, baskets were required. With a more dependable food supply, man could develop the refinements of community life.

Other theories hold that Early Man was driven to farming by climate changes following the last Ice Age. In any event mankind in Arizona progressed through cultures so basket-oriented that they are named by anthropologists as Basketmakers. Baskets as old as 9,000 to 7,000 B. C. have been found preserved in the dry sands of the Southwest. Some of the earliest of these artifacts are artistic.

Of ancient basket fragments recovered from Ventana Cave near Tucson, the U. of A.'s Dr. Emil Haury says, "Technically, there is no appreciable difference between new and old."

By the time of European contact, basketry and its offspring, pottery-making, were in full flower. Apaches were carrying water in twined, pitch-covered jars. Pimas were storing grain, 50 bushels to the basket. Hopi mothers were keeping their infants in woven cradle boards. Elsewhere basketry went into mats, walls, pot rests, shelves, and head-bands. Indians of complex societies were using baskets to winnow grain, excavate irrigation ditches, haul wood, parch corn, collect wild foods, express emotions and worship gods. In raising their craft to an art form, they used a wide variety of materials to create exceptional diversity in types, techniques, shapes and decorations.

This variety continues into modern Arizona basketry. Today's artisans use the traditional gifts of the land: yucca, bear grass, willow shoots, devil's claw, cattail, rabbit brush, wild sumac, har-

Apache speak of a nation of warriors capable of resisting invasion for 30 years. The mystical plaques of the Hopi could come from no other place than those mesas where hundreds of kachina gods are faithfully celebrated in dance and song and ceremony.

Tribe by tribe, the basketmakers of Arizona are:

- **The Pima** Descendants of prehistory's greatest irrigation farmers, Pima Indians today dwell along the Gila and Salt rivers of south central Arizona. Many continue to cultivate fields farmed for 2,000 years, out of irrigation canals that follow the contours of hundreds of miles of waterways dug by the ancient Ho Ho Kam.

Voluminous granary baskets no longer are woven, but a few women make shallow, medium-size flat bowls of close coiling. Over a foundation of carefully sized cattail, strips of willow shoots and devil's claw (*martynia*) are sewn into famed Pima designs: fret, squash blossom, turtle's back, butterfly, star, swastika, whirlwind. They are as strong and useful as any in the world, with some examples in daily household service for 30 years. The weavers never refer to patterns; rather they rely on mental images. When asked how big a basket she is weaving, a Pima weaver will respond, "I won't know until it's finished."

At about the turn of the century, probably at the request of collectors, the ever-hospitable Pima weavers began making exquisite miniatures of their fullsize baskets. Miniatures in Phoenix's Heard Museum range from three inches to one scarcely large enough to hold a single grain of wheat. A fine miniature might require three months of tedious toil.

- **The Papago** First cousins to the Pima, these desert people of southern



Lillian Johnson, of the White River Apache Reservation, draws upon ancient skills handed down from mother to daughter.

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On a piki tray used to cool cornbread are Hopi baskets, a morning kachina doll, and a miniature cradleboard.



Yavapai weavers employ coils over a three-rod foundation and ancient, traditional patterns in their work.

Apache burden baskets decorated with silver bells once filled Apache camps with "women's music."





Pai-Ute weavers sometimes weave wedding baskets (above) for use in traditional Navajo wedding ceremonies.

and infrequently, a touch of red from the root of the narrow-leaf yucca.

Another type of Papago basket, usually of larger size and smaller price, is put together relatively quickly with a "split-stitch" that skips large sections of the foundation coils.

• **The Yavapai** Of Yuman stock, the Sun People in the mid-1800's numbered 1,500, and they claimed a desert-to-mountain wilderness of central Arizona embracing 20,000 square miles. Directly in the path of white settlement, the Yavapai dwindled to a few hundred who now live near the old territorial capital of Prescott, and on their headquarters reservation at Fort McDowell. A lively academic debate persists as to whether the Yavapai taught basketry to their neighbors, the Apaches, or vice versa.

Whatever the case, Yavapais once made baskets so tough that food could be boiled in them. Ranging over their wooded nation, these hunters and gatherers used baskets for transporting dried meat, piñon nuts, mesquite beans and such.

Baskets produced today by a handful of weavers at both Prescott and Fort McDowell are coiled on a three-rod foundation. The sewing materials are split willow and devil's claw, not so finely sized as in Pima basketry. But what the Yavapai lack in stitching, they make up in lively design — animal and human figures and geometric flourishes.

• **The Apache** Along with their close relatives, the Navajos, the Athabaskan Apaches entered the region that is now Arizona from the 10th through the 17th centuries A. D. Their proclivities for raiding agricultural tribes quickly won them a host of enemies, but by

test of arms they wrested mountain refuges along the border of Arizona and New Mexico. Refusing to reconcile themselves to white domination, they retarded settlement of an area larger than France and Germany.

Geronimo, a basketweaver? Not hardly. But his women wove them, and today the people of the White Mountain and San Carlos tribes continue to manufacture stylized versions of a water bottle and burden basket.

The jug, in Apache called *tuus*, is twined of sumac or squawberry twigs, with split elements diagonally woven over whole elements. The customary pattern is a single band. When the weaving is done, ground leaves of juniper and red ochre are rubbed to fill the cracks. Then the entire jar is waterproofed with a glaze of piñon pitch.

The conical burden basket supported by a head band is of coarse twining of willow, cottonwood or wild mulberry. A simple band pattern may be colored with paint. Long strips of home-tanned buckskin terminate in tiny cones of metal that make music in motion.

• **The Chemehuevi** Technically Californian, this small Shoshonian band allied with Arizona's Mohaves. When their own reservation on the California side of the Colorado River proved uninhabitable, the diminutive Chemehuevis moved in with their gigantic friends.

Chemehuevi workmanship has ever been of the highest quality, but only two weavers, both about 80 years old, are active. Over a three-rod willow foundation they coil split willow, devil's claw, and sometimes a bit of red or tan juncus bark. The weave is exceedingly smooth. Designs of bugs, snakes, butterflies, and covote tracks

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are active weavers. The technique is to coil willow over a three-rod willow warp, with devil's claw design. In Havasupai society, the men own the land, but the women own the baskets.

• **The Hualapai** Whereas the Havasupai retreated to a protective canyon, their brother Hualapai infiltrated a



Pima miniatures fashioned for collectors of natural fibers or horsehair require months of patient labor to complete.

barren tableland south of Grand Canyon. They used to make closely coiled baskets of mulberry wood, and woven seed beaters for gathering foods from the wild.

When Highway 66 and the Santa Fe Railroad traversed their land, the Hualapai turned to cattle raising. Hualapai weavers had difficulty in selling top quality baskets to tourists for fair prices, so they offered a cruder model cheaper. Today's Hualapai burden baskets are diagonally twined of sumac twigs or squawberry. Not especially fair, the baskets are rugged; it's said that a Hualapai bowl, six inches in diameter, can support the weight of a man without crushing.

• **The Hopi** Lineal descendants of the pueblo Anasazi basketmakers, the Hopi inherit a rich tradition of weaving which they keep fresh to this day. A dozen villages on and under three

use nothing but native dyes, for example, yellow from the rabbit brush flower, and purple from Indian corn.

On Second Mesa live the only pueblo weavers in the country still coiling plaques and baskets, and they are splendid items—tightly woven native-dyed yucca over galleta grass or shredded yucca foundations. The innate Hopi flair for color and scale blossoms in abstracted kachina figures, thunderstorms and rainbows, animals and crops.

So basketry is far from vanished from Arizona, although in certain tribes the art is at the brink. Where hope is highest is at imaginative, progressive institutions such as the Museum of Northern Arizona. The annual midsummer Hopi show at the museum provides a marketplace for pueblo wares in surroundings where customers learn to appreciate the time, patience and talent embodied in every Hopi product. Shows of similar purpose are gaining in popularity in Phoenix, Scottsdale, Tucson and other large Arizona communities.

"It just may happen," says Dr. Danson, "that the education of the non-Indian to the values of Indian basketry may occur just in time to rescue the skills."

Another promising trend is toward the opening of crafts outlets on the reservations. One new outlet just opened is the Gila River Arts and Crafts Center off Interstate 10 south of Phoenix. Hired to manage the center for the Pima and Maricopa tribes is young, enthusiastic Jerry Collings, a college graduate who lived as a boy among the Chemehuevis. Learning weaving from them, he knows firsthand, "There is no way at today's prices, a Chemehuevi weaver can earn more than 25 cents an hour." Still,

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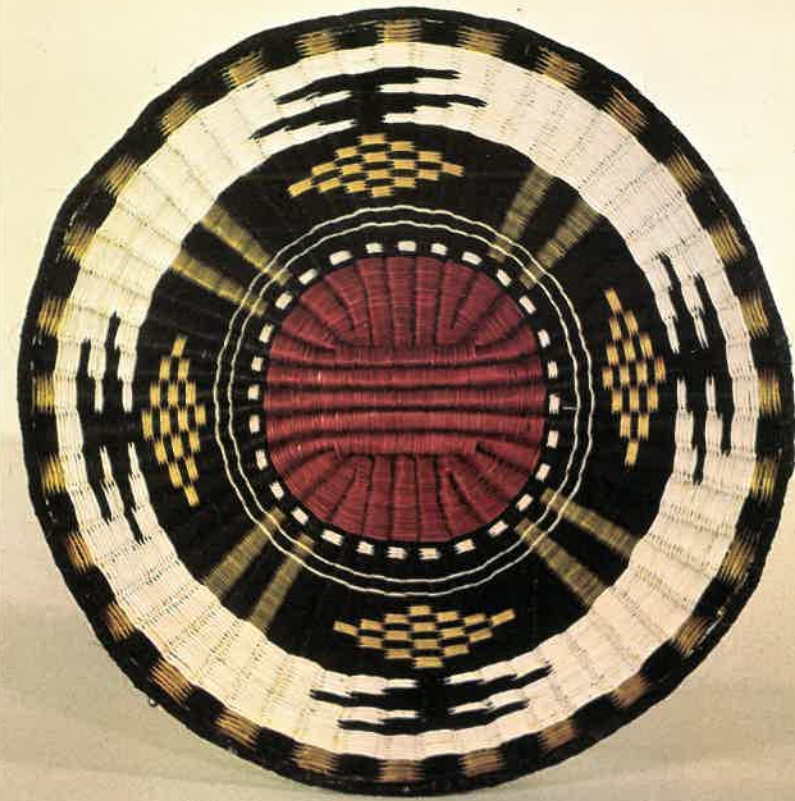
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Hopi wicker work of Dora Tawahongva, of Hotevilla, begins
with crossed elements forming a hump in the center.

In this Papago design, only “Elder Brother” knows how to
travel through the maze to reach his house.



Apaches made a water jug, or “tuus,” by coating a basket’s
interior with waterproof pinion pitch.

Stella Preston, of Kiakochomovi, shows lively design and
craftsmanship in her Hopi wicker work.



IF YOU ENJOYED seeing the swallows come back to Capistrano, you'll love watching the terns return to Humble's Grand Isle Gas Plant. Each April, right on schedule, thousands of the small, gull-like birds flock to this small island in the Gulf of Mexico. After flying 500 miles from the Yucatan Peninsula to Louisiana, the birds settle down within the gas plant confines to build nests and raise families.

Why Humble's gas plant? Ornithologists say Humble did the terns a good turn when the company brought in thousands of cubic yards of clam



Tern eggs, above, blend perfectly with

Return of the Terns



Terns

shells as a foundation for the maze of shiny towers which remove petroleum liquids from natural gas produced from nearby offshore platforms.

"The terns find an ideal nesting site among the clam shells," says Dr. George Lowery, Jr., professor of zoology at Louisiana State University and director of LSU's Museum of Natural Science. "They simply scratch out a small depression amid the shells, turn around a few times, and lay one to four speckled, cream-colored eggs. The birds and their eggs are perfectly camouflaged among the shells."

Gas plant employees welcome the migration each spring and do what they can to make the visitors feel at home. Burly oil workers spend hours locating the nests and marking them with stakes so as to warn away visitors. Vegetation goes uncut around the plant. Paths and walkways are re-routed to bypass concentrations of nests. Eggs laid in roadways are carefully moved to other nests where foster mothers readily take them under their wing. Young chicks wandering onto roads are shoed back to the safety of the plant.

In September, as the days get shorter and the avian barometer indicates good flying weather, the terns prepare for their journey abroad. And when the time is right, birds fill the fall sky as they head south to their wintering grounds across the Gulf.

Commenting on the phenomenon, a New Orleans outdoor writer says, "If there is any environmental conflict there, someone forgot to tell the terns about it, not to nest, that is, in the petroleum complex where they are bringing up their young by the thousands."

JOE TUCKER



Why Drill Offshore?

WHY DRILL OFFSHORE for oil and gas? There's only one answer to this question, but it's a good one: Because that's where the oil and gas are.

There's no way around it. To provide essential energy for America, the oil industry must go where deposits of oil and gas are likely to exist and look for them there. Part of this search is being directed toward the remaining deposits of petroleum on land. For example, Humble is searching in Arizona and West Virginia. And part is devoted toward uncovering extremely deep deposits, such as Humble has found in West Texas; or in remote areas, such as the Arctic. But the most promising area for large new supplies of oil and gas lies under the waters of America's continental shelf.

What's a Continental Shelf?

Continental shelves are submerged ledges of the continents they adjoin. From the water's edge, they extend 10 to 200 miles outward, deepening gradually to perhaps 1,000 feet. At that point, these shoulders of land angle steeply down to form broad slopes reaching into the abyss of the deep sea floor. Of the many resources contained in the continental margins, one of the most important is petroleum.

The American oil industry's involvement with the oceans is a combination of the new and the old. The basic concept of hunting for oil in water-covered areas is almost as old as the industry itself. (An early patent for an "improved submarine drilling apparatus" dates back to 1869, and the first offshore oil field to 1894 in California.) Yet, the first mobile rig capable of drilling in 20 feet of water was not built until 1949. Much of the industry's deepwater drilling technology has



and jacks itself up and out of the water.

In the Santa Barbara Channel, Humble's leases ranged in water depth from 600 feet down to 1,400 feet, so the company chose to use a semisubmersible rig. This type of rig floats over the wellsite supported by huge buoyant chambers which are ballasted with seawater and partially submerged. Like an iceberg, the vessel has two-thirds of its bulk underwater, giving it great stability. The main deck, with its derrick, clears the water by 40 feet.

Eight giant anchors weighing 20,000 pounds apiece hold the rig in place, with wrist-thick cables able to hold more than 400,000 pounds. An acoustic indicator enables the rig to position itself over the bore hole. This device, set on the seabottom, transmits signals to four hydrophones attached to the vessel's hull. A computer measures the travel time of each signal to each hydrophone and calculates the vessel's position with respect to the transmitter. Deviation from vertical can be corrected with the aid of giant winches which take up or ease tension on the anchor cables. The rig is so stable that it seldom rises or falls more than one foot, and rarely moves more than a few feet off of vertical.

To contain pressures which might be encountered while drilling the well, a blow-out preventer is placed at the wellhead on the sea floor. This device is a system of mechanical clamps for closing the hole quickly and tightly. On offshore wells, the BOP stack, as it is called, may weigh 100,000 pounds, stand 25 feet high, and be eight feet in diameter. It may cost half-a-million dollars. Controlled hydraulically from the rig floor, it can shut off the well within seconds, should trouble develop.

ging, well cementing, and well completion. Fleets of workboats and helicopters transport people, equipment, and supplies.

Marine drilling is expensive. A semi-submersible rig may cost from \$20 million to \$50 million to build, and \$20,000 to \$40,000 a day to operate.

How Do They Get the Oil Out?

Once a field is discovered and its dimensions outlined, it must be developed by drilling the number of additional wells necessary to drain the oil and gas efficiently. The process may take from five to seven years.

The mobile drilling rig, having made the initial discovery, departs for new wildcat locations. In its place, petroleum engineers install a permanent platform. It is used first as a base from which to drill 20 to 60 field wells, and later to support the equipment through which the wells produce.

Humble has installed 85 platforms in the Gulf of Mexico. The largest stands in 210 feet of water 70 miles offshore. It rises as high as a 28-story building and weighs 1,660 tons. To install it, Humble towed the structure of welded steel pipe to the wellsite on a barge. In the water, the structure's buoyancy was gradually decreased by allowing water to enter the hollow legs, so that it slowly sank to the ocean floor. Engineers then anchored the platform in place by inserting steel pilings through the legs and driving them several hundred feet into the seabed. A deck section was welded on top, and derrick, drilling gear, and living quarters for 34 men put in place.

From the platform, wells are drilled at a slant so that each taps a different area of the producing formation. Directional drilling enables a single plat-

to the surface, where a system of valves called a Christmas tree diverts it into flowlines. After preliminary processing, oil and gas then move through pipelines to shore facilities leading eventually to refineries.

Pipelines to shore are installed with the aid of pipelaying barges. As welders join 40-foot sections of pipe, the barge pulls itself forward on its anchor lines. The growing pipeline skids off the rear, sliding down a buoyant support called a stinger. A hydraulic trenching machine then buries the pipeline in the ocean floor so it won't snag fishermen's nets or ships' anchors.

Can They Keep it Clean?

In all its operations, Humble places primary emphasis on safety and dependability in order to avoid possible environmental damage. The rule is, "No pollution—not any."

Equipment and structures used offshore are the product of intensive research to ensure that the effect of water depths, tides, currents, waves, storm winds, and other elemental forces will not result in environmental problems. Rigs operating in California waters have ridden out storms with winds of 120 mph and waves up to 65 feet in height. In the Gulf, Humble platforms have endured hurricane winds of 140 mph and 60-foot waves without leaking oil. Platforms operating in Alaska's Cook Inlet regularly withstand ice floes six feet thick which are carried in and out of the inlet by 30-foot tides and swift currents.

Producing wells are further protected by downhole safety valves. These are installed within the well itself. Self-activated, they are designed to shut down production immediately in case

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serious as this was, investigations by 40 professional scientists found no apparent lasting damage to marine life or to the beaches a year later.

In keeping with the precautions which have enabled Humble to achieve a good record of environmental protection, the company has set up the machinery to clean up a spill if an accident should occur. Humble has helped to organize cooperatives in the ports and harbors where it has docks and terminals. These organizations provide men and equipment on a standby basis to respond immediately to an oil spill emergency.

have grown impressively.

Humble shares the public's concern for protecting the environment. The company believes oil and gas can be produced from marine wells without damage to the ecology, and has shown that it can be done.

Do We Really Need the Oil?

Since 1859, American oilmen have drilled more than two million wells in search of oil and gas to provide energy — the go of things — for the United States. Their success has helped our country attain a standard of living to which most of the world aspires.

ergy Americans consume. And experts point out that for the next 30 years at least, we will have to depend on fossil fuels such as oil and gas for over half of our energy needs. It is already too late, they say, for any alternatives. There are no technological magic wands which will create a substitute for oil and gas to any significant degree during the next 30 years.

The outer continental shelves offer a needed solution for mitigating our country's energy shortage within an appropriate time frame. Yet, government policies have restricted or halted exploration and development in this key area. The nation cannot continue to ignore these resources without suffering severe consequences, both physical and economic.

Testifying before a Congressional committee in April of 1972, Dr. Thomas D. Barrow, then Humble's president, said, "For the near future, the U. S. has no choice but to continue to rely heavily on oil and gas for its energy requirements."

Dr. Barrow recommended the adoption of a balanced marine resources management system structured to respond to the many-sided needs of society and nature. He urged that more lease sales of marine tracts should be held, and much larger amounts of acreage offered.

"Undeveloped reserves would not give a position of strength in dealing with the other producing countries simply because the reserves could not be developed and made available in time to help if foreign supplies were interrupted," Dr. Barrow stated. "It would take anywhere from three to five years, depending upon the location, to develop a new field and achieve a significant volume of production even after the field has been discovered."



Oil has been produced in Florida's Collier County since 1943 without damage to the Everglades.

Florida Thinks the Unthinkable

Florida ponders the problem of achieving new direction and better balance in its economy.

THINKING THE UNTHINKABLE, speaking the unspeakable, Jerry Thomas, president of the Florida Senate and businessman from the opulent Palm Beach district, recently called for a halt to his state's industrial and population growth.

"Florida no longer desires to be known as the fastest-growing state," he told fellow Floridians. "We have our hands full now taking care of more than 6,800,000 residents."

A few years back, instant death would have been the least punishment suggested by Florida's boosters for such a heretic. But in 1972 many of Florida's influential voices in politics and business spoke up in support of Senator Thomas. Governor Reubin Askew himself put in a carefully tempered word of agreement:

"I think we're at a point where our growth must be selective," Askew said. "It is incumbent on us to limit our development to clean industry. I wouldn't be consoled by tremendous population growth if it diluted our way of life."

The Legislature, while not exactly rallying about the Senate's president to the last man, nevertheless whacked 40 per cent from the state's promotional funds spent to lure new industry. The Orlando Chamber of Commerce, accustomed to spending \$175,000 annually on promotion, voted against spending another nickel. Several Florida cities dismissed their industrial promoters. An editor from Sarasota publicly asked a question clearly meant to be rhetorical:

"How many people can comfortably live in the Tampa Bay area?" he asked in his newspaper. "Florida's resources are not inexhaustible . . . The simple availability of water places a

UNTHINKABLE, speakable, Jerry Thomas, of the Florida Senate and from the opulent Palm Beach recently called for a halt to the state's industrial and popu-

l longer desires to be the fastest-growing state,"

Floridians. "We have been now taking care of 100,000 residents."

Back, instant death in the least punishment Florida's boosters for. But in 1972 many of the influential voices in politics spoke up in support of change. Governor Reubin Askew put in a carefully worded agreement:

"We are at a point where our growth is selective," Askew said. "It is on us to limit our development of the tourism industry. I wouldn't want a tremendous population to dilute our way of life." The future, while not exactly bright, the Senate's president said, nevertheless whacked the state's promoters from the state's promoters to lure new industry. The Orlando Chamber of Commerce is accustomed to spending a lot of money on promotion, spending another nickel. The cities dismissed their boosters. An editor from the Times asked a question to be rhetorical:

"Can people can comfortably live in the Tampa Bay area?" he asked the newspaper. "Florida's resources are inexhaustible . . . The quality of water places a



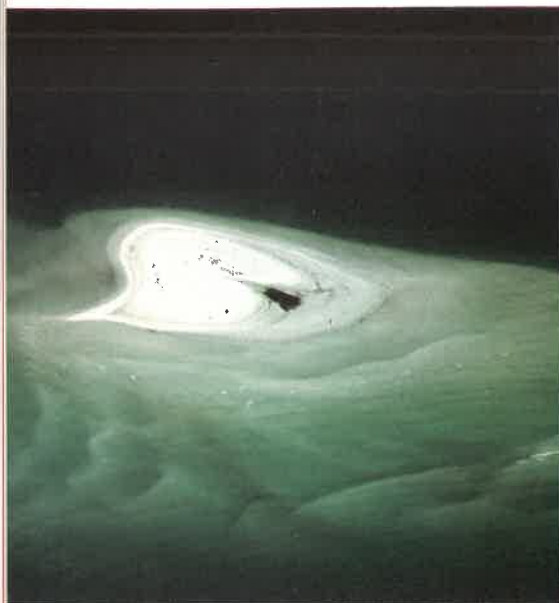
With each passing year, more of Florida's vital shoreline is permanently altered by uncontrolled development.



age into the Atlantic at Miami Beach is only one of 11 similar horror stories along the state's beaches. It's a problem which Nat Reed feels is of paramount importance. Once anathema to the state's runaway booster enthusiasts when he was a zealous chairman of the state Air and Water Pollution Control, Reed is now Assistant Secretary for Fish and Wildlife and Parks in the U. S. Department of the Interior. He recently asked Florida's Chamber of Commerce to adjust its commercial priorities to meet the population crisis. "If I could assign you but one mission . . . for the coming decade," Reed told them, "I would beg you to pick water pollution as your target . . . more specifically the goal of ending untreated or insufficiently treated human waste from entering our lakes, our estuaries and rivers or oceans."

And still the crowds pour in, making Florida the second-ranking tourist state in the Union. With only about one-third the resident population and the area of California, Florida absorbs the annual visits of almost twice as many tourists. True, they leave behind a golden carpet of about \$6 billion, three times the California take; but underground water reservoirs are balking at taking on one more visitor, no matter how fat his wallet.

On an aerial survey of the Lower East Coast, undertaken as research for a book I was writing about Florida's ecological health, I was appalled to see an unbroken northward procession of high-rise buildings crammed so close to the shoreline that winter storms threaten to carry them away. From just south of Miami, the unbroken parade of buildings, gleaming white in the semitropical sun, marches



A mangrove swamp begins when tides and currents build up a reef of sand or shell.



Fertilized by birds, the island acquires stabilizing plants and mangroves get started, slowly enlarging the island's surface.



From the air, the overcrowding is alarming.

But the pilot banked away from the coast and we flew up the central ridge. There, Florida's development problem showed a different face. For miles we flew over wilderness swamp. On the Upper West Coast, the plane flew low over watery fastnesses where no man has ever trod, not even an Indian. Whole counties flashed by with no more population in sight than a few grocery shoppers and courthouse litigants at the county seat.

High density on the lower coasts is blamed for virtually all the state's population troubles by Dr. Shaw Grigsby, sociologist at the University of Florida at Gainesville. "There is plenty of space for a better life," Dr. Grigsby says. "But how can an economy or a society be healthy with 1.25 million people living in Miami's Dade County and only 2,892 in Lafayette County?"

Dr. Grigsby points out that since the 1960 census, Lafayette County grew in population by only three persons. "There you have the heart of Florida's population problem," he says. "The dynamic youngsters are moving from the Lafayette Counties to the Dade Counties, looking for jobs but aggravating the urban crisis. They leave behind the old folks, the ailing and the retired."

The state Chamber of Commerce, issuing a report on the economic prospects for Florida during the Seventies, stated that, "... haphazard expansion ... has damaged Florida."

Of Florida's 67 counties, 50 have virtually no industry. Even where jobs exist, they are in the three lowest paying occupations. More than half the

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Driving from Munson to Berrydale,
through the Blackwater River State
Forest, I was startled to see a bobcat
stop in midhighway and study me
coolly, with no apparent fear. His curi-
osity was understandable, for I had
scarcely seen another human being
that morning except when passing
through the rare small town. The
previous evening I had glimpsed a
fleeing black bear, one of about 1,000
still living in North Florida.

In that northern tier of counties
along the Panhandle, immense tracts
of forest belonging to pulp and saw-
mills provide a delightful and seem-
ingly endless sylvan landscape. But
forests can support only meager
populations.

In Santa Rosa County, where I saw
the nonchalant bobcat, so few manu-
facturing jobs exist that statisticians
usually include them with neighboring
Escambia County. It and surrounding
counties are hardly industrialized,
much less overdeveloped. Here, people
would welcome a piece of the action
going on in the south.

They may soon get it.

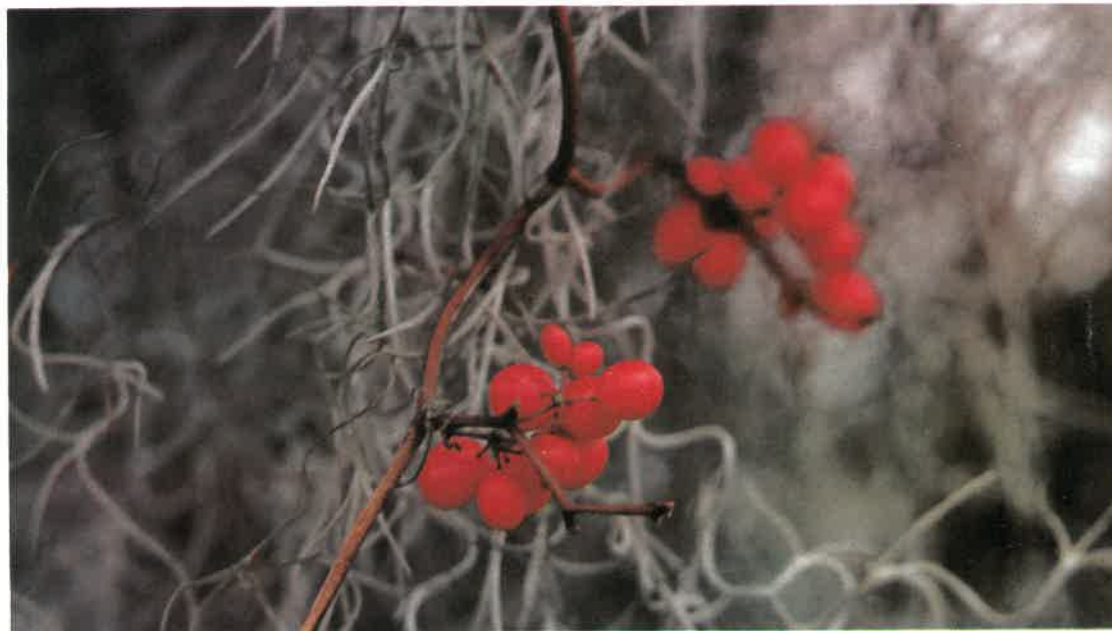
During my visit, Humble Oil & Re-
fining Company announced the dis-
covery of a new oilfield at Blackjack
Creek, a few miles southeast of the
rich Jay field and 15 miles north of
the county seat at Milton. Excitement
ran high in the town's shady streets.

Speaking to Milton's Kiwanis Club,
J. D. Bullock, assistant manager of the
Production Department of Humble's
Southeastern Division, explained what
the new oil industry would mean to
the area.

He forecast the creation of up to
300 permanent jobs. Yet, Bullock
pointed out "More people do not nec-



In a freshwater swamp, a water bird looks for a meal.



Red berries add color to masses of gray Spanish moss.





Florida's leaders are concerned that overdevelopment of shoreline areas (upper and lower left) will damage the state's environmental assets and strain its natural resources.



at overdevelopment of shoreline
damage the state's environmental
ces.

which \$800,000 would be returned to the county. Royalty payments would pour another \$14 million into the local economy.

The state's foremost geologist, Robert Vernon, called the Jay field the most exciting find of the last 20 years in the conterminous states. At a conference of some of the state government's foremost planners, called for my benefit, Vernon dismissed fears of environmentalists that oil exploration and production programs could damage the remaining wilderness areas.

"It's just a matter of good housekeeping," he told me.

Dr. Earle Frye, director of the Florida Game and Fresh Water Fish Commission, is a concerned expert who has visited all over the U. S. and watched oil being taken from beneath game preserves, breeding grounds, and recreation areas without damage.

"Oil can be handled clean as a whistle," he said. He explained that oil leases in wildlife management areas contain many safeguards. Complete specifications are written out for control of petroleum operations without disturbing the game or its hunters, or the campers and fishermen who use the area.

Dr. Frye pointed out besides that money from oil leases in such areas enable the Game and Fish Commission to buy more land elsewhere in Florida for new game and wildlife management preserves.

An editorial in the Fort Myers, Fla., News-Press put the issue a little more bluntly. Said the editor:

"Before giving way to hysterics those raising all this hullabaloo might have reflected upon one simple but significant fact that all of them know



Good housekeeping has enabled Humble to find and develop important oil reserves in Florida without damage to the environment. Each well increases the state's tax base by \$500,000, while requiring little of community services.

defender of the environment at Welder Refuge, grinned as he said the wells merely made the refuge greener — at least at budget-planning time. He and I saw a rare peregrine falcon knock a female spoonbill duck from

southwest counties since 1943, two pipelines laid across Conservation Districts in the Everglades have been in operation since 1963 with no damage to the environment. Some noted that an oilfield has been in production in



Fingerprints for Oil

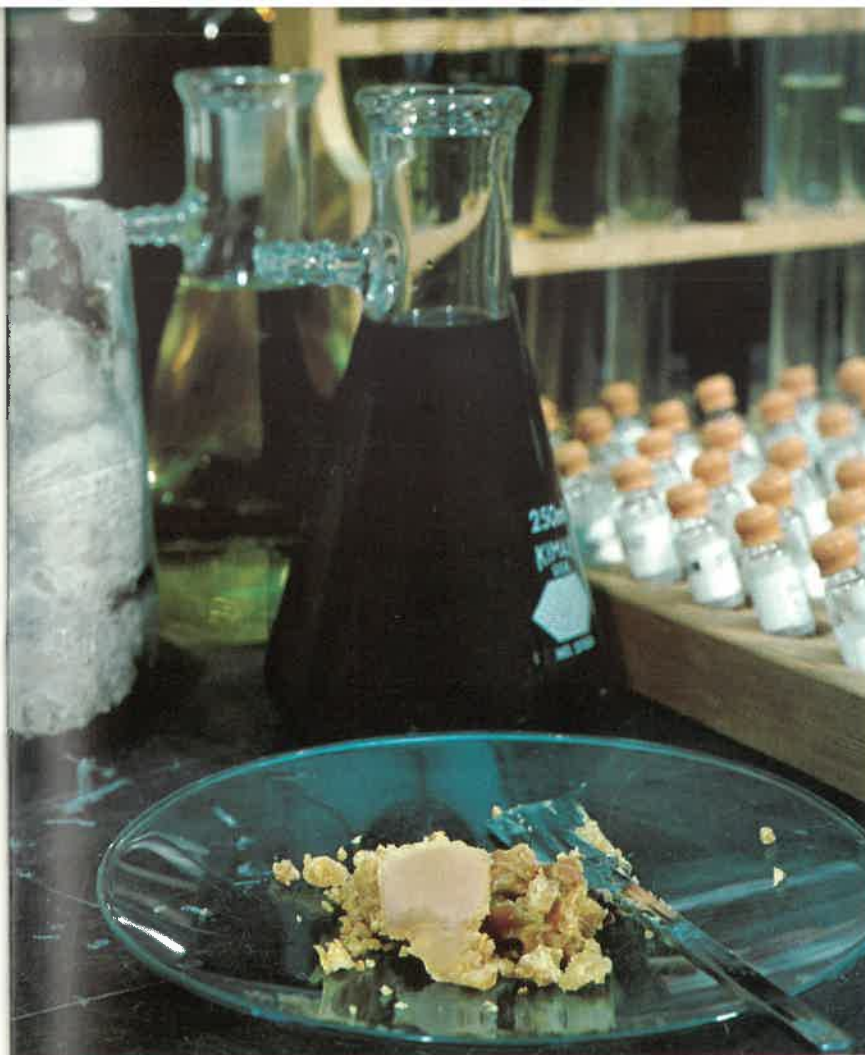
Two Humble research affiliates have learned how to “fingerprint” crude oil so as to identify its origin.

WHILE DRIFTING ACROSS the Atlantic in a reed boat named *Ra*, ethnologist Thor Heyerdahl passed through an area where he found “blobs of solidified oil” floating on the sea’s surface. Assuming they “must be the waste from a tanker,” Heyerdahl looked for the culprit, but “there was no ship in sight.”

Heyerdahl’s assumption was understandable, but he could have been wrong. Some of the oil found on the sea does come from tankers. But the “soft, asphalt-like clumps” he saw



Mines, for example, began collecting and analyzing specimens of crude oil more than 50 years ago. Oil companies likewise have been assembling “libraries” of crude oil samples from all over the world. A collection owned by Esso Production Research Company, a Humble affiliate in Texas, requires an entire building to house. Row on row of sealed quart bottles sit in darkness on steel racks. Their contents include water-clear distillates from the Middle East, brown syrups from California, black inks from



Fingerprinting is possible because no two crude oils are alike; thick wax in the dish is from a Utah well.

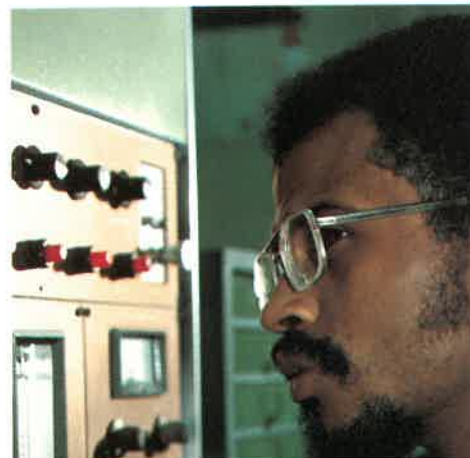


Vials, above, contain fractions of crude oil separated for gas chromatography. Tubes, below, contain carbon dioxide generated by oxidation during the identification process.

mple, began collecting specimens of crude oil years ago. Oil companies have been assembling crude oil samples from around the world. A collection owned by Exxon Research Company, an affiliate in Texas, requires a new building to house the samples. The building is filled with sealed quart bottles sitting on steel racks. Their contents—water-clear distillates from the East, brown syrups from the Gulf, black inks from

organic residue of ancient plant and animal life," he says. "Consider all the mathematical variations and combinations of hydrogen and carbon which are possible with these basic building blocks of petroleum. The number of combinations is almost inconceivable. Makes the problem of identification a real can of worms."

Now, scientific teams with Humble Oil & Refining Company affiliates believe they have learned how to untangle those worms. And if their methods prove reliable, the U. S. Environmental Protection Agency

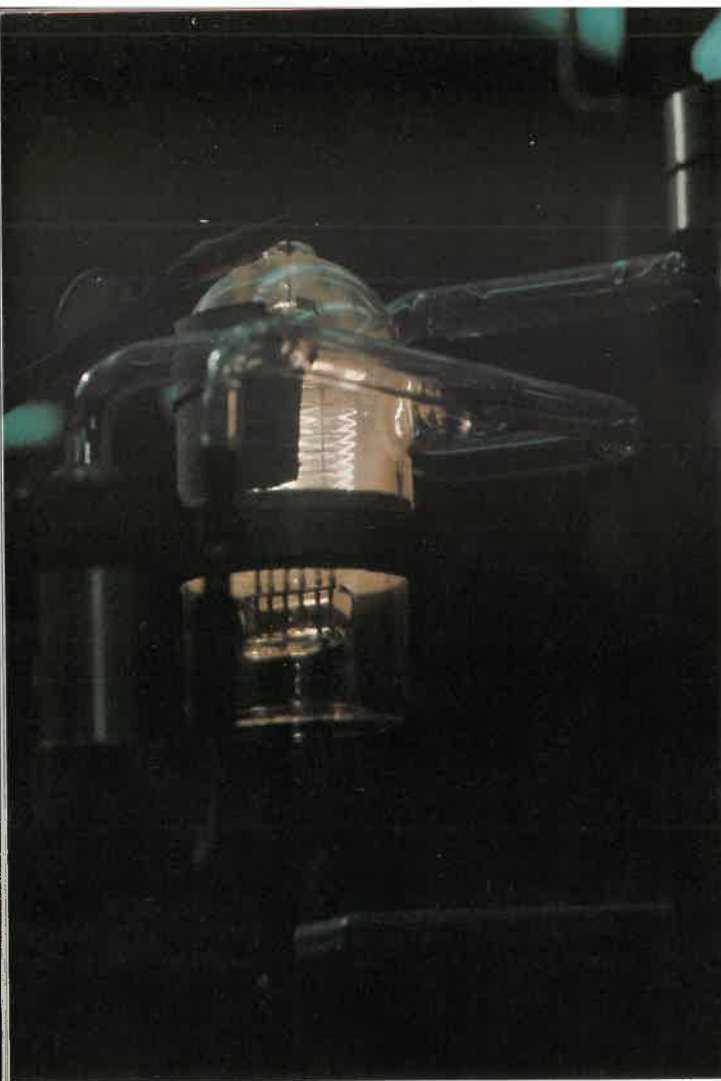


used it to differentiate between two oils coming from different producing zones in a single well, and between oils coming from two different wells in a single field.

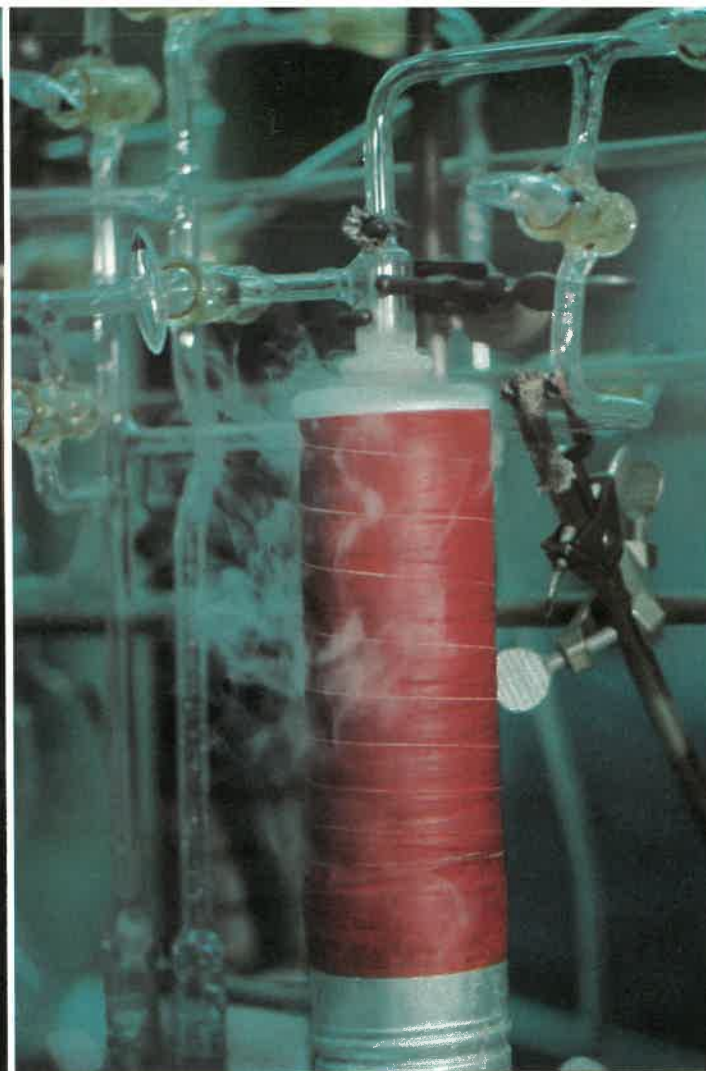
At ER&E, Martin Lieberman and Leonard Berkowitz saw the need to examine the changes which occur in oil when it is exposed to the elements.

"After a week of floating on the ocean, oil is a much different substance from that emerging from an oil well," Lieberman observes.

So, Lieberman and Berkowitz, working under an EPA contract, proposed to



A vacuum gauge measures ultra-low pressures in mass spectrometry.



A liquid nitrogen trap condenses and removes impurities from carbon dioxide samples.



a daily dosage of ultraviolet "sunshine," stirred by paddles imitating wave action, and ruffled by wind from an electric fan, the laboratory seas were ready for a simulated oil spill. Each tank received a different kind of oil—assorted crudes and fuels.

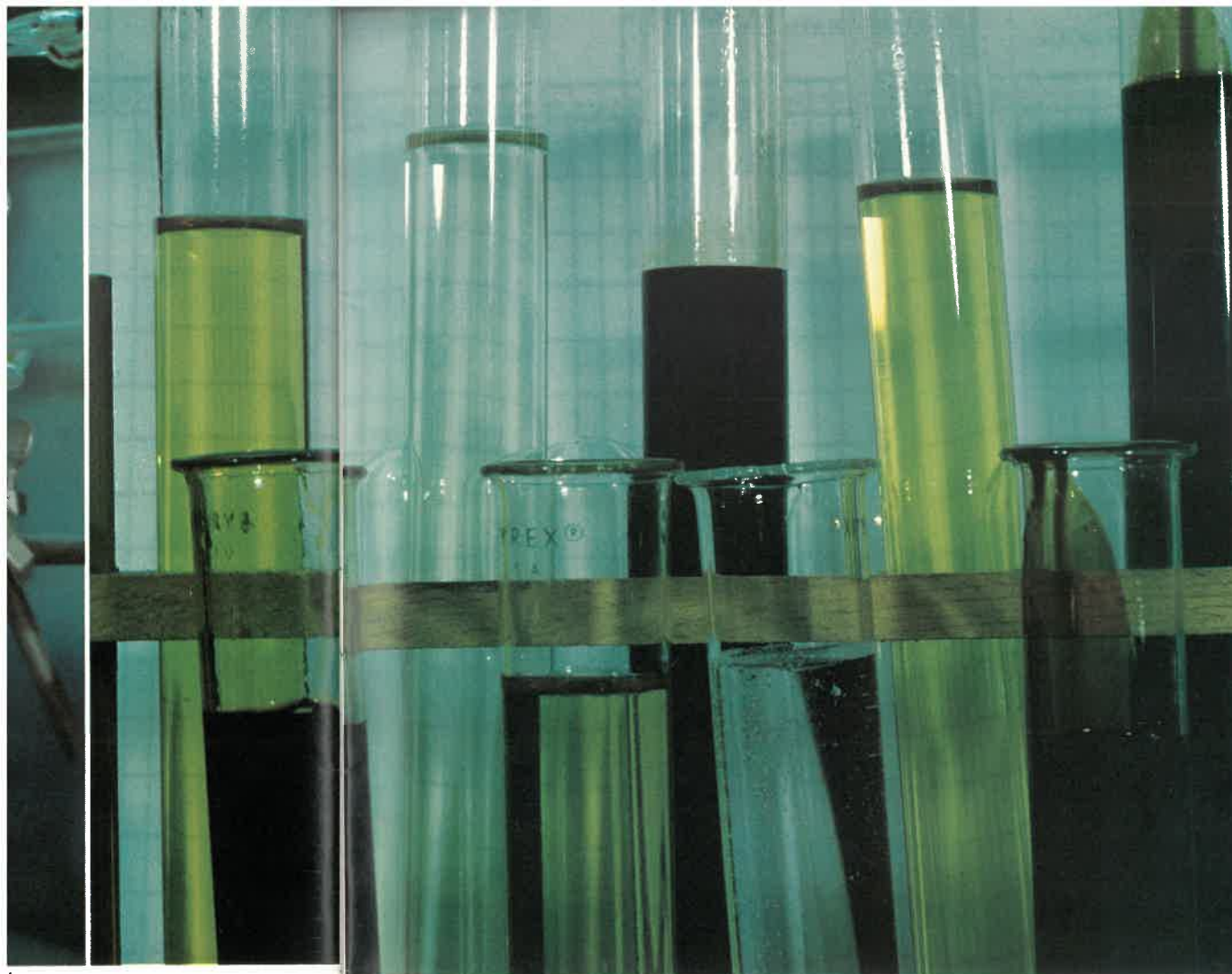
From the moment the oil spread into a slick onto the surface of the water, changes began to occur, Lieberman recalls. The slick created two broad interfaces. At the air-oil interface, the light hydrocarbons immediately began to evaporate into the air.



Recently, the Houston-based team which had developed the same general type of identification procedure for Humble had its chance.

Oceanographers working with Texas A&M University brought in 10 samples collected in the Gulf of Mexico some 50 miles off the Mexican coast just south of Brownsville, Texas. Some had been scooped from the water's surface; others had been dredged from the sea floor.

To EPR's David Johnson, who helped Bruce Koons with the analysis,



Test tubes contain samples of distilled oils, such as diesel and fuel oil.



A Soxhlet Extractor isolates oily components from beach tar samples.

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David Johnson, who
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One sample went into the maw of an electronic sorcerer called a gas chromatograph. In a matter of minutes, it had sorted out the compounds in each sample according to their boiling points and produced a graphic report called a chromatogram. Comparing the relative loss of gaseous and volatile liquid compounds, Johnson noted that those taken from the sea floor were much older than those recovered at the surface.

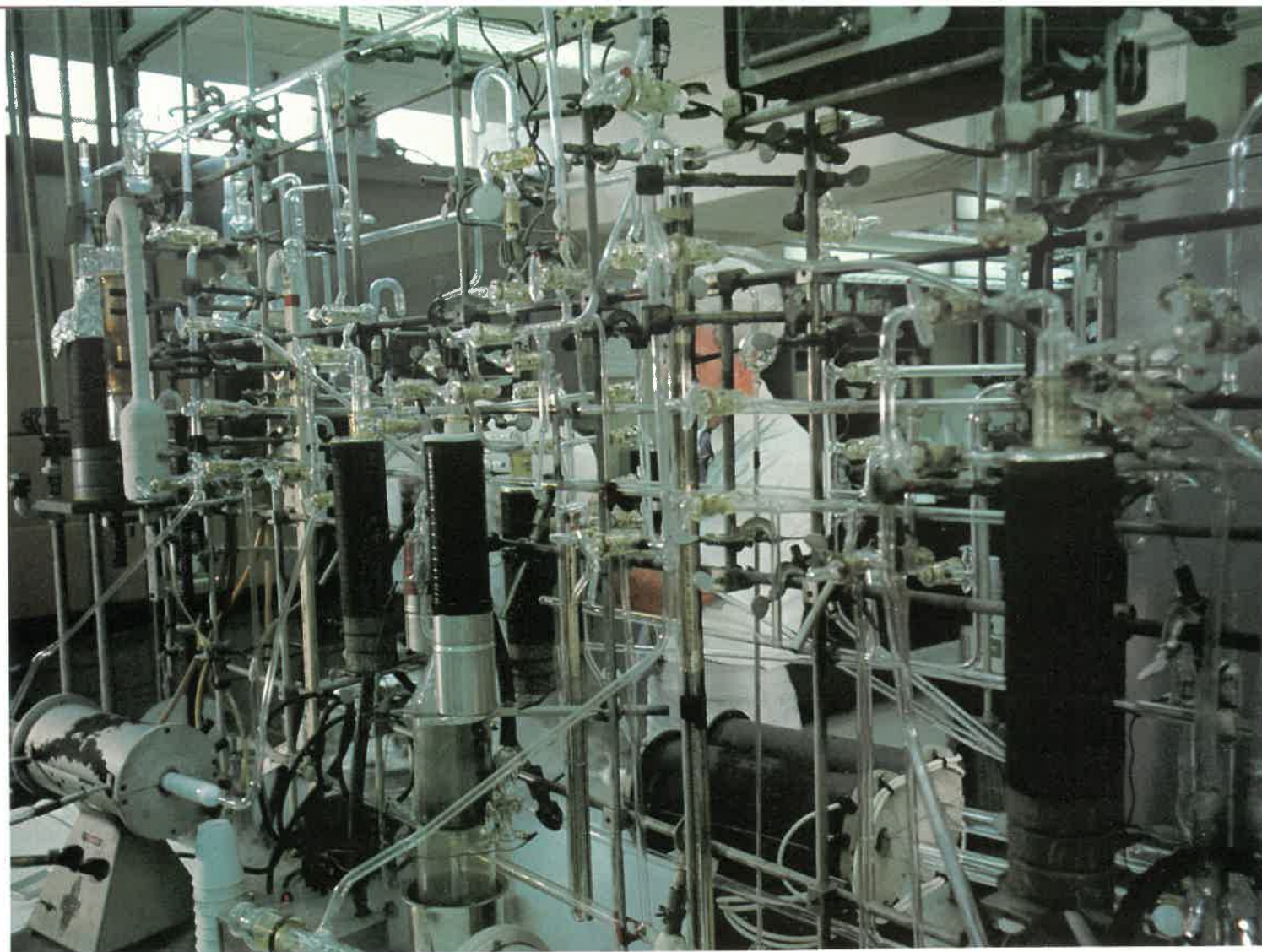
Johnson then put the mass spectrometer to work. It quickly counted



have been leaking oil into the Gulf for centuries," he says.

Berkowitz believes that more tests of this type are needed to verify the system developed for EPA. "We need to field-test samples of a variety of oil types from several locations," he says. "That's the only way we'll be able to tell how good our system is." He and fellow scientists agree that as yet they are unable to say with absolute certainty that they can identify any oil, at any time, under any circumstance.

Furthermore, the job of cataloging



Jim Mercer starts a tar sample through a carbon isotope preparation procedure.

ing to better ways to enforce the Water Quality Improvement Act of 1970. The U. S. Coast Guard is experimenting with sensing buoys to be dropped into water-borne slicks. The American Society for Testing Materials is doing research in rapid sampling methods. Several organizations are attempting to develop remote sensing devices for use in aircraft and orbiting satellites which can identify such phenomena as sea conditions and wave heights. Actual spill data are



the tar showed 0.1 per cent sulfur content, about 15 times lower than the crude processed at Jersey's Port Dickson refinery. Additional testing proved that the gobs of tar were coming from oilfields in Sumatra, a hundred miles across the Straits of Malacca.

With U. S. consumption of oil expected to double by 1985, and a shrinking domestic supply, shipments by tanker from foreign sources could well account for half of the nation's



New Boom Sweeps Clean

WHEN REESE NORTON heard of the great oil blowout of 1969, he couldn't believe it at first. He drove 80 miles from his office in Inglewood to Santa Barbara, parked on Plaza del Mar, and walked down to the beach. Then, he believed . . .

What a *mess*, Norton thought. Chocolate-colored crude oil covered the waters of the picturesque marina, staining everything it touched: pleasure craft, breakwater, sandy shore. Emergency crews scattered straw to absorb the oil. Scores of newsmen reported gruesome details to a worldwide audience.

The dismal scene struck Norton to his soul. His life was oil. He was born in a tiny cottage on a hill above a California refinery. His father, and his grandfather before him, were oilmen. For 37 adult years, Norton had explored for oil, found it, and produced it—in pride. In the company where

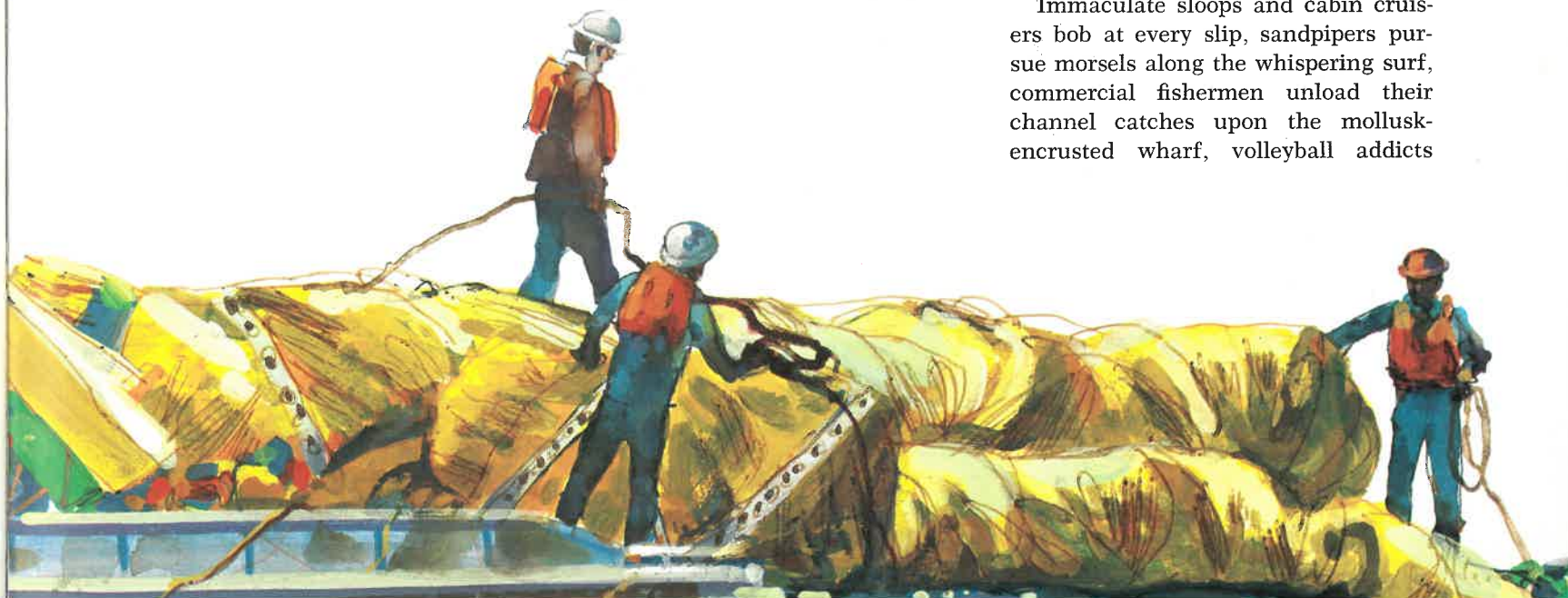
he worked as a field supervisor, he became recognized as a fighter against pollution, and an expert in drawing up contingency plans for coping with accidents. When the oil industry banded together to curtail spillage into Los Angeles' Ballona Creek, Norton took the lead, knocked heads together, and insisted that every spill, however minor, in every tiny tributary, be identified and corrected.

Now *this*, at Santa Barbara.

"I remember saying to myself at the time, 'It shouldn't happen, and if by some freak circumstance it happens, there should be some way to contain it and pick it up before it comes ashore, and God forbid, if it threatens a coast, we should have better defense weapons than straw and pitchforks.'"

Today, Reese Norton's office is in Santa Barbara, in the Marine Center Building overlooking the smallcraft harbor, the Spanish-style town and the creamy strands that make Santa Barbara "The Riviera of the West."

Immaculate sloops and cabin cruisers bob at every slip, sandpipers pursue morsels along the whispering surf, commercial fishermen unload their channel catches upon the mollusk-encrusted wharf, volleyball addicts



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joust on sandy shoreside courts, bikini beauties laze at Los Baños del Mar, and tourists from Iowa cast for corbina in the combers where Cabrillo landed in 1542.

"Santa Barbara's environment is back to normal," Norton says. "My job, plain and simple, is to help keep it that way."

Norton is executive vice president of Clean Seas, Inc., an independent, nonprofit firm founded and supported by 15 major oil companies, Humble among them, operating along the south central coast of California. The exclusive role of Clean Seas is to provide a capability for quickly containing and cleaning up oil spills, regardless of source, along 250 miles of coast from Point Dume on the south to Cape San Martin on the north. In Clean Seas' region of responsibility are 16 oil platforms or islands, and 12 tanker terminals, as well as considerable transient tanker ship traffic.

Two years after formation, Clean Seas comprises a reaction force of proven brainpower and formidable equipment. In Clean Seas' arsenal is a boom that can capture and hold oil in the open sea, in strong currents, high winds and heavy seas. In effect,

Clean Seas is maturing as the oil-spill equivalent of a fire department, with Norton as the fulltime chief.

"Clean Seas is the expert specialist in its field," Norton says. "We can quickly bring together all the skills, manpower and equipment available anywhere in our area. This amounts to a massive capability—far greater than any single company could muster in a time of trouble."

Before the dark days of winter 1969, Norton believes, the oil industry was lulled by its own record—in nearly 70 years of drilling in California waters, there had not been an offshore oil well blowout of any consequence. To that time, 500 exploratory holes had been drilled from fixed or floating structures, 443 offshore oil wells had been completed, and over 1.3 billion barrels of oil produced—without significant oil spillage or water pollution.

"What problems existed were in the shipping centers," Norton explains. "The spills that occurred in loading and offloading petroleum from ships were cleaned up by third-party contractors." Norton points out that in places such as San Diego, San Francisco, and Los Angeles, various contractors developed considerable know-how in dealing with minor spills in sheltered waters.

"But after Santa Barbara," Norton

says, "our pledge was to combat spills offshore, if need be, out in the channel wide open to the elements—and that was a whole new ball game."

To brainstorm answers, Norton recruited some of the brightest minds of the California oil industry. Organized into task force teams, they have developed the means for:

- Maintaining a detailed and current inventory of every piece of cleanup and containment available. This includes gear of the oil industry, independent contractors, and government agencies.
- Encouraging development and production of new and more effective equipment and methods, where technology appears to lag behind potential threats.
- Determining the need for and availability of manpower which can be called upon in emergencies.
- Maintaining a command post on the Santa Barbara jetty which is completely equipped with the most modern of radio communications and banks of telephones.
- Most important, keeping an up-to-date and comprehensive contingency plan for coping with spills or blowouts, large or small.



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“We can’t wait for an alarm, and then all of a sudden start scrambling for help,” Norton says. He wants Clean Seas prepared for any important eventuality, including the staging and deployment of equipment, wildlife rescue, procurement of supplies, feeding and housing of workers, transportation needs, and aerial surveillance of a spill. “Name it and we’ve got it in our contingency plan,” Norton says. He observes that Clean Seas can be called into action by anyone that needs help—a member company, a nonmember company, or a government agency.

Clean Seas’ budget is shared by member companies in proportion to their offshore activities. Most of the money goes to acquire equipment or supplies, and to perfect more effective ways of combatting spills.

In improving their ability to combat spills, Norton encountered a troublesome problem early in the organization’s life: the lack of a really good boom which would contain oil where there was noticeable current or wave action. “People have made booms out of everything you can think of,” Norton says: logs and chains, aluminum and canvas, plywood and oil drums. But they all had one shortcoming. They

wouldn’t do the job Clean Seas wanted done. Where there was current, the boom would tilt, allowing oil to flow underneath; and when there were waves, oil would splash over the boom and escape. And battered by wind and waves of moderate severity, a boom might disintegrate.

It fell to a task force of engineers of Humble Oil & Refining Company, and its affiliate, Esso Production Research Company, to create an ocean-going boom of unprecedented strength and effectiveness. And this they proceeded to do.

The goals of the task force were ambitious: they wanted a boom that would survive 20-foot waves, two-knot currents, and 60-knot winds. These values were drawn from studies that showed that the Santa Barbara Channel, 99 per cent of the time, had waves of 12 feet or less, currents of one knot or less, and winds of 40 knots or less.

Another goal was a system that could be loaded onto trucks for rapid highway transportation, could be assembled readily by unskilled workers, and could be launched swiftly from either ship or shore.

Working to these specifications, the task force devised what they called the Bottom Tension (B-T) Boom.

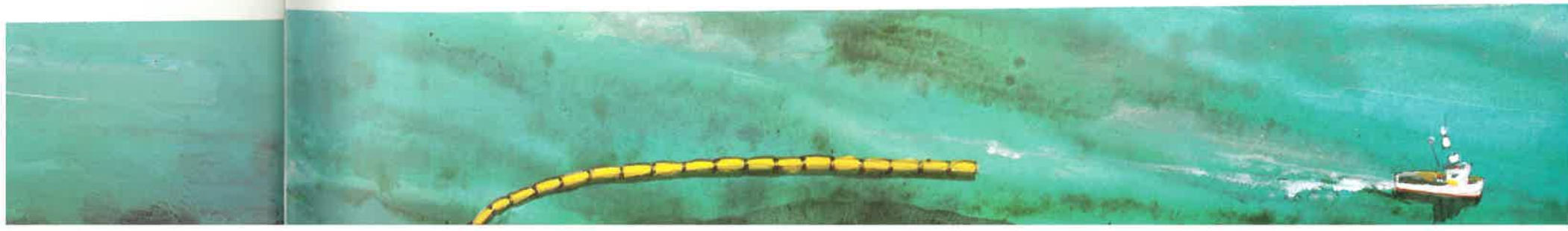
Essentially, the B-T Boom is a semi-

submerged barrier formed by a tough, flexible laminated belting eight feet wide, similar to those used ashore for conveyor systems carrying gravel or ore. This is suspended from polyethylene buoyancy units four feet in diameter and 13 feet long. The units are joined by a lattice of stout polypropylene rope, and at the bottom of this net, the wrist-thick steel tow cable is attached. It all fastens together with common nuts and bolts.

Says Jerry Cunningham, one of the Humble engineers, “The weight of the heavy tow line at the bottom of the curtain keeps it under tension and upright.” Thus, the name: Bottom Tension Boom.

In tests, untrained workmen assembled the boom from the deck of a workboat in six hours. On the beach, they put it together in less than five hours, and launched it through four-to-six-foot surf with breakers rising occasionally to eight feet.

Towed to natural oil seeps in the Santa Barbara Channel, the B-T Boom prototype surrounded and held slicks in waves six to eight feet high, with a 1¼-knot current and 20 knot winds. Later, the boom was recovered with-



out damage through a pounding surf.

Reese Norton and Clean Seas were convinced. The first 500 feet of B-T Boom went to Clean Seas, and an order was placed for 500 feet more. Moreover, the San Francisco counterpart of Clean Seas, Clean Bay, Inc., says it wants 1,000 feet, too.

Nor is the B-T Boom the only weapon in Clean Seas' arsenal. A lightweight, high-volume skimmer system sucks up the oil caught by the B-T Boom. Additionally, Clean Seas has perfected an Oil Recovery System consisting of a skimmer boat and towed booms. The system can clear a swath 200 feet wide through waves as high as three or four feet. On call by Clean Seas for use in calm waters are a score of skimmers and four miles of light booms.

"And we have on standby," Norton says, "all of the smaller equipment that eventually cleaned up Santa Barbara in 1969." Looking for increased oil activity in the channel, Norton believes he should have at least 3,000 feet of B-T Boom ready for deployment in the area.

Norton is first to agree with critics who say that Clean Seas is like a fire department that has never fought a fire. Thus far, Clean Seas has not been

called out to sweep up a spill.

Norton, of course, hopes the emergency never arises. "But that doesn't mean we are unproven," he insists. "Our training programs have been extensive, and obviously, our capabilities have increased tremendously over what was on hand three years ago."

Qualified approval of the progress of Clean Seas and similar organizations comes from officials most interested in protecting California's coastal environment.

In a speech in May, 1972, at Santa Barbara, Dr. Vincent E. McKelvey, director of the U. S. Geological Survey, called Clean Seas a commendable example in a nationwide network of organizations whose sole purpose is containment and elimination of oil spills.

Santa Barbara Harbormaster Don Sathre was on duty during the 1969 spill. Says Sathre, "Clean Seas is certainly a step in the right direction. Of course, there hasn't been a crisis since Clean Seas was founded, and it remains to be seen how Clean Seas can perform in an actual emergency."

But the harbormaster, who has known frustration, says he feels a lot better knowing that one phone call will bring out Clean Seas and all its resources. "I've been in almost daily contact with Clean Seas personnel,"

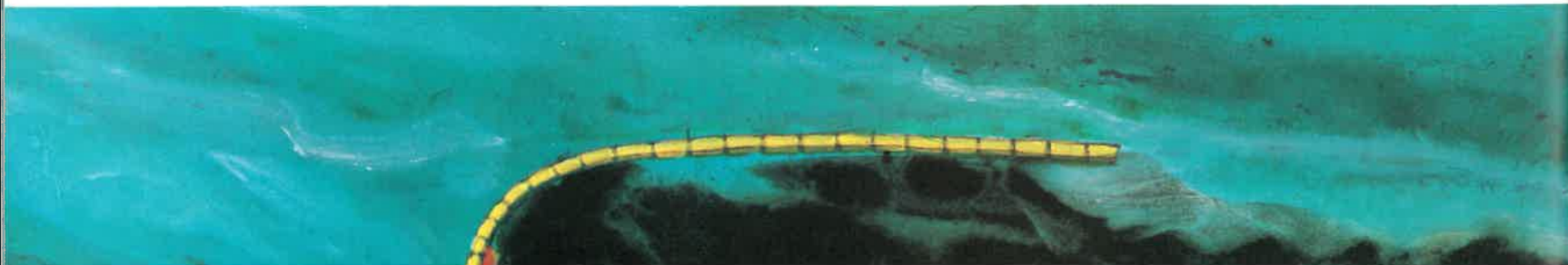
he says, "and the oil industry picked the best man possible to head up the program. I have unlimited faith in the integrity of Reese Norton."

Captain W. H. Putman, of the California Department of Fish and Game, long has crusaded for strict environmental safeguards. In a recent speech in San Diego he said, "The state wholeheartedly approves of the objectives of the petroleum industry's cooperatives and nonprofit corporations formed to combat oil spills."

Elbert Wilkinson of Los Angeles, offshore operations engineer with the California Division of Oil and Gas, offers these evaluations of Clean Seas:

"As the state regulatory agency, we've been in close touch with Clean Seas from the outset. It's remarkable enough to have 15 highly competitive companies agree on anything. Yet that's what has come about, and a lot of progress has been made.

"It seems logical and proper to me that the industry should provide this capability for containment and clean-up. Here, ready to be mobilized, is a reaction force of people who know how to deal with oil problems. It's been my observation that top quality



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representatives have been selected from member companies. We've gotten to know most of them personally, and this should enhance efficiency if a problem should arise."

Charles T. Bourns of San Francisco, for two years the federal Environmen- tal Protection Agency's oil spill action coordinator and an observer of Clean Seas' growth, says:

"It's a smart move for the oil in- dustry to pool resources to provide a specialized service. Clean Seas is there, on call to the companies, the EPA, the Coast Guard. This means that the government alone doesn't have to go out and round up dozens of clean- up contractors at taxpayers' expense.

"I think it's commendable also that Clean Seas stands ready to respond to emergencies outside the direct respon- sibilities of the member firms. For ex- ample, if a foreign tanker gets into trouble off the coast. A capability is there that would not exist, if not for Clean Seas."

Especially promising are the mutual assistance agreements evolving among Clean Seas, Clean Bay and other West Coast oil cleanup firms. Clean Bay, based at San Francisco, guards shores from Cape San Martin 340 miles

north to Humboldt Bay. Humble also is a member of Clean Bay. Of high priority is protection of San Francisco Bay, which has endured its own mas- sive oil spill — 20,000 barrels — from the collision of two tankers in fog near the Golden Gate Bridge in Jan- uary, 1971.

Says Forrest M. Smith, executive vice president and manager of Clean Bay:

"The spill took nine days to clean up, at a cost of \$5 million to the re- sponsible company. If a similar spill were to occur today, it would be a different story."

Smith says his organization could do the same job for \$3 million, and complete it in five or six days instead of nine. Furthermore, he says his or- ganization is approaching the goal of being able to clean up a spill five times the size of the 1971 bay spill. At the same time, Clean Bay is developing a lightering capability of up to 400,000 barrels to facilitate salvage of a dam- aged vessel and avert additional spill exposure. "The equipment to do this is now available and proven and we are in the process of evaluating it," Smith reports.

Like fire chiefs in adjoining town- ships, Forrest Smith and Reese Norton keep one another posted on develop- ments in apparatus and techniques.

"I think of Clean Bay as my auxil- iary, and vice versa," says Norton. Mutual assistance agreements involv- ing Clean Seas and Clean Bay with other cleanup organizations multiply the available response from Mexico to Canada.

There's one question Norton hears every day. Yet, he still pauses refle- ctively before answering. His mind goes back to 1969 to the most dis- heartening day of his career, when he walked along East Beach in Santa Barbara and watched a brown surf stain mile upon mile of *La Tierra Adorada*, the beloved land.

Could Clean Seas today handle the oil produced by the Santa Barbara blowout? Norton answers:

"You must bear in mind, that was a tremendous volume of oil released at a rapid rate during a 'hundred-year storm' of a severity not likely to repeat more than once a century. I doubt that any effort by man could have had much effect offshore during that storm.

"But given less severe weather and seas, and a few thousand feet of the B-T Boom, yes, I feel certain we could have been quite effective in contain- ing that oil."

DON DEDERA



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