MAP SUPPLEMENT: "CLOSE-UP: CANADA" — ONTARIO

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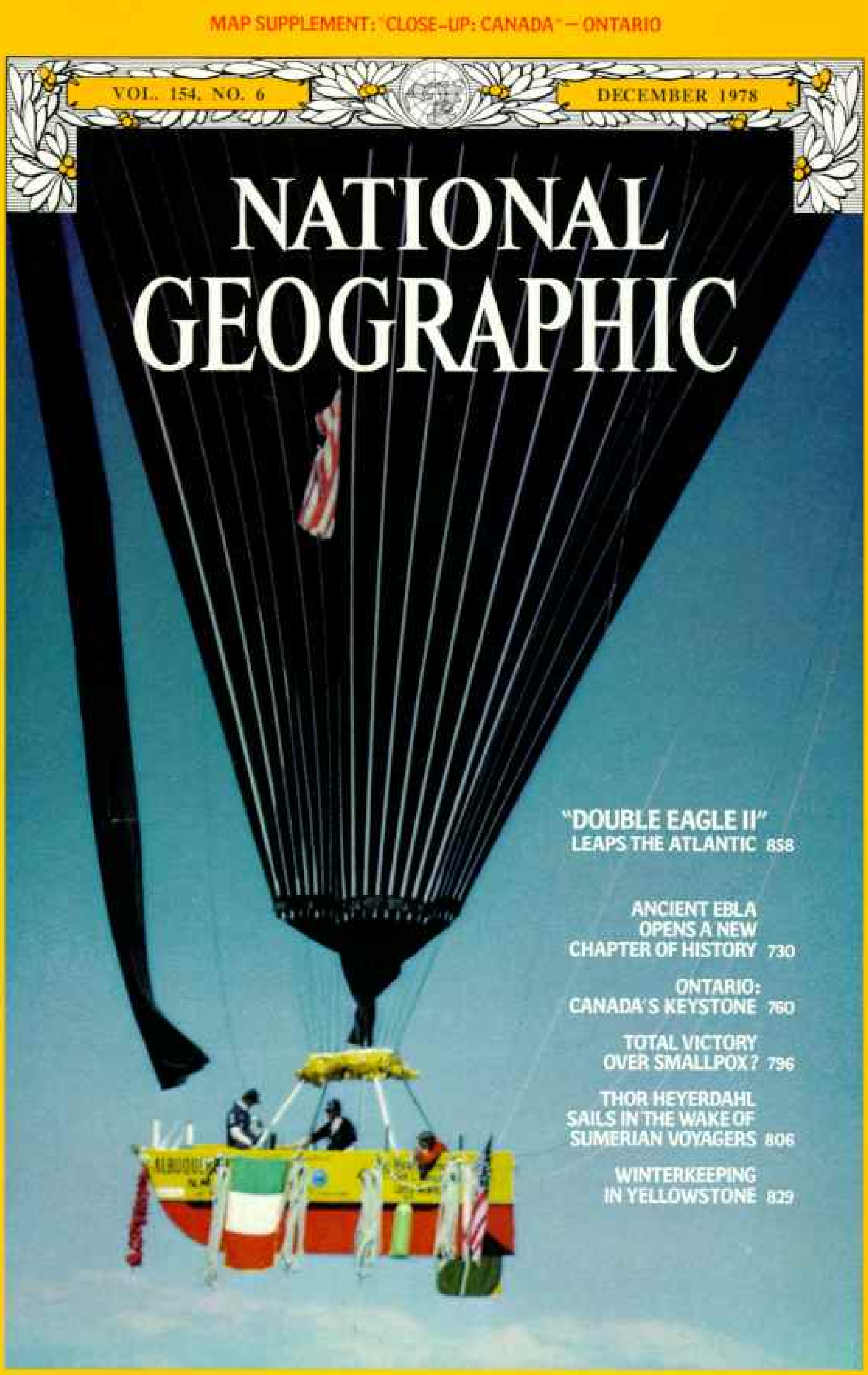


OFFICIAL JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D.C.

THE ONE CERTAINTY of any map is that it will be outdated. These days there is another certainty: Someone will complain about it.

The planet is papered with regions claimed by two or more nations, left in limbo by treaty or stalemate, acknowledged by one power but not by others. Solid old geographic names become political lightning rods.

For 30 years Society maps have carried the notation "Palestine"—in type reserved for regions—in that ancient area of such intense interest to three of the world's major faiths. At the same time we have clearly delineated the modern State of Israel in a typeface that always indicates political entities. The tradition was continued on our newly issued Middle East map, which appeared at the time of the Camp David meetings. To our surprise, it was charged that the map gave subtle support to the Palestinian cause. Political Palestine, having been partitioned in 1948, no longer exists. But we think it of interest to denote a region with such profound historical connotations, and have since added a map note so the purpose of the name cannot be misinterpreted.

On the same map we indicated a divided Cyprus, while using a single color to show the island as a political entity. We noted a "Turkish Cypriot State" in that area occupied by Turks, north of the United Nations-patrolled cease-fire line. Obviously we explained too much and too little. The map was thought by some critics to legitimize an administrative unit as a government. The point was well taken. Subsequently we amended the map and added a note to clarify the Cyprus situation.

In Asia, the People's Republic of China has never been pleased with our depiction of Taiwan, and India has not liked how we show her borders with China or with Pakistan. India claims all of Kashmir, as Ecuador claims part of Peru and both Britain and Argentina claim the Falkland Islands. In all, there are more than a dozen areas of claim and counterclaim on our maps.

In the face of this, our policy is to show the de facto situation and note changes as they occur. Thus we now show Viet Nam as one country. We show Korea divided, with two capital cities. We show Transkei, but note that it is recognized only by South Africa.

Our purpose is to convey the maximum amount of information, not to make political commentary.

Gilbert M. Grosvenor

NATIONAL GEOGRAPHIC

THE NATIONAL GEOGRAPHIC MAGAZINE VOL. 154, NO. 6

December 1978

COVER: Double Eagle II *floats toward touchdown in France after its historic flight. Photograph by Alain Dejean, Sygma.*

EBLA

By HOWARD LA FAY

Photographs by JAMES L. STANFIELD
BOTH NATIONAL GEOGRAPHIC STAFF

Paintings by LOUIS S. GLANZMAN

SPLENDOR OF AN UNKNOWN EMPIRE

11 x 10 CM (4.5 x 4 IN.); NATIONAL MUSEUM ALEPPO, GIANNI TORTOLI

IN THE BRIEF SPRINGTIME of northwestern Syria—a season of bright, warm days and cool nights—you seem almost to be suspended in the past. Dozens of tells, mounds cloaking the ruins of ancient cities, erupt from the sweeping plain. From the top of one, Tell Mardikh, I watched shepherds guide their flocks through emerald pastures as they have since time immemorial. Farmers were harvesting the early crops—radishes, lettuce, leeks—and carrying them to market. Now they go to Aleppo, 60 kilometers (35 miles) to the north; once, some 4,500 years ago, they had come to the bazaars of the great capital slowly emerging from Tell Mardikh, where I stood.

For 15 dusty, difficult years, Dr. Paolo Matthiae of the University of Rome, director of the Italian Archeological Mission in Syria (page 739), has been probing this mound. Early on, he discovered a magnificent gate and a massive wall. Working inward, year by year, he unearthed dwellings, cisterns, temples—clearly the remains of an important site. But which? An inscription found in 1968 identified it as Ebla, an obscure city mentioned in scattered documents of the second and third millennia B.C.

Then, in 1975, Matthiae hit an archeological jackpot. In the ruins of a palace apparently destroyed in the 23rd century B.C., he came upon the greatest third-millennium archive ever unearthed. More than 15,000 cuneiform tablets *(Continued on page 735)*

Lost pages from history's first chapters, 4,500-year-old clay tablets found in northwestern Syria reveal that Ebla rivaled Egypt and Mesopotamia as a major power of the ancient world. Written in the oldest Semitic language yet identified, documents such as this accounting of wages for palace workers have scholars rethinking civilization's formative years.

Savagery often swept like a fierce desert wind over the ancient Middle East. According to archeologist Paolo Matthiae, discoverer of Ebla, the city was sacked by the relentless Akkadians about 2250 B.C., as depicted in this painting.

For this article, the artist renders scenes in the shape of Ebla tablets, with characters springing to life from backgrounds inspired by artistic conventions of that period. Here, Akkadian King Naram-Sin subdues an Eblaite as soldiers stand ready at his back, and captives languish in a net beneath.

The recurring conquests of cities left layers of ruins over which new structures were raised. Archeologists digging into a mound called Tell Mardikh sliced through several layers before discovering Ebla, a major city of the Early Bronze Age. The excavation yielded the largest archive of third-millennium texts ever found and sent waves of excitement through the world of Biblical scholarship. Epigraphist Giovanni Pettinato says the tablets mention the cities of Sodom and Gomorrah, and include the name David, found in no other ancient text except the Bible.

KANIŞH
CARCHEMISH
HALAB
EBLA
EMAR
UGARIT
ELISHAH
BYBLOS
BERYTUS
DAMASCUS
MARI
TIGRIS
EUPHRATES
MESOPOTAMIA
ASSUR
KHAMAZI?
BABYLON
AKKAD
KISH
NIPPUR
SUMER
UR
JERUSALEM
GAZA
GOMORRAH?
SODOM?
SINAI
MEMPHIS
NILE
EGYPT

Once thriving culture, tumbled from the cradle of civilization into obscurity, Ebla now grows in historical stature as a center of surprisingly far-flung trade. The tablets list more than 5,000 place-names and picture Ebla as an economic giant that traded with Byblos, Mari, Assur, Kish, Khamazi, and other cities. Question marks (**above**) follow the names of cities whose exact locations are unknown. The texts include the oldest bilingual dictionaries ever found. Characters in Sumerian, a language that scholars understand, permitted decipherment of the Eblaite terms.

The wooden figure (**facing page**) clutching an ax—symbol of authority—may depict one of the city's kings.

and fragments—commercial records, treaties, chronicles—whispered, through the mists of ancient and ambiguous syntax, of an unknown Semitic empire, with Ebla as its seat, that once dominated much of the Middle East. Since archeologists had long regarded Syria as little more than a buffer between the brilliant civilizations of Egypt and Mesopotamia, this find struck the scholarly world like a thunderbolt.*

"These discoveries," says Dr. Ignace J. Gelb of the University of Chicago's Oriental Institute, "reveal a new culture, a new language, a new history. Ebla was a mighty kingdom, treated on an equal footing with the most powerful states of the time."

"How important are the Ebla tablets?" asks Dr. Giovanni Pettinato, former epigraphist of the Italian Mission (page 749). "Remember this: *All* the other texts of this period recovered to date do not total a fourth of those from Ebla."

Tablets Reveal Rich Details

The clay tablets with their intricately incised script attest that the craftsmen of Ebla gained renown for the quality of their metallurgy and textiles, ceramics and woodworking. One product was a cloth of scarlet and gold that apparently differed little from the brocade still manufactured in modern Syria.

The kings of Ebla signed treaties with Assur, on the Tigris River, and Khamazi, far to the east. Tribute poured into the royal coffers from all quarters.

In addition to the unsuspected magnificence of the empire, the texts bear witness to an astonishing density of population in the ancient world. More than five thousand geographic names appear on the tablets.

Reports Dr. Pettinato: "We encounter a swarm of small states even in the immediate vicinity of Ebla. . . . The enormous number of cities and villages presents an entirely new picture of the urbanization of Syria and Palestine in the third millennium."

The names of cities thought to have been founded much later, such as Beirut and Byblos, leap from the tablets. Damascus and Gaza are mentioned, as well as two of

*See Howard La Fay's "Syria" in the September 1978 NATIONAL GEOGRAPHIC, with the accompanying map supplement **Early Civilizations in the Middle East**.

16 CM (6.3 IN) TALL, NATIONAL MUSEUM DAMASCUS

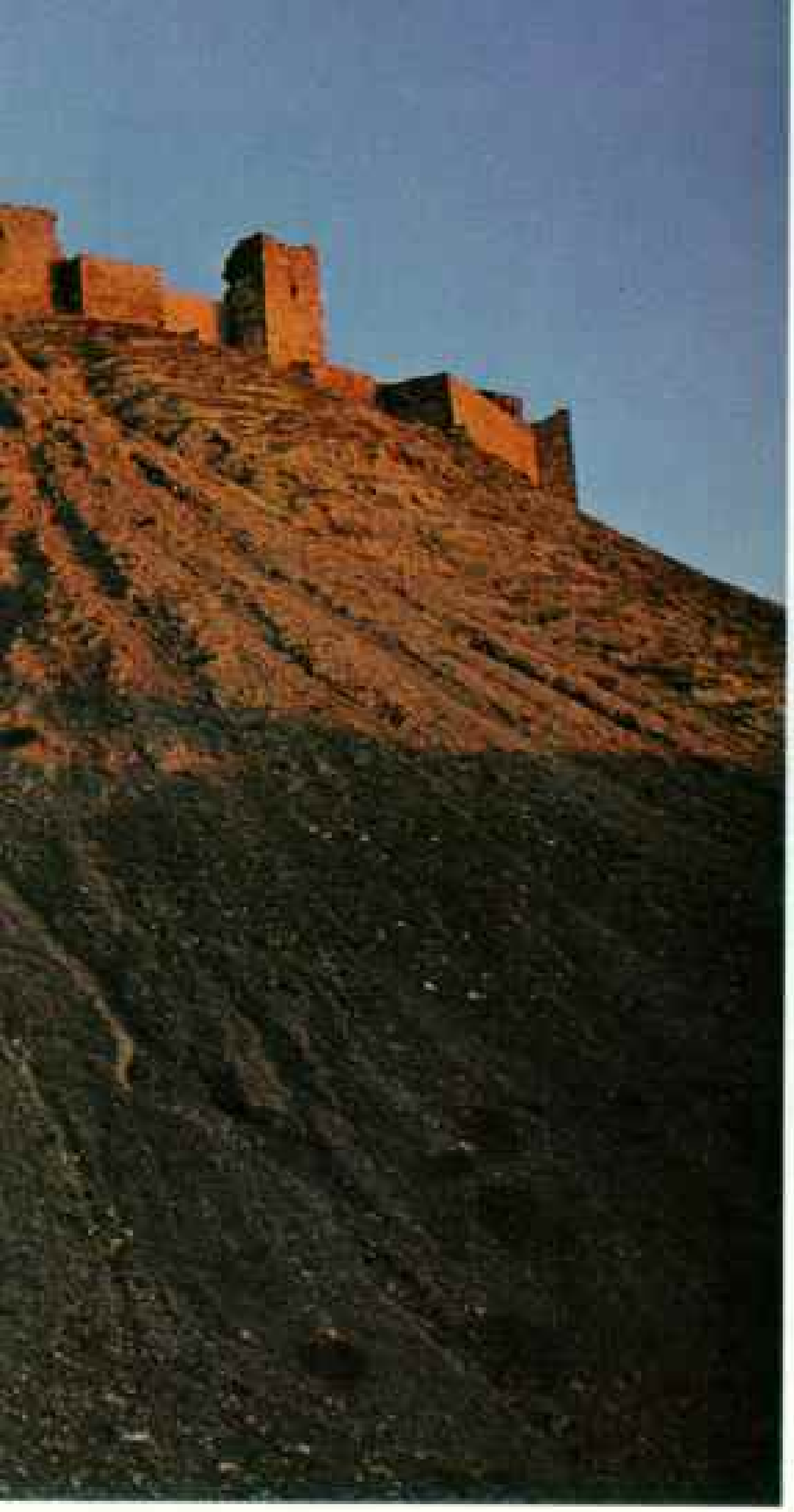
the Biblical cities of the plain, Sodom and Gomorrah. Also included is Iram, an obscure city referred to in Sura 89 of the Koran.

Most intriguing of all are the personal names found on the Ebla tablets. They include Ab-ra-mu (Abraham), E-sa-um (Esau), and Sa-u-lum (Saul). Present as well is a name never found before in ancient literature, save for the Old Testament: Da-u-dum (David). Further, the name of a king, Ebrium, who reigned about 2300 B.C., bears an uncanny resemblance to Eber of the Book of Genesis, who was the great-great-grandson of Noah and the great-great-great-great-grandfather of Abraham, the Biblical progenitor of the Hebrews.

Three great religions—Judaism, Christianity, and Islam—trace their historical origins to the Patriarch Abraham. The Book of Genesis introduces him as a native of Ur of the Chaldees, in southern Mesopotamia. Scholars have always taken this at face value. Most of them believe that about 1800 B.C. Abraham and his followers migrated through the Fertile Crescent—north from Ur, across Syria, and down into Palestine.

Biblical Scholars Excited, Mystified

But we now encounter a Syrian capital, dating from five hundred years *before* the widely accepted date for Abraham—a place rich in patriarchal and Biblical names. Provocatively, the Ebla tablets mention a nearby Syrian city called Ur, while Deuteronomy refers to Jacob, Abraham's grandson, as a Syrian. Furthermore, Muslim scholars have long held that Abraham's epic journey occurred about 2300 B.C.



In Rome I called upon the Reverend Mitchell Dahood, dean of the Pontifical Biblical Institute's Oriental Faculty and a renowned authority on the languages of the ancient Middle East. He explained the explosive effects of Ebla upon Biblical studies.

"Consider this one aspect alone," he said. "In early passages of the Old Testament, God is referred to as El. Then Exodus 3:14 records that He revealed His true name, Yahweh—which has come into English as Jehovah—to Moses. But the Ebla tablets show that a thousand years before that—and this has produced much excitement, and even consternation, among scholars—both Il and Ya, forms equivalent to El and Yahweh, existed in Northwest Semitic personal names. For example, in Ebla we find a man named Mi-ka-il (Who is like God?)—

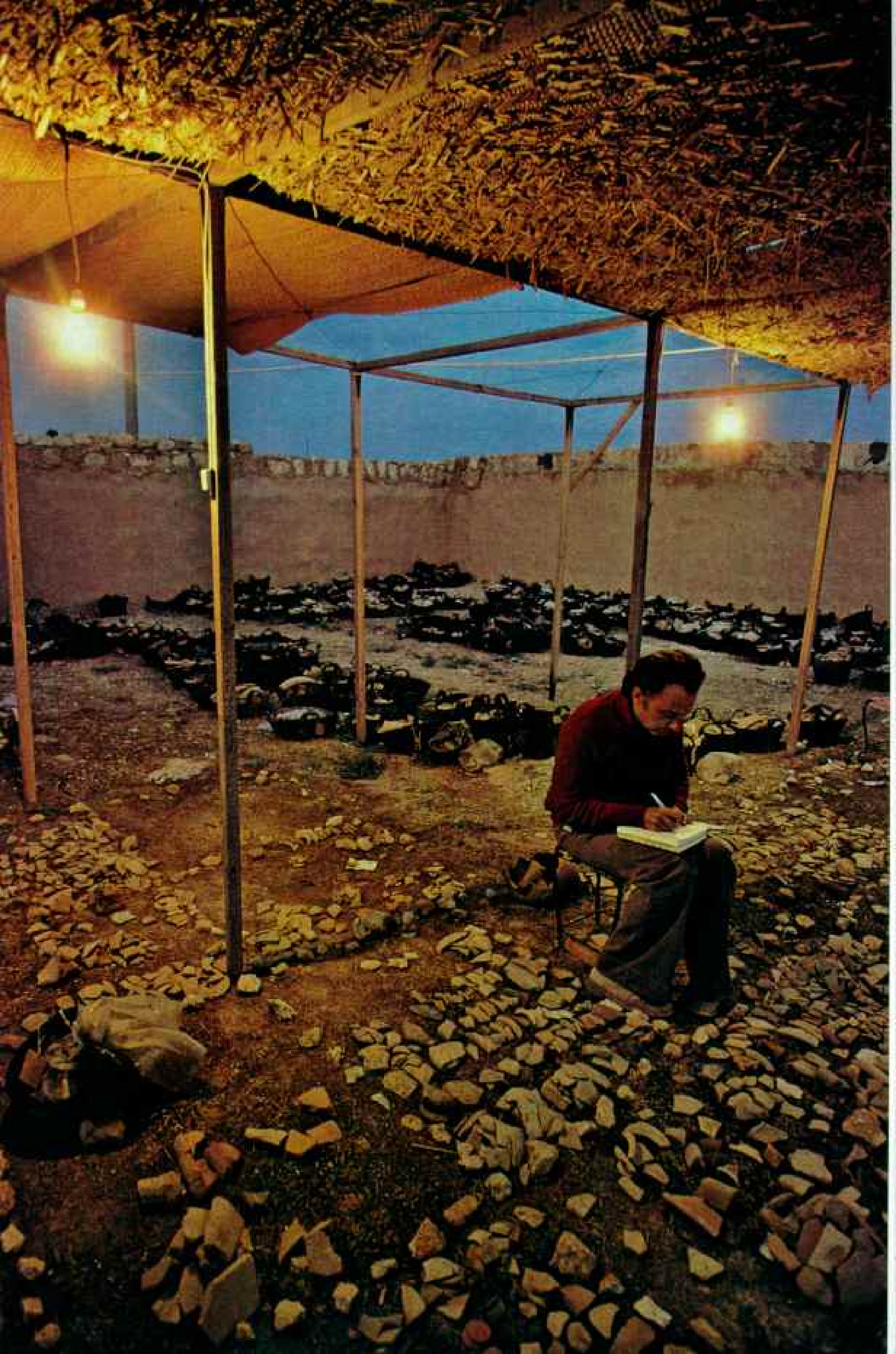
High seat of power, the citadel of Aleppo (**upper left**) endures atop a tell, or mound, similar to that which entombed Ebla, 60 kilometers (35 miles) distant. Aleppo's walled city center has yielded some archeological discoveries, but is used primarily as a historical museum.

Aleppo began to dominate its neighbor about the 18th century B.C. as it preempted Ebla's role as the area's major trading center. Today the tell is surrounded by modern Aleppo, a vibrant metropolis of more than a million people.

At the Tell Mardikh site (**above**) Dr. Stefania Mazzoni, assistant to the chief excavator, directs the work in a room of Ebla's royal palace.

A scholarly round of solitaire, dealing with shards instead of cards, absorbs Paolo Matthiae as he catalogs pottery fragments (**right**). Dr. Matthiae, a University of Rome archeologist and chief of the Italian Archeological Mission in Syria, has directed the Tell Mardikh excavation since its beginning 15 years ago. Dr. Mazzoni supervises the clearing of a mud-brick wall (**above**). Rewards from the often tedious work: a painted jug (**left**) and a gold-leaf-covered figurine of a bull with a human face (**below**).

FIGURINE, 5 CM (2 IN.); PITCHER, 18 CM (7 1/2 IN.); BOTH NATIONAL MUSEUM ALEPPO, PAOLO MATTHIAE



the modern Michael, of course—and another, Mi-ka-ya (Who is like Ya?)."

Father Dahood believes that the language and culture of Ebla did not die with the city, but survived in such Canaanite centers as Ugarit, a Mediterranean port that flourished in the 14th century B.C. (page 754). This heritage passed on to the peoples of Palestine, of which the Hebrews were one.

Dr. Matthiae feels that "the chief value of the Ebla archives is that they show a great state of the third millennium B.C. in its administrative, economic, social, and religious structures. But, in a broader sense, we have here a completely new and unknown world—a northwestern Semitic culture that was the foundation for later, brilliant Syrian successors. An empire that alters forever our perception of ancient history.

"In my opinion, the claimed Biblical associations are not based on real evidence; the divine name Yahweh does not appear at all in Ebla texts. The highly developed urban civilization of third-millennium Ebla cannot be soundly compared with the nomadic culture of the patriarchs."

In the spring of this past year I visited Ebla for the first time. The tell rises majestically from the plain and, as you turn east off the Aleppo-Homs highway, it seems to dominate the horizon.

The people of the ancient Near East erected their cities on strategic sites with plentiful water. As a result, after destruction at the hands of pillaging armies—and to weaker cities this came as often as once a generation—the population tended to rebuild on the ruins. Excavating a tell is like slicing a stack of pancakes; each stratum, with its embedded trove of artifacts, encapsulates history from one catastrophe to the next.

Fire Preserves History

Dr. Matthiae has christened the central mound of Tell Mardikh with its palace and temples the "acropolis." The trenches of 15 years of excavation furrow its flanks and top. Clambering past the deep pits, I looked down into the palace archive. The sockets of the wooden shelves that had held the incredible collection of clay tablets still pierced the plastered walls; the shelves themselves

NATIONAL MUSEUM ALEPPO; PAOLO MATTHIAE

The gods smiled on Ebla's political maneuverings—or so the Eblaites hoped. This commemorative carving on a limestone basin shows dignitaries embracing, probably after Ebla struck an alliance with another city. A goddess, at right, stands by to render her blessing. One tablet contains what may be the oldest military communiqué—an Eblaite general's report to his king of the defeat of Mari, 385 kilometers (240 miles) away.

had burned and collapsed around 2250 B.C. Ironically, the flames of destruction had baked the clay, preserving the texts for posterity (pages 746-7).

The modern mind cannot conjure up the horrors of an ancient siege or the dread consequences of defeat. The Assyrian King Ashurnasirpal II described one of his victories: "I cut off their heads; I burned them with fire; a pile of living men and of heads over against the city gate I set up; men I impaled on stakes; the city I destroyed . . . I turned it into mounds and ruin heaps; the young men and maidens . . . I burned."

By way of a monumental stairway—each step once intricately inlaid with shell—I descended into the spacious audience court. The dais where once the ruler had held court still stood, and in the crevices that crazed the floor poppies nodded scarlet. A passage by Omar Khayyám came to mind:

I sometimes think that never blows so red
The Rose as where some buried
Caesar bled. . . .

Wandering through the royal quarters, I reflected on one singularly attractive obligation of kingship in the Middle East. The monarch was expected to defend the widowed, the orphaned, and the poor from all exploitation and injustice. According to documents unearthed at Ugarit, failure to protect the poor could cost a king his throne.

On the reverse slope of the acropolis, excavations reveal the quarters of the 11,700 functionaries who served the palace in its prime. By ancient standards, Ebla was a megalopolis. Some thirty thousand lived within the walls, and the population of the city plus its suburbs and satellites came to more than a quarter of a million.

Later I had coffee with Dr. Matthiae in his quarters in the village of Tell Mardikh, adjacent to the site. "We know," he said, "that the walls of the palace were as tall as 15 meters [50 feet]. Very imposing. As to its grandeur, we have no idea. And perhaps we never will. Erosion has certainly destroyed the upper reaches."

Dr. Matthiae has formulated a tentative reconstruction of Ebla's history. Discoveries yet to come, however, will certainly modify the details. After what he calls "an intense period of formation," Ebla became, by about 2400 B.C., a thriving city. Prosperity and power burgeoned under the reigns of five successive kings. Indeed, so powerful did Ebla's kings become that they apparently contended with Sargon of Akkad, founder of the world's first empire, for domination of the Euphrates River.

"Control of the Euphrates," pointed out Dr. Matthiae, "meant control over the strategic traffic in metals from Anatolia and in wood from the Syrian forests near the Mediterranean, both natural resources essential to Mesopotamian economic life."

Akkadians Prove Relentless Foes

The struggle apparently ended when Sargon defeated the Eblaites sometime before 2300 B.C. The economic considerations involved stand out clearly in Sargon's victory inscription: "He worshiped the god Dagan, who gave him from that time onwards the Upper Country, Mari, Yarmuti and Ebla, as far as the Forest of Cedars and the Mountain of Silver."

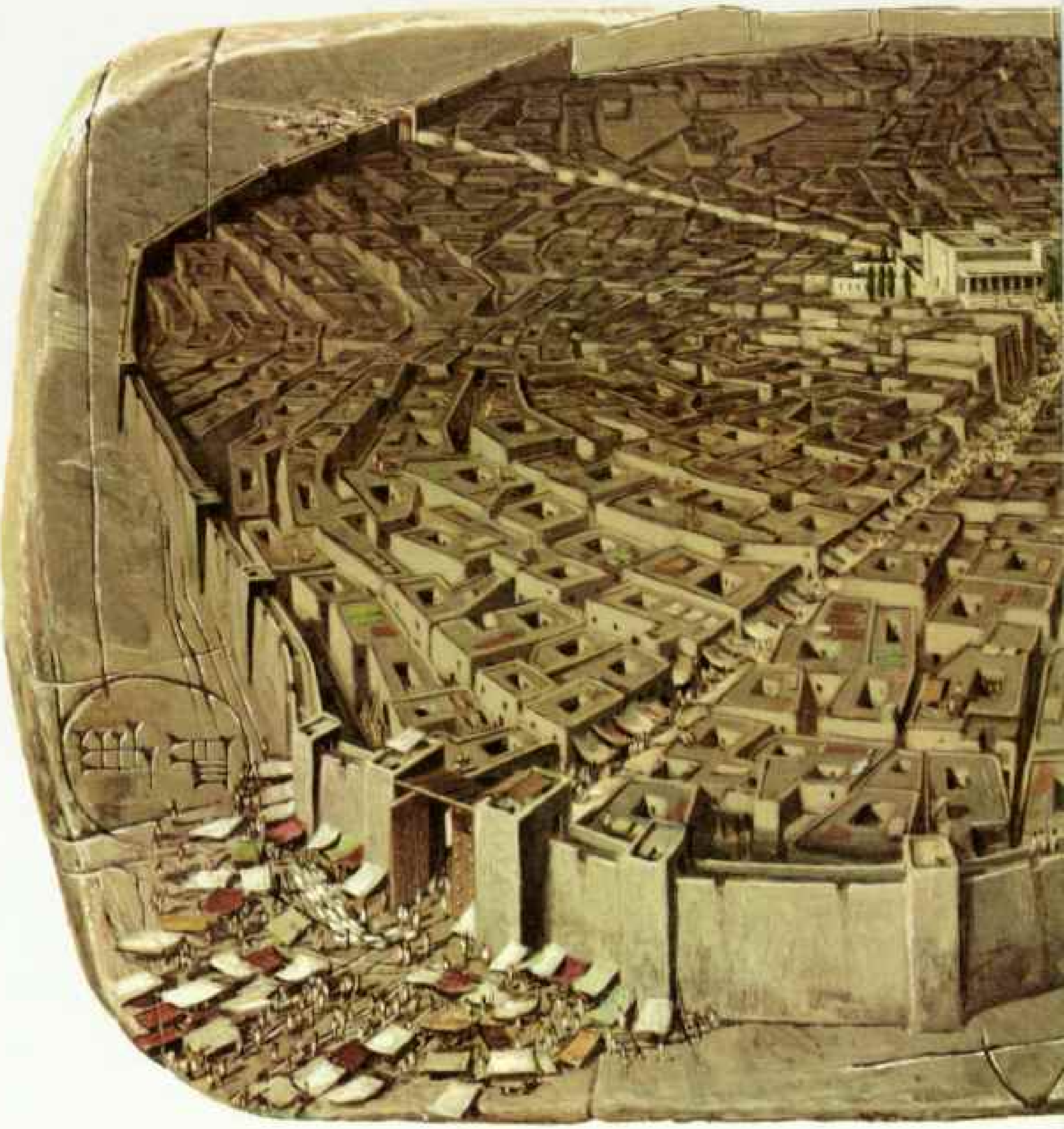
"It's probable," Dr. Matthiae told me, "that this vague formula indicates a victory and an exaction of tribute rather than an actual conquest of Ebla. For, less than a century later, when Sargon's grandson Naram-Sin captured Ebla and burned it along with its precious archives, he proclaimed the epic nature of his deed. On a monument to himself, he inscribed: "Naram-Sin, the strong, the conqueror of . . . Ebla, never before subdued in history."

But Ebla rose from the ruins. The last century of the third millennium finds references in far-flung cities to the presence of Eblaites. Royal records from Ur of the Chaldees, for example, mention two Eblaites by name—Ili-Dagan and Gura. And "Surim, the messenger, the man from Ebla," even made votive offerings to the local god.

"But," Dr. Matthiae told me, "about 2000 B.C. Ebla was destroyed again. We know it because of the thick layers of ash found everywhere in this stratum. What happened? Well, Ur fell to the Elamites and the nomadic Amorites around 2000 B.C. Several texts show the presence of Amorites throughout northern Syria during this period. Doubtless they struck at Ebla too and wiped it out. This time the attack resulted in the collapse of early Syrian *(Continued on page 748)*

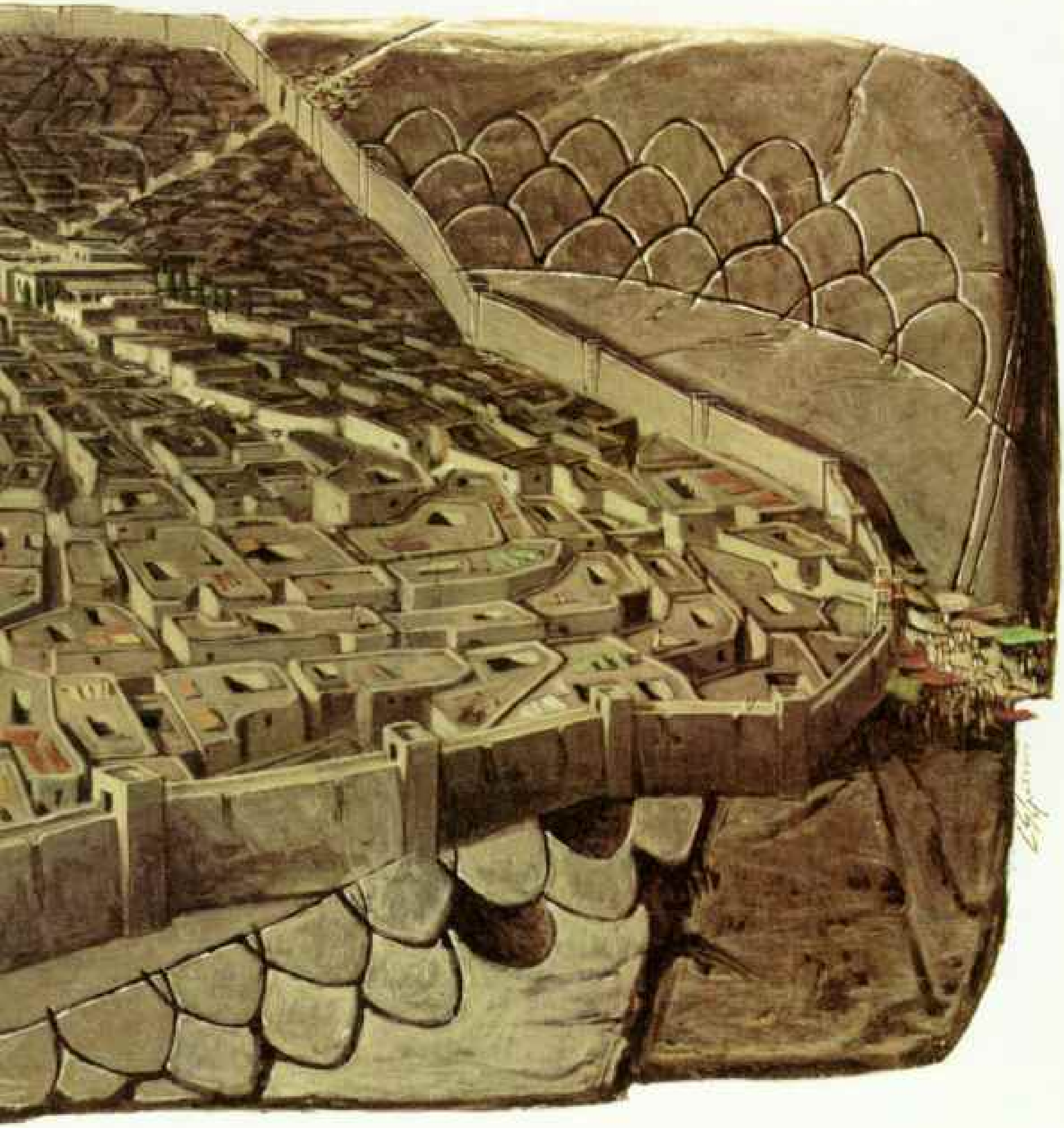
Beneath the royal-purple sky of dusk, the king's palace at Ebla glows once more, this time from scores of photographic lights rather than oil lamps. From here the

monarch and his aides administered a sprawling city-state of 260,000 persons, including suburbs and satellite towns that paid taxes in grain and livestock.



NATIONAL MUSEUM DAMASCUS.
NATIONAL GEOGRAPHIC PHOTOGRAPHER WINFIELD PARKS

All roads led to Ebla throughout much of the Middle East, long before Rome held sway. Once there, those roads went directly to the steps of the royal palace. Ebla erected no walls around its palace, only around the city itself. Eblaites believed their leaders should be accessible and accountable. A king ascended the throne not strictly through lineage but by election, and was responsible for the welfare of widows, the orphaned, and the poor. If derelict, a king could be ousted by a group of elders. The palace complex



included an audience court where citizens aired grievances before their ruler.

The tablets mention a long-reigning king named Ebrium, and scholars have noted the similarity of the name with that of Eber of the Bible, a direct forefather of Abraham.

In this painting, distant mountains loom like huddled eggs before Ebla's imposing walls. Each of the four city gates was dedicated to a different god, and each city quadrant was overseen by a *lugal*, a kind of ward boss. An extensive labor division was revealed by a tablet listing numerous professions. Close to the king stood the scribe, who oiled the machinery of the city's bureaucracy. A king who couldn't read messages from other cities or write treaties placed heavy responsibility on those who could.

The inscription on this sculpture fragment found at Tell Mardikh in 1968 (**left**) identified it as a statue of Ibbit-Lim, a member of a royal Eblaite family, and confirmed that the site of Ebla had indeed been found.

An unlikely-looking trove of archeological gems, fractured tablets lie half-buried, awaiting the excavator's brush and the interpreter's eye. When fire gutted Ebla, many tablets fell and broke as the wooden shelves holding them collapsed. But the fire also

PAOLO MATTHIAE

proved a boon to archeology, for it turned the archive into a kiln that baked the tablets to a hardness that withstood the ages. In all, diggers have unearthed more than 15,000 tablets and fragments since the archive's discovery in 1975.

Ebla yields her secrets only to patient suitors, as these scholars (**right**) well know. After initial bafflement followed by years of painstaking study, Dr. Pettinato, seated, concluded that Eblaite was a Semitic language heretofore unknown. The Reverend Mitchell Dahood, standing, a linguist at the Pontifical Biblical Institute in Rome, believes Eblaite will illuminate enigmatic terms used in the Old Testament.

The Eblaite equivalent of today's school notebook, this tablet (**left**) shows a student's attempt to complete an exercise. The excavation revealed the existence of the oldest academies for scribes outside of Sumer, where cuneiform writing originated. Though most of Ebla's writings are in the Sumerian language, the Eblaites also used Sumerian words as syllables to write the words of their own tongue.

NATIONAL MUSEUM ALEPPO, GIANNI TORTOLI (LEFT); WINFIELD PARKS

(Continued from page 741)

culture as well as the destruction of the city. In the aftermath we find a new people with a new culture. Ebla flourished briefly once again, but around 1800 B.C. the city began to decline, and within two hundred years finally disappeared from history."

Dr. Pettinato disagrees with this chronology. For a number of reasons, he feels that some of the tablets from the royal archives date from at least 2500 B.C., making the city older than Dr. Matthiae's estimate. Furthermore, he said, "These early tablets display an ease of expression, an elegance, that indicates complete mastery of the cuneiform system by the scribes. One can only conclude that writing had been in use at Ebla for a long time before 2500 B.C."

Writing Born of Trade

Dr. Pettinato's work on the tablets stands as a classic of philological research. To appreciate his achievement, one must understand something of the development of written language in Mesopotamia, the Land Between the Two Rivers, where it originated some 5,000 years ago.

In the beginning, writing was the child of economics, existing merely to record transactions. When a trader shipped ten head of cattle, he sent a crude bill of sale in clay—with a pictographic symbol for cattle plus a sign for the number ten. The buyer responded with a similar receipt. Thus ancient businessmen, and the inevitable tax collectors, could maintain their ledgers.

A mysterious people, the Sumerians, appeared suddenly in Mesopotamia in the fourth millennium. They founded the first cities, and they also developed an elaborate pictographic system of writing with some two thousand signs. When an unknown genius realized that signs could also represent sounds, writing as we know it was born.

The Sumerians and their script dominated the Fertile Crescent for more than a thousand years. And for almost all that time they had to fight off the incursions of barbarous Semites. When the defenses finally broke in the 24th century B.C., the great Sargon—a western Semite—built his Akkadian empire upon conquered Sumer. He, and virtually every king who reigned thereafter in the Land Between the Two Rivers, retained

Sumerian as the idiom of religion and literature, and even adapted Sumer's system of writing to express their own various languages.

In the Ebla tablets studied thus far, the majority of the words appear to be Sumerian. The remainder, in the language of Ebla, were initially indecipherable. But Dr. Pettinato found even the Sumerian portions difficult to read, since the Eblaite scribes were completely bilingual. Because they "could switch with the utmost ease from one language to the other, it was almost impossible to understand a tablet completely, for Sumerian words would alternate with words written in this as yet incomprehensible tongue."

Eblaite Language Tough to Crack

Dr. Pettinato set himself the task of identifying the unknown language; not a simple undertaking, for cuneiform signs can convey many meanings. Indeed, the sign that originally depicted the rising sun came to represent some forty words and a dozen separate syllables.

In the end the bilingualism of the scribes gave him the key to decipherment. Some of the texts bore the notation *dub-gar* at the end, Sumerian for "tablet written." In other tablets he noticed that the final Sumerian characters were *gal* and *balag*, meaningless in juxtaposition. But the same two signs could also be read as *ik* and *tub*. Fortunately, Dr. Pettinato had studied Canaanite languages before specializing in Sumerology; in *ik-tub* he recognized a form of the West Semitic word *ktb*, "to write," obviously expressing the same idea as *dub-gar*.

With that clue, Dr. Pettinato went on to identify the language of Ebla as a new Northwest Semitic tongue, a forerunner of all the Canaanite dialects, which include Ugaritic, Phoenician, and Hebrew.

Once deciphered, the tablets transmitted vivid glimpses of the remote past. For example, Ebla maintained an academy for scribes, the earliest known outside the land of Sumer. Among the scholastic texts, he found the first known bilingual dictionaries, lists of 3,000 Sumerian words with Eblaite equivalents. Then there are the students' tablets. "One notes the unsteady hand, the slight familiarity and even less patience; some tablets are even left half completed. Others show signs of erasure or a disapproving tick mark added by the teacher."

With obvious delight Dr. Pettinato told me of an Eblaite named Azi whose long-ago career he had been able to follow through the royal archives. "We first meet him on what seems to be an examination text, one of the documents prepared by the young Azi to acquire the title of *dub-sar*, scribe." The pupil completed his test by inscribing:

a-zi	Azi
dub musar	has written the tablet,
ip-tur-i-sar	Iptur-Isar
dub-zu-zu	(being) the teacher,
ab-ba	the Elder
tam-ta-il	Tamta-il
um-mi-a	the dean.
a-zi	Azi.

"Well," continued Dr. Pettinato, "Azi obviously passed, because when we encounter him later he has the title of *dub-zu-zu*, Sumerian for 'the one who knows tablets.' Finally, in maturity, he appears at the very summit of the administration of Ebla."

On a list of professions found at Ebla, that of scribe is rated number one. Not only did a

scribe's peculiar skills enable a king—himself usually illiterate—to make his will known throughout his dominions, but the stylus, flicking across wet clay, kept the commercial records that organized trade. He wrote the treaties that bound states together and described the wars that split them asunder. Not least, he recorded the liturgies and anthems to the deities who stood between mankind and impending doom.

The ancient world knew well the overwhelming power of the word. Along about 2080 B.C., an aging pharaoh gave some advice to the son, Merykare, who would succeed him: "Be a craftsman in speech, [so that] thou mayest be strong . . . the tongue is a sword . . . and speech is more valorous than any fighting."

Archives Link Ebla to Mari

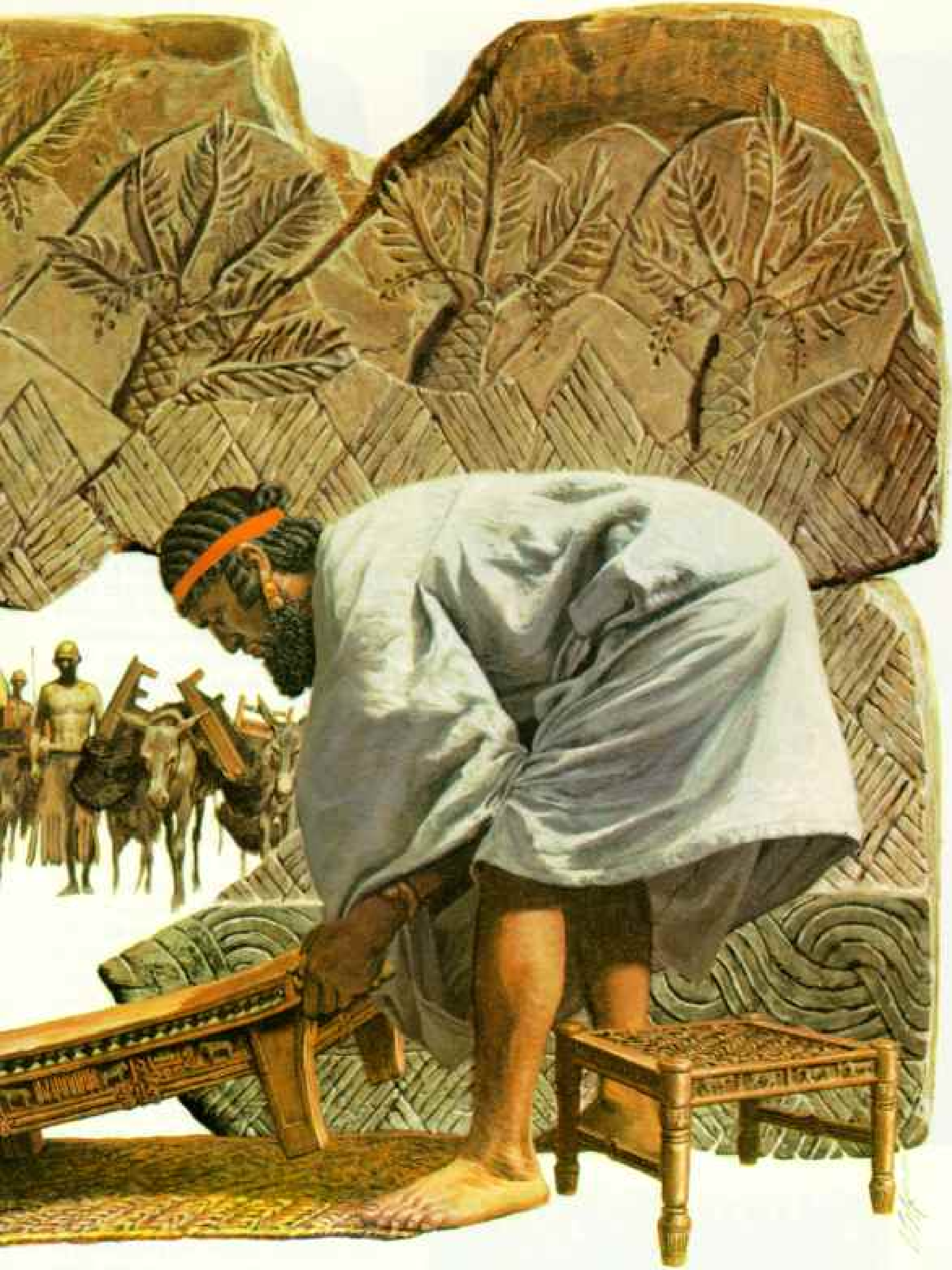
The royal archives of Ebla revealed some surprising information regarding Mari, a great city on the middle Euphrates. Excavations commenced there by the French in 1933 uncovered a striking capital that had enjoyed periods of brilliance in the third millennium and again at the outset of the second. The magnificence of Mari may be measured by the fact that the royal palace numbered three hundred rooms and courts.

Dr. Pettinato has found some five hundred mentions of Mari at Ebla. Not only did a lively trade bind the two cities, but Ebla actually conquered Mari, and Eblaite kings mounted the throne.

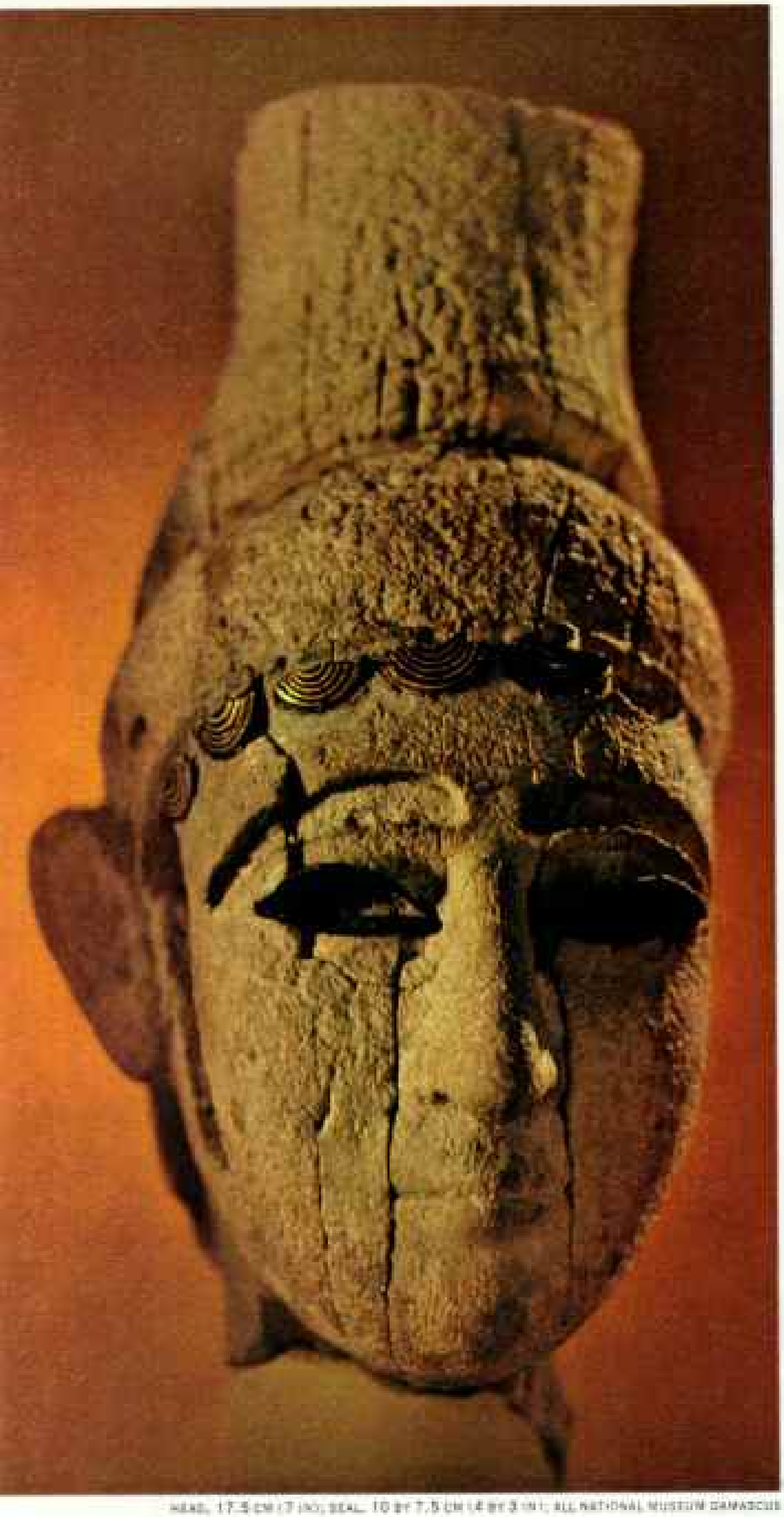
The Eblaites gave a different name to each year of their complex calendar, often memorializing some great event that had occurred. One—approximately equivalent to 2480 B.C. by Pettinato's estimate—is called *Dis mu til Mari ki*, Year of the Defeat of Mari. Apparently, at that time, Mari had become subject to *(Continued on page 755)*

Information was power in Ebla, where scribes carried as much clout as generals. Ensconced in his archive, a scribe checks one tablet while others are filed. Eblaites used both tablet sides, writing in columns; these texts record quantities of goods. After completing the list on the reverse side, scribes often left blank columns to separate the totals, inscribed on the left.

Handy with tools as well as tablets, Eblaites produced fine goods of metal, wood, cloth, and clay. In this montage, craftsmen load shell-inlaid tables for



shipment abroad. Behind a tableau depicting the mountainous countryside over which they traveled, a caravan of Eblaites arrives at a distant city, ready to trade.



HEAD, 17.5 CM (7 IN); SEAL, 10 BY 7.5 CM (4 BY 3 IN.); ALL NATIONAL MUSEUM DAMASCUS

The apparent heir to Ebla's legacy, a cosmopolitan north Canaanite center called Ugarit glittered on the Syrian coast. One of Ugarit's sizable achievements fits onto a finger-size tablet (**lower left**). Its face bears Ugarit's entire 30-letter alphabet—a giant step in practicality from the hundreds of characters used in Ebla. The Ugaritic vocabulary, however, inherited many words from the Eblaite language. Scholars also discern the influence of Ebla in the cultures of other Canaanite peoples from whom the Hebrews borrowed.

Whether the subject of this Ugaritic sculpture (**left**) was divine or mortal, male or female, is unknown. But the person's station was lofty enough to merit a likeness in ivory, a coif once veneered with gold, and ornaments of gold and silver. The excavation at Ugarit, still active fifty years after the discovery, yielded a letter (**above**) to the king of Ugarit from Ini-Teshub, king of Carchemish, a city near Ebla. The tablet carries the Carchemish seal.

While waiting for the significance of Ebla to crystallize, Biblical scholarship has already been aided by discoveries at Ugarit. The Ugaritic texts tell of such deities as El, Asherah, Baal, and Dagan, known previously only from the Bible and a few scattered texts. Ugaritic literature portrays these gods and goddesses in colorful epics and rituals. This has brought deeper understanding of a religious system that, as the Bible relates, was violently opposed by the Hebrew prophets.

(Continued from page 750) Ebla. But Iblul-Il, king of Mari, not only withheld tribute but also seems to have seized an Eblaite commercial colony as well. Ebla dispatched a general, Enna-Dagan, and an army to deal with the recalcitrant Iblul-Il.

Enna-Dagan has left us what may be the world's first military communiqué. He marched toward Mari, and every rebellious village en route felt his fury. "The town of Aburu," he wrote to his monarch, "and the town of Ilgi . . . I besieged and I conquered . . . piles of corpses I gathered in the land."

All along the route—and, eerily, it is identical to that followed by the present-day road between northwestern Syria and Mari—Enna-Dagan triumphed. The names of the towns ring out like a litany of doom—Tibalat and Ilwi, Irim and Emar and Lalanium—and always the dread coda: "piles of corpses I gathered."

The forces of Iblul-Il resisted energetically, but in the end Mari surrendered; Iblul-Il paid a prodigious tribute in silver and gold. A few decades later Mari appears to have passed into total vassalage, because its ruler, Shura-Damu, was the son of Ebrium, perhaps Ebla's greatest king.

Pettinato has learned that the kings of Ebla—like their Old Testament counterparts—were anointed when they mounted the throne, and that the office was elective rather than hereditary. Ebrium won four seven-year terms and ruled for 28 years. Apparently defeat was gracefully accepted, for records show that ex-kings—still retaining their royal titles—continued to receive rations even after their reigns had ended.

Scribes Taught in Distant Cities

Ebla played out its historic destiny in constant interaction with the varied kingdoms of Mesopotamia, from Sumer to Babylonia. Kish and Adab are mentioned frequently in Eblaite texts, and Dr. Pettinato believes that scribes from Ebla even taught in Mesopotamian capitals. Abu Salabikh—probably the Biblical Erech—had some "special relationship" with the Syrian city; of the tablets unearthed there, 80 percent bear the names of Semitic, probably Eblaite, scribes. Clearly, to understand Ebla, one must also understand the seminal civilizations of the Land Between the Two Rivers.

Ancient Mesopotamia is modern Iraq, an Arab nation with an oil-rich, hard-driving socialist government. For as long as men can remember, the Land Between the Two Rivers has been productive. It remains so today, but only where the ancient irrigation systems are being modernized and supplemented by the government. In the brief greening of springtime, farmers in the hinterland hasten to reap a swift crop of grain. Dairy herds, browsing on the fresh grass, provide cream, and when the first apricots arrive, Iraqis delight in a rich sherbet chunky with the new fruit, called *mishmish*.

A Land Weary With the Past

Despite this transient plenty, the land seems bereft of promise. Away from the cities, the terrain wearies the eye. Flat and featureless, it stretches to the horizon. When I reached southern Iraq, the waxing sun of early May was already bleaching and baking the soil. Midsummer would bring temperatures as high as 60°C (140°F), and the savage sun, with no clouds to veil it, would incinerate the little plots of green.

A harsh and forbidding land. But one that shaped destiny. One that shaped even our own everyday lives. The mathematics of Sumer—based on a sexagesimal system—lives on in our 60-second minute, 60-minute hour, and 360-degree circle.

The two mighty rivers of the Fertile Crescent, the Tigris and the Euphrates, still flow tirelessly. Gods among rivers, these. Once, dim thousands of years ago, they quickened the soil beneath the hand of some unknown tiller sowing the seeds of civilization. Nippur rose, and Kish, and Ur of the Chaldees—names that echo down the eons like a cradlesong of mankind.

But all that happened long ago. Now the terrain—overfarmed, over-irrigated—dissolves into a khaki-colored infinity. Like the ancient kingdoms that it nourished, the Land Between the Two Rivers has succumbed to time and to exhaustion.

Nowhere is time's cruelty more manifest than in the sand-swamped ruins of Nippur. Once it was a garden city on the Euphrates, the religious center of Sumer, dedicated to the supreme deity, Enlil, who also figured in Ebla's syncretistic pantheon. But the fickle river shifted its course, abandoning

Nippur to the desert like a discarded lover.

From the Babylon Gate in Nippur's crumbled western wall, I walked across rolling mounds of potsherds. For generations archeologists have been probing the remains of this vast and once densely populated city with spectacular results. Yet the desert still dominates Nippur. Sand, like a slow but certain surf, laps about the base of Enlil's great, crumbled ziggurat; sand almost as dark as gunpowder, minute grains that sift into excavated structures and gradually lull them back into their long subterranean sleep. Standing there in the desolation, I remembered a love poem from the city's great days. Four thousand years ago a bride of King Shu-Sin had sung:

Bridegroom, dear to my heart,
Goodly is your beauty, honeysweet,
Lion, dear to my heart,
Goodly is your beauty, honeysweet. . . .
Bridegroom, let me caress you. . . .

Nippur, in its remote rise and fall, had known every nuance of human relations. Archeologists have found a legal text that affords vivid evidence of the essential sameness of mankind's condition.

It seems that, about 1900 B.C., three men—Ku-Enlilla, son of a barber, Enlil-ennam, son of an orchard keeper, and one Nanna-sig—murdered the son of a priest, Lu-Inanna. They had done so at the instigation of the victim's wife, Nin-dada, and one of the three had been her lover.

The king ordered a trial before the nine elders of the assembly of Nippur. The elders, whose professions ranged from birdcatcher to potter, pronounced: "Those three males and that woman should be killed. . . ."

Two lawyers spoke for the defense, and their words spell out the abysmal estate of women in the ancient world: "Granted that she killed her husband—what can a [mere] woman do that she should be killed?" Concluded the court: "Her guilt exceeds that of the ones who killed. . . ."

So all were put to death—Nin-dada, racked by the same dark passions that scream from this morning's tabloid, her lover, and his two accomplices. Somewhere beneath my feet they lay, all passion purged. Yet, the curious workings of archeology had conferred upon these felons a fame denied to many a king of this very city.

Babylon Cursed as Seat of Iniquity

Driving northwest from the ruins of Nippur, I passed through the modern city of Al Hillah, notable because it is built of mud bricks scavenged from nearby Babylon. Just outside Al Hillah, I came to a wondrous road sign: Turn left for Babylon; straight ahead for Baghdad. I turned left.

Tradition has made Babylon a synonym for wickedness and vice. Actually it was one of the noblest cities of antiquity—one that bestrode its world for two thousand years. Even the Prophet Jeremiah referred to it as a "golden cup in the Lord's hand."

To enter the ruins, you mount a contemporary stairway. At its top the remains of the great city lie before you—the squarish, arrogant architecture of bricks baked for eternity. You pass through the soaring Ishtar Gate, where sculpted lions and bulls and griffins stride on the looming walls.

Once they glistened in glazes of purple and gold. Once too the chariots of mighty kings clattered through to the roar of the multitudes. Beyond stretched the broad Processional Way, leading to the temple of Babylon's chief god, Marduk. The great King Nebuchadnezzar plated the interior of the god's sanctuary—40 meters (130 feet) long—with solid gold.

But Marduk and his temple are long gone. All is abandoned, all is quiet in the glare of the pitiless sun. The ruins stretch toward the Euphrates like a jumble of tiny, truncated tells. Picking my way through them, I reached the river and strolled among the erect date palms that line it like sentries.

A boy passed, leading the family goats

Wide-eyed and suppliant, King Itur-Shamagan of Mari exudes adoration for the deity to whom his statue was dedicated. Mentioned often in the Tell Mardikh tablets, Mari traded with Ebla for several decades. Located on the Euphrates River along the main trade routes of the Middle East, the city gleaned fabulous wealth. After Mari's discovery in 1933, excavators unearthed a three-hundred-room palace.

.92 M (3 FT.), NATIONAL MUSEUM DAMASCUS

homeward; two small girls sang a sweet childhood song. Otherwise, no sound save the soothing chirps of the swallows darting among the palms. What was there to remember, as the twilight fell, but the 2,600-year-old lament of the captive children of Israel? "By the rivers of Babylon, there we sat down, yea, we wept. . . ."

Baghdad Evokes an Ancient Spirit

But it is false to associate Babylon only with melancholy. The city lived too long and too joyously for that. In Baghdad, the next evening, I found an atmosphere more evocative of Mesopotamia's past.

In the Iraqi capital, public gardens line the Tigris, and I walked through them downriver from the Al-Jumhuriya Bridge. Roses, hollyhocks, oleanders grow in profusion, and sunflowers provide gaudy splashes of yellow. Vendors hawk sweets and nuts and chilled drinks. There are playgrounds, and children shriek with delight as they clamber on the slides and jungle gyms.

As the sun sets, lanterns pierce the dusk. They glow yellow, red, blue, green against the foliage. Neon lights shine above the fish restaurants and cafés along the shore. Small groups patrol the riverside, rejoicing in the first breeze of evening. Beside the restaurants, the men who cook *mezgoof*, or grilled fish, prepare their fire pits and restock their bathtub tanks with large carp fresh caught in the Tigris. It is pleasant to stand in the dark and watch the fish, split and affixed to stakes, cooking slowly beside a big, wind-blown wood fire. To eat them is something else; mezgoof, alas, tastes like grilled mud.

Gaily lighted pleasure boats dart up and down the river, voices lift in laughter, and the bats make their first sorties against the swarming mosquitoes. Of a spring evening, was life in ancient Babylon like this? I rather suspect that it was.

Autumn brought me back to Ebla, where the Italian Mission was tidying up after almost two months of digging. I found Dr. Matthiae jubilant. The campaign had produced some seven hundred significant artifacts.

"The most important," he told me, "is the lid to an Egyptian stone jar. It bears the cartouche of Pepi I, the pharaoh who reigned from 2332 to 2283 B.C. This proves that the city is as ancient as we claimed and, further, that it could not have been destroyed until after the beginning of Pepi's reign. It is also the first evidence ever found of Egyptians in the interior of Syria.

"And that's not all," he continued. "We've found some evidence suggesting that somewhere in the tell is another archive, this one dating from the early 18th century, the time of Hammurapi."

Ebla holds surprises yet to come.

New Life for Past Glories

No one can visit the stark remains of the great civilizations that once raised battlements and temples from the Syrian plain to the Persian Gulf without recalling the vindictive cry of the Prophet Jeremiah: "Her cities are a desolation, a dry land, and a wilderness, a land wherein no man dwelleth, neither doth any son of man pass thereby."

For long centuries that epitaph stood as the simple truth. The harsh, sunstruck soil had swallowed up the gaudy, pagan magnificence of Babylon and Nippur and Ebla. Even today, wolves howl in the wasteland beside Ur of the Chaldees.

Yet the skill of archeologists has imparted a new life to these germinal cities. In recognizing the brilliant achievement of those who built them, we do no more than recognize our legacy from those distant days when the world—at least to our kind—was as new as morning. □

Thousands of characters, with tales to tell of a long-darkened stage of history, will lure an increasing audience as their once bewildering language becomes more and more intelligible. Some subjects may sound mundane, but they significantly enhance the body of knowledge about Ebla: These tablets report on international trade, describe various professions, and keep track of cattle allotments to civil servants and payments in grain exacted by the king. Fruitful digging at Tell Mardikh could last another century. And beneath Ebla, experts feel, ancient settlements from the depths of man's civilized history await their turns. NATIONAL MUSEUM ALEPPO, GIANNI TORTOLI

Canada's Keystone
ONTARIO

By DAVID S. BOYER
SENIOR WRITER

PHOTOGRAPHS BY SAM ABELL AND THE AUTHOR

On the threshold of a new life, Niagara Falls hometown bride Josephine Mirabelli poses for wedding pictures at Oakes Garden overlooking the falls. Her province too

YOU *COULD* ENTER the Province of Ontario by crossing a bridge into the Canadian city of Niagara Falls. Millions do.

You'd likely be stricken with awe by that terrifying cathedral of falling water. You'd certainly know you were in tourist country: boat trips into the spray, observation towers, miles of souvenir shops, restaurants, motels. And in honeymoon land, of course. Most motels advertise honeymoon suites.

But you'd see little to suggest you had just entered the richest and probably most crucially important province in Canada today. Or a huge industrial workshop, fringing a vast northern wilderness. Or the heartland of the world's second largest nation, grappling with the most diverse and momentous problems in its history. Or a province with a bewildering love-hate relationship with the United States.

Especially if you were on a honeymoon.

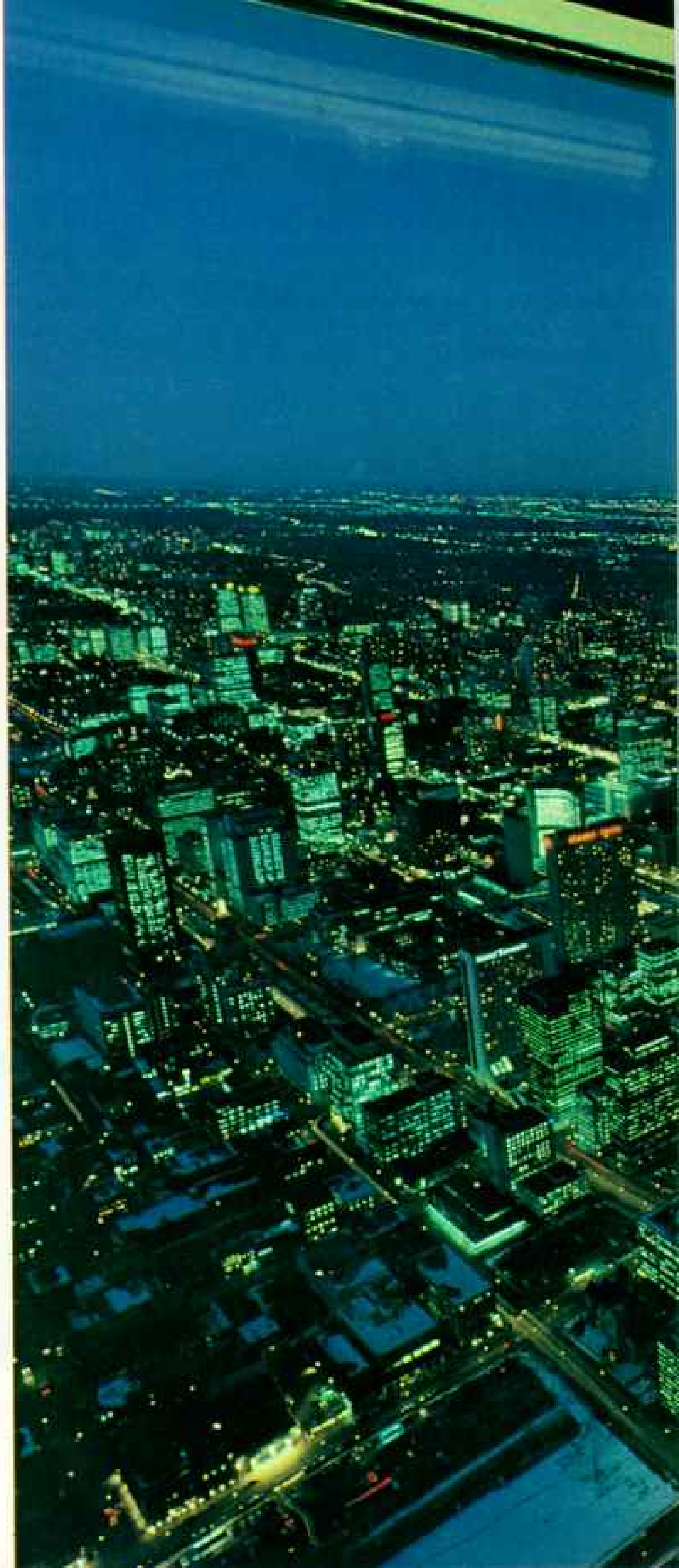
"It's curious. *(Continued on page 765)*

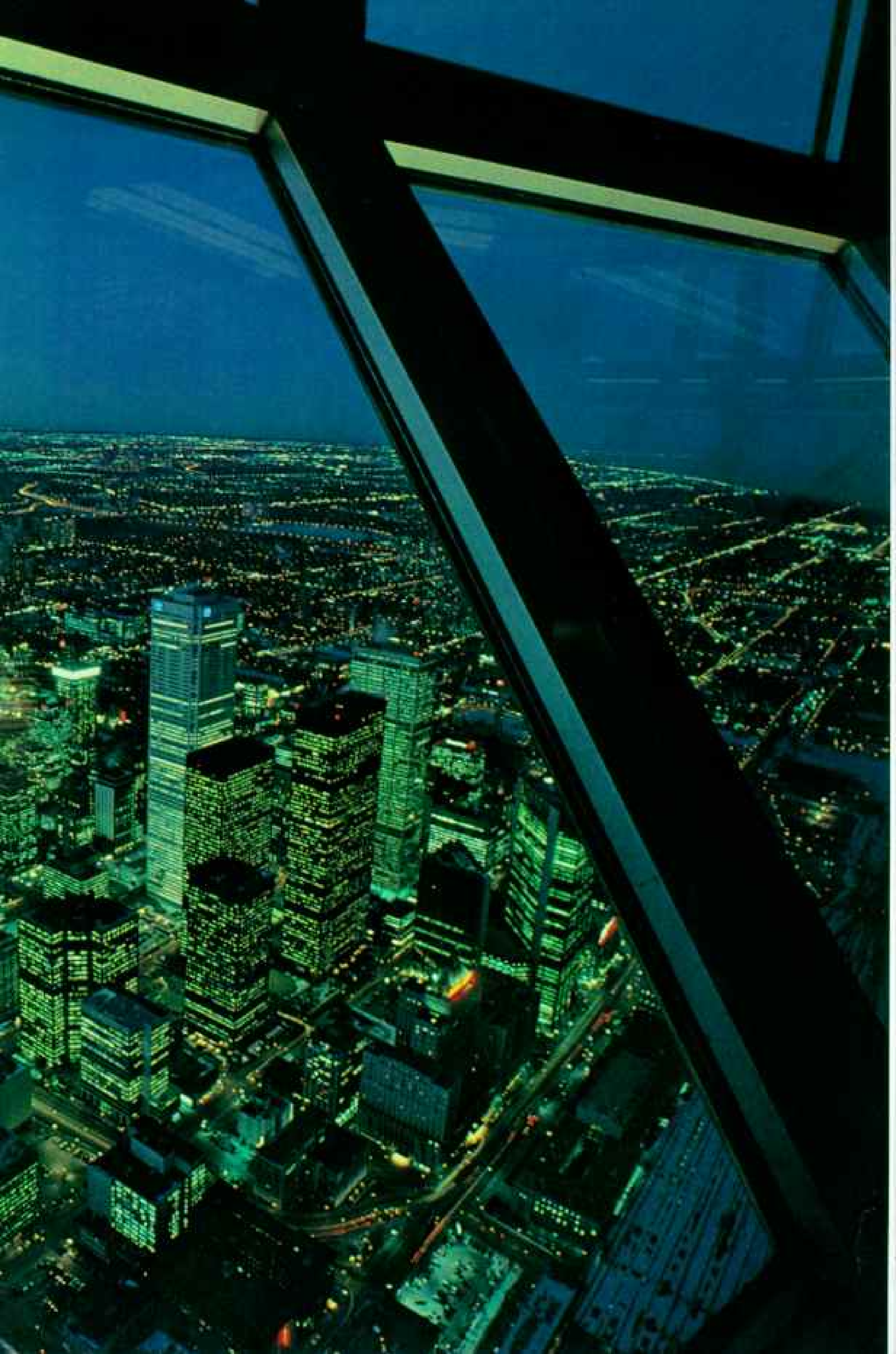
SAM ABELL

stands at a threshold. With Quebec threatening separation, Ontario as the most populous of Canada's ten provinces seeks to cement the marriage that is the Confederation.

SAM ABELL (ABOVE) AND DAVID S. BOYER

Reflection of success, Toronto caps its achievement as a center of finance, education, and the arts with the world's tallest free-standing structure, the 1,821-foot CN (Canadian National) Tower. The city's prosperity draws a third of Canada's 150,000 annual immigrants. Seen from the tower (**right**), Toronto stretches into farm-gobbling suburbs and looks toward the infinity of Ontario's underdeveloped north. "All this progress is marvelous," one city official quipped. "Now if only it would stop."





Ontario

"The golden hinge," Ontario links Canada's east and west. Ironically, this richest province began in 1791 as a poor English breakaway from French Quebec. Today's Ontarians are multinational, and their provincial budget tops 13 billion dollars.

Hudson Bay
Islands within Hudson and James Bays belong to the Northwest Territories
Belcher Islands
Polar Bear Provincial Park
James Bay
Akimiski Island
Severn
Winisk Wild River Provincial Park
Attawapiskat
Sandy Lake
Summer Beaver
Lansdowne House
Fort Hope
Lake St. Joseph
GOLD IRON
COPPER ZINC
COPPER
Whitewater Lake
Albany
Moosonee
Moose River
Moose Factory
Onakawana
Lac Seul
Lake of the Woods
ZINC COPPER LEAD
Lake Nipigon
IRON
NICKEL
Thunder Bay
Quetico Provincial Park
Fort William Historical Park
Pukaskwa National Park
TRANS-CANADA HIGHWAY
COPPER ZINC
Cochrane
ZINC SILVER COPPER
Timmins
GOLD
IRON
SILVER
NICKEL
URANIUM
Sudbury
Elliot Lake
Ottawa
Chalk River
Vankleek Hill
Algonquin Prov. Park
Ottawa
Morrisburg
St. Lawrence
Georgian Bay
Rideau River and Canal
Lake Simcoe
Kingston
Lake Huron
Rolland Marsh
Oshawa
Lake Ontario
Toronto
Kitchener
Stratford
Hamilton
Niagara-on-the-Lake
Niagara Falls
St. Catharines
OIL PIPELINE
GAS
Windsor
SALT
Lake Erie
Lake Michigan

Tundra
Transition forest
Forest
Farmland
Parkland
ZINC Mineral-producing area

Power-generating centers
Hydro
Thermal-conventional
Thermal-nuclear

0 KILOMETERS 300
0 STATUTE MILES 300

DRAWN BY LEO B. ZEBARTH
COMPILED BY MARGUERITE B. HUDDLESTON
NATIONAL GEOGRAPHIC ART DIVISION

ALASKA
U.S.
CANADA
YUKON TERRITORY
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
Hudson Bay
QUEBEC
NEWFOUNDLAND
PRINCE EDWARD ISLAND
NOVA SCOTIA
NEW BRUNSWICK

0 KILOMETERS 1000
0 STATUTE MILES 1000

AREA: 412,582 square miles. **POPULATION:** 8,400,000. **CITIES:** Toronto (pop. 2,850,000), provincial capital, is Canada's largest metropolitan area; Ottawa (pop. 304,000), nation's capital. **ECONOMY:** Ontario's manufactures equal half of Canada's total; second in mineral production after Alberta. **LANGUAGES:** 6,460,000 English speakers; 462,000 French.

Everybody thinks of Niagara Falls as the honeymoon capital of the world, and we don't even know how the idea got started."

James Moir heads the Canadian Niagara Resort and Tourist Association. Under the thundering of the falls, he tells me they have 14 million visitors a year—more than any other resort town in North America. "We've heard that Napoleon's brother brought his bride up here by stagecoach from New Orleans in about 1804. We can't corroborate that story, but grooms have been bringing brides for at least a hundred years. Filmmakers produce honeymoon movies here all the time, but they never even *ask* how it all came about."

Now as it happened, I married into Canada twenty years ago—a young woman from Vancouver, British Columbia. Out there, they feel about as far from the province that influences them, politically and economically, as you can get.* (And, in fact, Siberia is geographically closer than Ottawa, their national capital.)

Like Canadians in every other province and territory, they have a basic mistrust of this Ontario. Yet they know in their bones that throughout Canada's history it has been Ottawa and Toronto and Ontario that have held the nation together. And in recent times, with a grinding buildup of troubles across the land, Canadians are taking a closer look at this heartland province. (See **Close-Up: Canada—Ontario**, a supplement to this issue.)

When I first arrived to explore Ontario, it wasn't through Niagara Falls but Ottawa. Here on Parliament Hill, home of the Government of Canada, the questions tend to gather, and the answers sometimes too.

Queen Orders a Capital Compromise

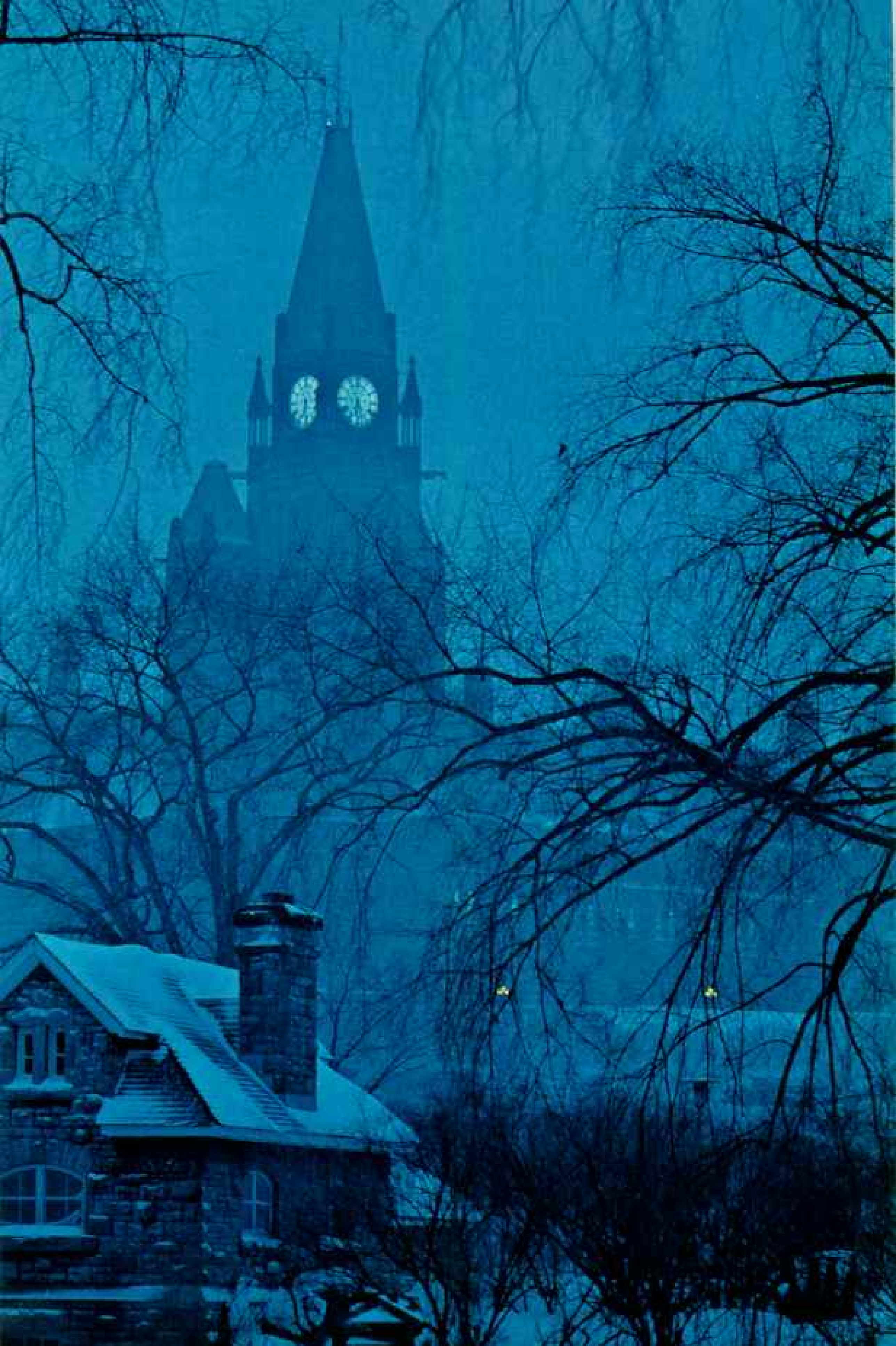
Ottawa is the capital because 120 years ago Queen Victoria decided that Canada was never going to work with Toronto as its capital—nor Quebec City, nor Kingston, nor Montreal. All those places had been tried, in French and English Canada, and for reasons having to do with two centuries of nationalistic non-understanding, new and neutral ground was needed.

So Victoria placed her new capital out in the wilderness on the forested border between the French and English, on the Ottawa and Rideau Rivers. And away from the troublesome United States border. After the War of 1812, England's military built the 124-mile Rideau Canal between Ottawa and Kingston, so British forces wouldn't have to sail a long stretch of the St. Lawrence River under the menace of cannons on the U. S. shore.

* "Dream On, Vancouver," by Mike Edwards, appeared in the October 1978 GEOGRAPHIC.

DAVID S. BOYER

Skillful negotiator, pipe-smoking Ontario Premier William Davis—here conferring with aide Edward Stewart—saw his ten-point economic program for the nation accepted at this February meeting of Canada's premiers and prime minister. Davis operates from strength; his Progressive Conservative Party has ruled Ontarians—a third of all Canadians—for 35 years. He believes that "resolving the national-unity question goes hand in hand with solving unemployment, inflation, and regional disparities."



When winter comes, good-natured Ottawans don woolens and seek the bright side of the 85 inches of snow and minus 20°F temperature that make the city the coldest capital anywhere, except for Ulan Bator in Mongolia. A creative child transforms a frozen pane into palm-print art (**right**). Skaters—as many as 35,000 on a Sunday—sport on a six-mile rink downtown, the Rideau Canal (**below**).

Behind the traditional English facade of Parliament (**left**), Canadians of many ethnic groups and political persuasions warm up with vigorous debate under a system bequeathed by Great Britain. They are fashioning radical alterations. The languages act of 1969 says federal services must be available in English and French. To stress biculturalism, Ottawa was united with the Quebec city of Hull across the river to form the National Capital Region.

As winter melts into blue-skied spring, millions of tulips bloom and the first of two million visitors arrive. Cruise boats and canoes wend the Rideau; young people tune up for the Ottawa International Festival of Music. At Parliament, university reservists don red coats to take part in the popular "Changing the Guard."

ALL BY DAVID S. BOYER

The capital has been here ever since, for worse and for better. For better, recently.

Ottawa has had a sweeping renovation. Miles of sleek new government office buildings surround the Old World core of Canada's Parliament Buildings and monuments. There are parks by the dozens and flowers by the millions, along with bicycle paths and walking trails, restaurants and theaters—on both the Ontario and Quebec sides of the Ottawa River. And with French and English Canadians of both sides happily using them all.

City Spreads Cosmopolitan Feast

It is late September. In running shoes and only a hundred yards from my hotel, I turn onto a leaf-strewn pathway along the Rideau Canal and fall in with another jogger. Jim McDonald, it turns out, is running not only for the sake of his cardiovascular system and the crisp glory of the morning, but is also gearing up to help his boss, Prime Minister Pierre Elliott Trudeau, in the forthcoming election race.

"Ottawa is Canada's best-kept secret, you know," Jim says. "And even in the winter. It's the coldest major capital in the world, but this canal is always mobbed with ice skaters. I skate twelve miles myself most mornings before breakfast. And ski in Gatineau Park, right over there in Quebec.

"Nighttimes, at the National Arts Centre, you can hear concerts by the best orchestras from around the world, enjoy the finest theater, meet fascinating people. Across the river you can find French restaurants to make your mouth water."

Why does Jim McDonald, raised in Toronto, consider all this so significant? Because he knows Ottawa's dismal history.

For a hundred years after Victoria chose this capital city, it sat stolidly on an Ontario bluff, content to be dull and frumpy, acting bigoted, looking down its nose into French-Canadian Quebec.* Its government bureaus were almost completely under the control of English-speaking Canadians, Anglophones, who had little awareness of Francophones or their language. With few exceptions French-speaking people were relegated to clerical and menial jobs. Provided they would speak English, of course.

Today all that is changed. Francophones hold thousands of important positions. The French language is not only respectable, it is de rigueur.

Under French-Canadian Prime Minister Trudeau, and before him Anglophone Prime Minister Lester Pearson, the city not only cast off most of its moldering, red-brick Victorian shell, but also joined the rest of the nation in a billion-dollar bilingual and bicultural revolution.

"Everything you do here," Jim McDonald says, "is now both in French and English. They are more than simply two official government languages for work. You need French for just about everything—for cocktail parties, for dinners, for plays and operas in French."

Dual Cultures—Precarious Balance

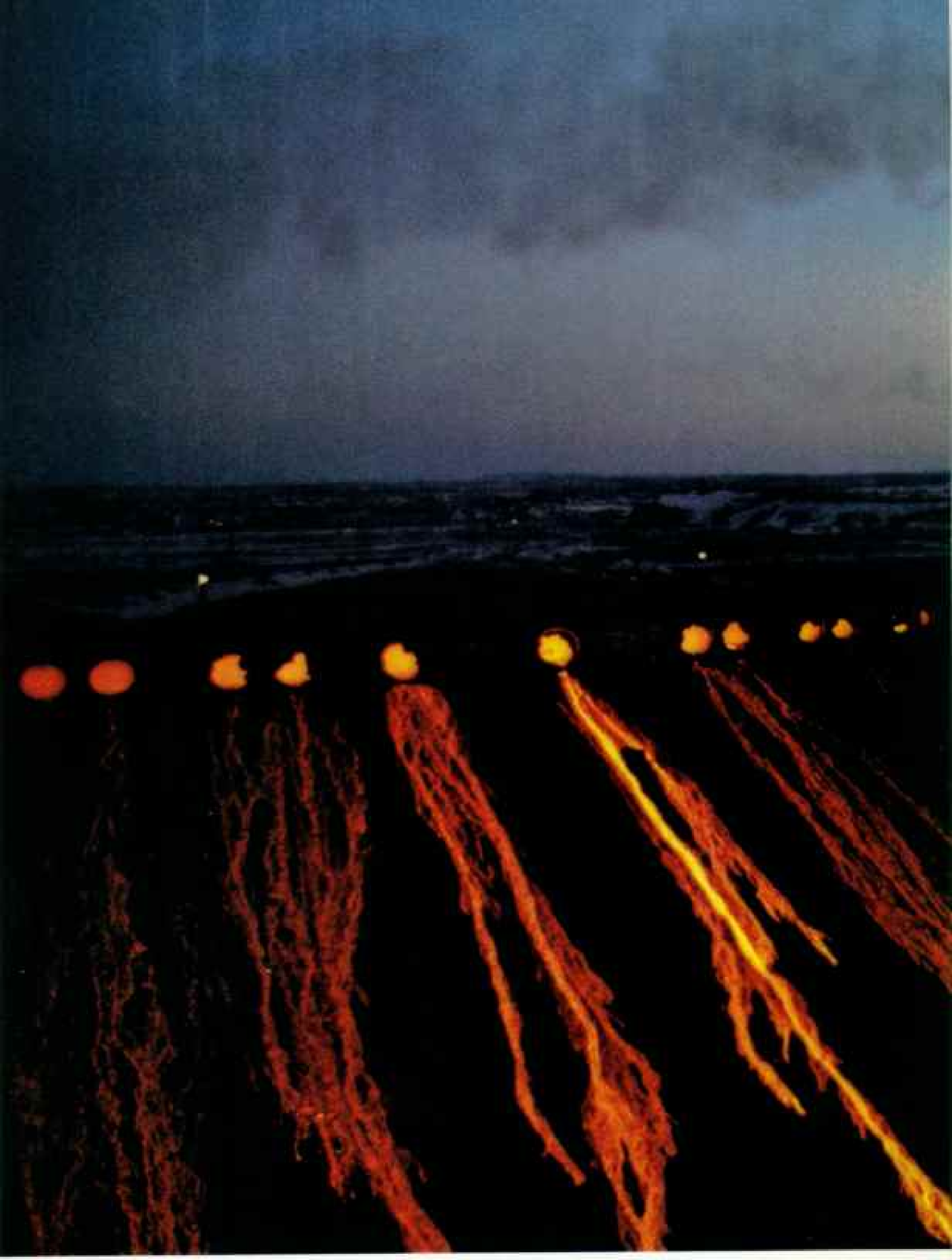
Ottawa, finally, has become a meeting place. Here the traditionally bitter "two solitudes" of Canada—the mutually isolated "superior" English and the withdrawn, resentful French—are meeting in a new atmosphere, wining and dining, talking and playing, operating a national government together. In two languages. However precariously.

"The question," says McDonald, "is whether we've been able to make enough changes in our attitudes, and soon enough, to help dissuade the French Canadians of Quebec from voting themselves out, and so breaking up Canada.

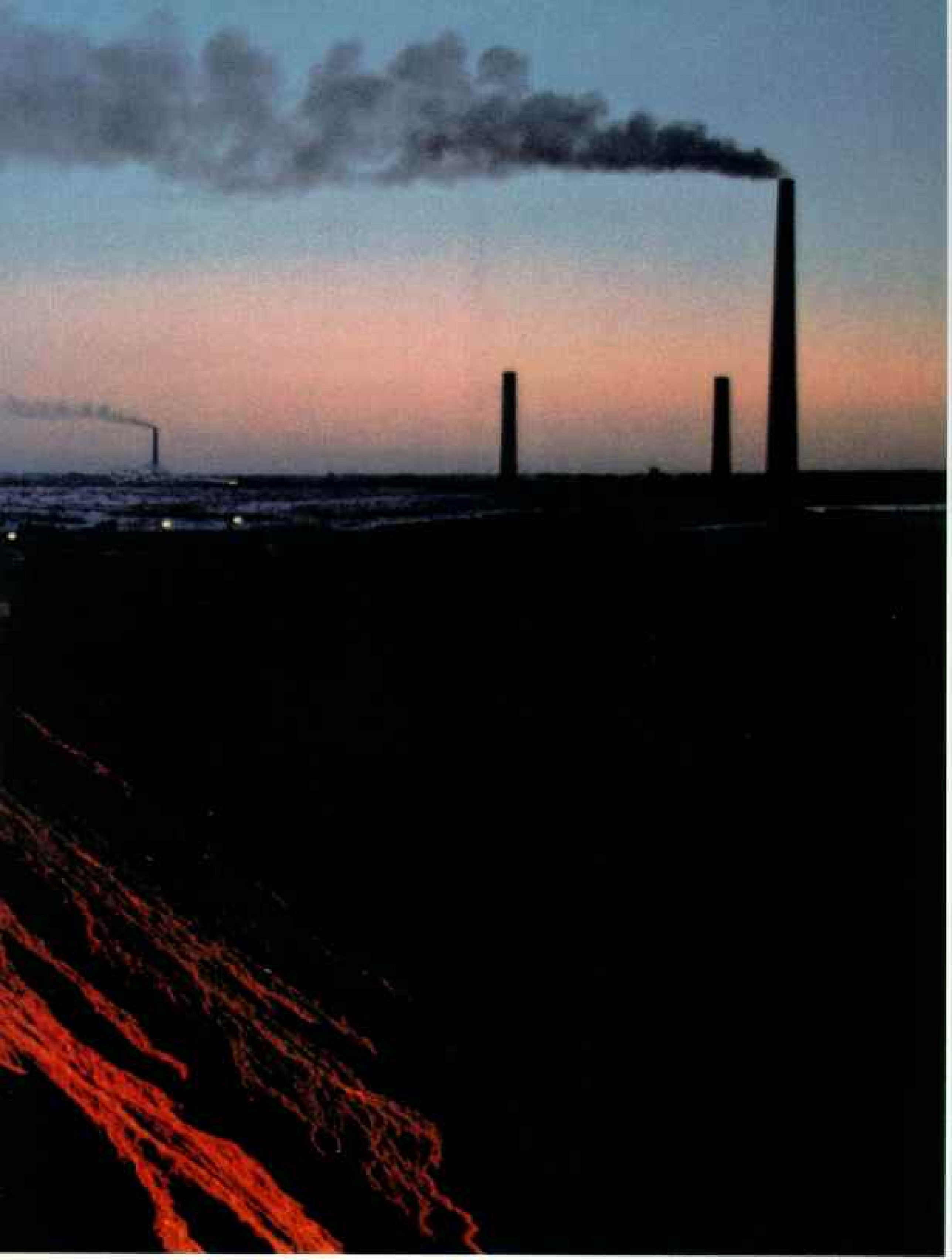
"It's incumbent on people like me, who grew up totally Anglicized, to learn to consider our two languages and our two cultures as a national privilege. We should stop fretting over who we are, vis-à-vis you Americans, *(Continued on page 772)*

*See "One Canada—or Two?" by Peter T. White, NATIONAL GEOGRAPHIC, April 1977.

Learning the ropes, deckhand Bridget Westcott sets steel mooring cables on the 730-foot *Glossbrenner*, one of the workhorse freighters serving Ontario's 35 St. Lawrence Seaway ports. Ignoring detractors claiming a woman can't do it, 22-year-old Westcott has worked her way up to the wheelhouse "the old way—on deck." SAM ABELL



Like erupting volcanoes, caldrons at Sudbury disgorge hot slag, refuse of the world's largest nickel-mining operation. For decades sulfurous emissions seared the landscape, leaving it so barren that U. S. astronauts trained here for moon walks. Now other nations



SAM ABELL

have cut Canada's share of the free-world nickel market from 92 to 43 percent, and 2,200 Sudbury miners have been laid off. Nickel is but one corner of Ontario's vast mineral warehouse, which contributes $2,500,000,000 annually to the Canadian economy.

SAM ABELL

Eager pony trainer, 10-year-old Katja Fagerstroem, here with a friend's mount, won points at a June show in Aurora, opening a season she hopes will carry her to Toronto's Royal Agricultural Winter Fair.

and should start being unified Canadians."

If Ottawa worries about national unity, Toronto, fifty minutes away by jet, has bleary eyes over the depressed economy.

Here live 2,850,000 people, a tenth of Canada's population.* They run the commercial powerhouse of the nation and wear a longtime nationwide image as tightfisted bankers, businessmen, and manufacturers, all bent on ruling and supplying Canada as if from Imperial Rome.

Golden Horseshoe Scores a Ringer

Toronto's commercial complex has expanded along the curving western shoreline of Lake Ontario, from Oshawa to St. Catharines and through other onetime small-towns-become-rich-cities like Mississauga, Brampton, Burlington.

Now known as the Golden Horseshoe, this crescent has become Canada's only megalopolis, with 3.8 million people. Clusters of gleaming skyscrapers cleave the horizon, including high-rise offices for four of Canada's eleven chartered banks as well as for hundreds of Canadian, foreign, and multinational corporations.

Spread out below them are clanging concentrations of industry, with two huge steel mills in Hamilton as centerpieces for miles of manufacturing plants.

Wages and salaries in the Golden Horseshoe exceed those in the U. S., and this financial stronghold helps Ontario account for 43 percent of all taxes paid in Canada.

Toronto itself is the headquarters of the English-speaking press—newspapers, magazines, books—and the performing arts: radio, TV, theater, and concert hall. I found that many Torontonians feel they have been stigmatized as the communications and cultural overlords of English Canada.

However that may be, Ontario's provincial government here in Toronto presides over some of Canada's cleanest and most crime-free cities. The province's 37 universities and career-oriented colleges provide excellent educational opportunities for young people, and its social services offer superior health care and pensions. In many ways Ontario is the envy of the continent.

Little wonder, then, that it is a mecca

*See "Canada's Dowager Learns to Swing," by Ethel A. Starbird, GEOGRAPHIC, August 1975.

for immigrants from just about everywhere.

Cashing a United States traveler's check in downtown Toronto, I stand beneath the shimmering strands of a five-story hanging sculpture in the 12-story lobby of the gold-windowed Royal Bank of Canada (2,500 ounces of gold washed onto the plate glass), looking into the dark eyes of a beautiful and foreign face.

Lucy Ann Ferrone smiles at my question:

"Yes, in my department alone, we have a Burmese girl, a Chinese, an East Indian, and a dozen new immigrants from Europe—German, Polish, Russian, Greek, Portuguese. I'm Italian-Canadian.

"We have a class on how to answer the telephone, 26 of us, and only three speak with a Canadian accent."

So many immigrants have poured in that as many as 260,000 Ontarians are said to speak no English at all. That does not include, of course, the half a million Franco-Ontarians, most of whom are bilingual.

Bank Plans to Polish Image

On the 11th floor of the towering Toronto Dominion Bank, at home in his spacious beige-carpeted office, TD chairman of the board Richard M. Thomson concedes that the Canadian banking business has only recently begun to correct another bad image—English-Canadian male.

"We will have women here in our executive suites before long," he says. "So far, we have fifty women managers across Canada, out of 985 branch banks, but that number is growing."

It happens this day that there is another slide in a four-year-long economic slowdown: The Canadian dollar has fallen again, to a new 40-year low. It has lost 14 cents in 15 months against the U. S. dollar. Mr. Thomson takes me down to the TD "trading room," where computers display the rise and fall of international currencies.

"Your dollar and ours were both overvalued," he says. "But our economy has suffered more deeply. Too much borrowing from abroad. Too many pay raises. Declining productivity. Falling mineral prices. High inflation and stubborn unemployment rates. Our efforts to solve these problems need to be more concerted."

Mr. Thomson is one of many who feel that the economic destinies of the U. S. and Canada ride the same train.

"Our economies are very closely tied together. Ontario and specifically Toronto are undoubtedly among the most American places in Canada. We reflect your trends here very quickly, in optimism or pessimism, in fashion or finance." Even, it seems, in Thanksgiving Day.

Loyalists Left Turkeys Behind

Thanksgiving may have come to Ontario with a heavy influx of United Empire Loyalists, refugees from the new United States, who left when King George III lost the Revolutionary War.

"We inherited the holiday from the U. S., like so many other things. But as you see, we don't do all that much about it."

Two Toronto businessmen have taken me for a Thanksgiving Day weekend of bass fishing at their cottage on Lake Huron. No wives. No big family dinner. Just lunch. And talking a little cold turkey about the 220 million foreigners to the south.

I borrow a fishing rod from Joe Dobbs, just retired from Moore Corporation, largest maker of business forms in the world. At the tiller is Joe's buddy, Gordon Acri, an Italian-Canadian contractor.

"My company is unusual," Joe says. "It's Canadian. But the economy is highly American. You own more of our industry and natural resources than we do and control too many board rooms in Toronto. We've got more American capital and companies than are good for us."

Gordon joins in the assault: "We get more American TV channels, and so more Americanism, than many big U. S. cities do. We finally got rid of some Canadian-edition U. S. magazines, but for years there wasn't much chance for our own."

"Nothing personal," says Joe. "Just afraid of your power and your crushing culture. Pierre Trudeau said it: 'It's like sleeping with an elephant; you lie awake waiting for him to turn over.'"

Gordon is busy changing his lure. We haven't been catching many fish.

"Let's face it," he says, "we're also envious. We made a big mistake, you know. We should have divided North America from north to south, not east to west. Then we'd

Weaving family ties as strong as their Mennonite faith, sisters—two of them twins—help their mother husk corn after a buggy ride to the fields to pick it. The austere, self-sufficient Mennonites near Kitchener, descendants of pioneers from Pennsylvania

EMY ARELL

and Europe, win admiration for their fine farms with high yields based on crop rotation and manure fertilizer. But they are often at odds with the government for their unwillingness to participate in welfare programs, join cooperatives, or be computerized.

each of us have some warm weather."

To be sure, millions of Americans do come north to Ontario in the summer. But proportionally more Canadians go south in winter, or at least spend lots more money.

"Canada had a nearly two-billion-dollar tourist deficit in 1977," Joe says. "But it's not only the lure of Florida and California and Hawaii. It's also our own high wages and prices. Meals and motels and air fares, everything costs more up here. Actually, we can have a holiday for less south of the line, even taking the loss on our dollar."

Blue Jays Play Beerless Baseball

Yet the cheap Canadian dollar is one reason for the flow of American visitors northward. Another is that the Toronto Blue Jays have finally brought major-league baseball to Ontario. Just don't expect to cheer over a beer at Exhibition Stadium.

No beer? Well, the province turned it down. "I don't want a bunch of drunks spoiling the game for my kids," a lawmaker had said. (Even though the Blue Jays are owned in part by the Labatt brewery!)

Roy Hartsfield is the Blue Jays manager—a chipper little good ol' boy from Georgia, who long ago played second base for the Boston Braves. I find him under the stands, waiting out a rainstorm to start the season's final game.

"There's only one Canadian on our team," Roy admits. "But Toronto doesn't mind. Canadians know that when U. S. hockey teams go looking for players, they search up here in Canada.

"An American kid is born with a baseball bat in his hand, and a Canadian kid with a hockey stick. You can't practice outfielding in the snow, you realize. So Canadians, if anything, usually become pitchers. You *can* practice pitching in a warm basement."

Roy squints out into the cold rain:

"First game we ever played here was in a snowstorm. But the fans came in their parkas and filled the stands anyway.

"Fantastic the way Toronto has accepted us. One and a half million paid admissions last year. And ten million dollars' worth of Blue Jay hats and jackets and emblems. And not only Torontonians. They come from all over Ontario. And Buffalo and Detroit and other U. S. cities too.

"Toronto's a magnet for Americans. A good, clean city. Canadian opera and ballet, orchestras and plays and films. They're right across the street there, at Ontario Place. Uptown there are nightclubs, discos, hotels, restaurants. First class, with international cuisines! You can't count 'em! And safe streets. And a warm welcome.

"We know—we're Americans on the Blue Jays. And Canadians really took us into their hearts!"

I recall Joe Dobbs's complaints about United States domination of Canada. Anti-Americanism? Well, nothing personal.

"We fell away from you in your time of racial violence and your Viet Nam war," another Torontonian tells me. "But we are swinging back to the notion that our closest neighbors are our best partners. There is renewed friendship between our countries."

Province Stocks the Nation's Larder

The Golden Horseshoe hasn't converted all of southern Ontario into city streets and factories and office buildings. The land-use planners fight to prevent that.

I drive the rolling countryside, breathing air scented by apple orchards, vineyards, and tobacco fields—fragrances overpowered in places by over-rich aromas rising out of beef and dairy pastures. Ontario farms, concentrated in a southern belt 500 miles long, produce a third of Canada's crops (except for grain), and are surpassed in dairy products only by Quebec's.

For an hour I ride a tractor-combine with Harry Horlings and his wife, Jane, harvesting onions (pages 778-9). Harry's face tells of wind and rain and sun. He has to shout over the roar of the machinery.

"Farmers here will box up 100,000 tons of onions and carrots in the marsh," he says. Holland Marsh, drained to its ebony-black organic soil, borders Lake Simcoe.

"Even so," he admits, "much of our produce comes from the States. We've got good land in Ontario. But with our long winters, there are many things we just can't grow."

I'd heard that buyers are waving cash before the eyes of Ontario farmers.

"There isn't much left you can afford any more," Harry says. "To buy *or* sell. *Or* farm. Land is being swallowed up—by towns or roads, industries or shopping malls. Farm

prices go on up. Those 25 prime acres in onions next door sold last week for a quarter of a million—ten thousand dollars an acre!

"Fortunately, we have our son David. He's 17. And we'd lots rather give the land to him. Not for the dollars it'll be worth, but so he can have the same privilege we did: to work with what God gave us."

Settling a Rugged Northland

What God gave Ontario includes a cold, wild north—a wilderness that stretches away to Hudson Bay, and westward for a thousand miles (pages 784-5). I would travel for days but never reach its ends.

To the north, over the past century, went prospectors and miners, digging tunnels into the Precambrian rock of the Canadian Shield, finding silver and gold, copper, nickel, lead, zinc, platinum, and, later, uranium. With them went loggers and farmers to clear the forests and tame the land, thousands of them French Canadians.

From Toronto, meanwhile, went men with money and know-how—businessmen and engineers, mining tycoons and timber barons—English Canadians, British, and Americans.

Together they created new towns, mines, smelters, and pulp mills and sent the resources of the north to meet the needs of the south. In time they sent tens of billions coursing into the Ontario money stream, and billions in profits abroad.

When a forest was cleared or an ore body mined out, they moved on to others, almost without looking back. Boomtowns and billions. Ghost towns and spent lives. But constantly more exports, for a burgeoning economy, a spiraling stock market. Gradually the province came to be divided, north and south, in wealth, in life-style, in politics.

On a frozen February day I depart cosmopolitan Toronto for the rugged reality of the north and the tough people who give it glamour—working Canadians of every national origin who have cast their lot with a land that offers outdoor jobs and fishing and hunting and wilderness and quiet.

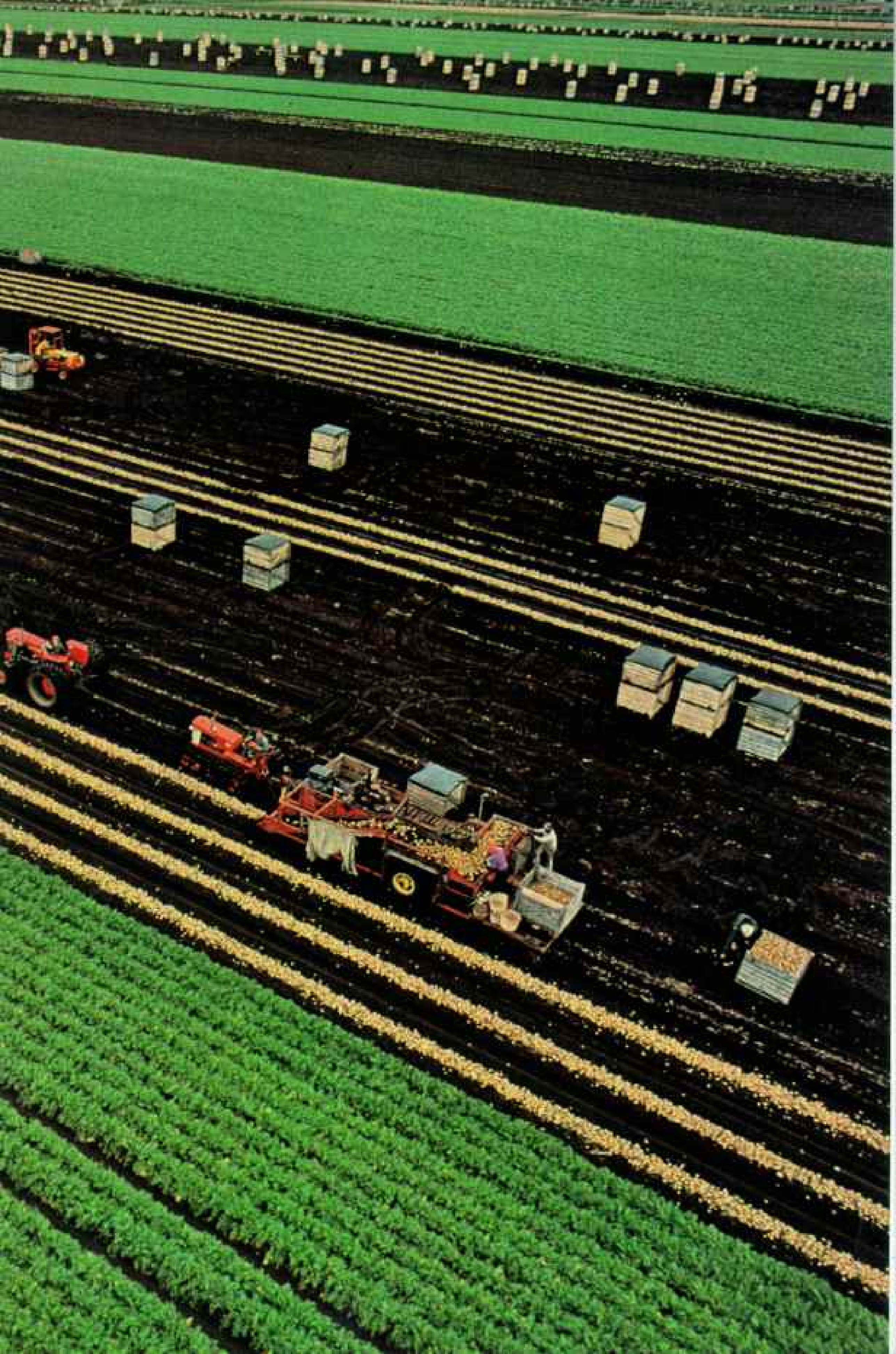
They are not "too fussy," as they often put it, that the north levies heavy taxes—in hard labor, cold weather, social problems, and economic uncertainty.

Our Air *(Continued on page 781)*

SAM ABELL (ABOVE) AND DAVID S. BOYER (FOLLOWING PAGES)

Just within eat reach, Golden Delicious apples grow conveniently low in realtor Henry Klassen's orchard at Niagara-on-the-Lake. The mini-trees, popular in Europe, are created by grafting normal branches to dwarf roots. "Pruning like mad" helped Klassen's two acres produce 1,200 bushels last year, three times the yield of conventional orchards.

Black muck is the medium, big harvests the message in the Holland Marsh, where Harry Horlings gathers yellow onions (**following pages**), carrots, and lettuce. Drained in the 1920's, the 7,200-acre marsh is heavily fertilized and irrigated to produce bumper crops. Ontario's family farms raise 95 percent of Canada's corn as well as fruits, vegetables, soybeans, and tobacco in such profusion that farm receipts are the highest in the nation.



Canada jet spins icy contrails high over snow-laden forests. As we reach Ontario's mining belt, the forests begin to thin. Blue-frozen lakes stamp jigsaw-puzzle patterns across an almost forever land.

We circle low to land at Sudbury, beautifully blanketed in snow. In summer some areas around its once highly toxic smelters are like naked stretches of the moon (pages 770-71). During the roaring 1940's Sudbury's mines and smelters churned out 92 percent of the free world's nickel. But now its workers face an adverse future; demand for nickel has slumped, and mines in Australia, the Philippines, Latin America, and the Soviet Union have joined the competition.

Miners of nearby Elliot Lake and Timmins had suffered more in the sixties. Elliot Lake's uranium had simply gone begging on a fallen market, and mines in Timmins had closed down, one by one, as the price for gold wandered in the doldrums.

Trying to Break the Pattern

Today Elliot Lake has revived, and has begun digging seven billion dollars' worth of uranium for Ontario's atomic-energy future. Gold prices are again under full sail, but more significant for Timmins is the discovery, aided by electromagnetic devices, of a new wealth of zinc, silver, and copper—a mine called Kidd Creek.

Some leaders of the north, however, have finally declared war on boom and bust.

"Someone has to face the problem. *Some* generation. Maybe there'll *be* no tomorrow. Natural resources are exhaustible. We're out to change the pattern of the north."

So states Doug Frith from his new regional office in Sudbury. He heads the municipal authority here, which coordinates the governments of a city and its suburbs. The concept originated in Toronto and has spread to 11 other regions in Ontario.

"We're trying to bring together labor and management, the provincial and federal governments, and everybody else, to plan our northern future," Doug says. "We want diversification, new industries, research and development, education. We can't live forever on just trees and minerals."

With the miners of Kidd Creek I go thousands of feet below frost line. But even underground there are winterbound tunnels filled with ice and others flowing with ice water, for those tunnels lead from Kidd Creek's deep open-pit mine.

From their giant machines, with lights flashing in the darkness, miners send thousands of tons of high-grade ore crashing into North America's highest-capacity underground crusher. If the men come up cold and wet, there are hot sauna baths, and clothes washers and dryers.

"One of the richest and most modern zinc and silver mines in the world." Eric Belford should know; he's manager of mining.

"We'll make a bundle, too, when mineral prices go back up. And the government will

BOTH BY SAM ABELL

Refugee from civilization. Wendell Beckwith fled a world-ranging career as a consulting engineer 17 years ago to design a life with nature. He settled on Whitewater Lake in northern Ontario, a wilderness the size of France and the two Germanys combined. Helped by Indians, he builds a "snail home" of logs (**above**); the moss-chinked roof will sprout an early vegetable garden warmed from within.

collect big taxes. Raw-material exports—that's what Canadian mining is all about."

Aboveground, far above, the jet carries us northward toward Hudson Bay; most of the passengers are taciturn northern Canadians in Eskimo-style parkas.

NDP Champions Northern Rights

More talkative, wearing a pin-striped suit in the next seat, is Arnold Peters, member of Parliament. Representing working-class Ontarians of the Timiskaming District, he belongs to the New Democratic Party. The NDP is a northern socialist challenge to Ontario Premier William Davis's investment-oriented Progressive Conservative southern constituency.

Arnold Peters gestures across the cold blue landscape; a feather of white smoke rises from another lonely mining town. He was a miner once himself.

"We need jobs up here desperately," he says. "We may even open Ontario's first coal mine, at Onakawana. There's enough lignite there to generate a million kilowatts for thirty years or more.

"But there are questions. Should all the profits keep traveling to Toronto and the U. S.? Or should some be held back for the Canadians who do the work? The NDP has just called for public ownership of the big mines. We want some cushion for our towns and homes and families, after the trees and the nickel and the coal run out.

"And not only that. There's the big problem of damage to the environment. And the Indians. This is Indian country."

Ontario has more Indians—at least 65,000—than any other province; indeed, almost all the land was acquired by treaty. The trouble, as one official puts it, was that Indians looked on treaties as articles of peace, while white men saw them as writs of surrender—land acquisitions. Over the years the Indians have been crushed into ghettos of unemployment and welfare.

We land at the part-white, part-Indian town of Moosonee, near James Bay, and taxi over the frozen Moose River to an Indian settlement called Moose Factory. At the community hall Cree Indian leaders are making emotional speeches to Mr. Justice Patrick Hartt of Ontario's Supreme Court, head of the Royal Commission on the Northern Environment.

The Indians speak of their ties to the land, and of the broken promises the white man made at Moose Factory in 1905. At that meeting chiefs of five local bands were given one hour to agree to Treaty Number 9, covering an area nearly as large as Wyoming.

Sinclair Williams, a band spokesman, addresses Justice Hartt: "We are very concerned about the white man destroying our surroundings. Our relationship with the land is as sacred as a marriage created by the Great Spirit. This marriage must not be broken or our people cannot survive."

Others echo his feelings. Then John Fletcher stands up. His face is lined and furrowed like a relief map. His eyes are deep and blinking; for 90 winters he has squinted into the blinding northern snow. He speaks in the Cree language through an interpreter: "I am one of the living witnesses of the signing of the treaty. The commissioners representing His Majesty said, 'Do you see this river flow which never stops flowing? This treaty will be like an example to it.' I think we forget what the treaty means."

Justice Hartt is touched. He takes the old man's hand and promises to carry his message to the great white chiefs of the south.

"Quiet Revolution" May Get Louder

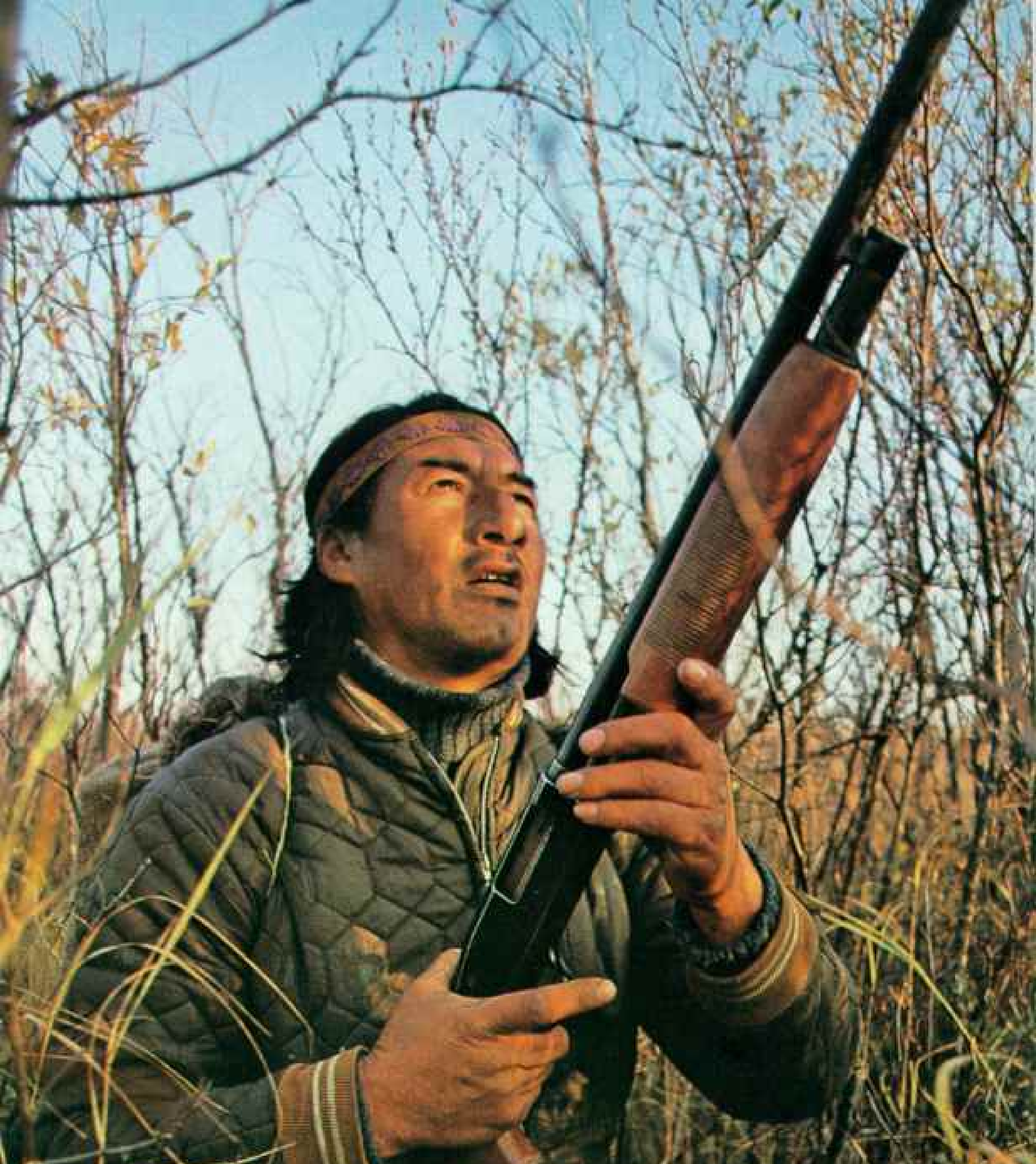
When the time comes to negotiate with federal and provincial leaders, Andrew Rickard intends to be on hand as leader of the Indians of the north. Andy is president of the Grand Council of Treaty Number 9. He is only 36; his English is commanding, his confidence clear, his determination burning. Wearing a wolf-fur parka, he tells me:

"We are conducting a quiet revolution, within the system. We intend to give Ontario and Canada *(Continued on page 787)*

Fat with feasting on seals, a polar bear and her cubs swim in Hudson Bay near the preserve that carries their name, Polar Bear Provincial Park. With great foresight Ontario in 1968 set aside a 9,300-square-mile subarctic habitat as large as New Hampshire to protect the land and its bears, caribou, arctic foxes, and snow geese. SAM ABELL

Wild to the far horizon, northern Ontario stretches from the spruce-draped highlands of the Precambrian shield, formed during earth's infancy, northeast to the young lake-strewn tundra of Hudson Bay (**above**). Here the last ice age so depressed earth's crust that the land is still recovering, rising 50 inches a century, the greatest uplift on the continent. These shallow lakes are nearly lifeless, but in rivers and upland lakes fish flourish and tourists follow their lure. Here an Indian guide prepares a walleye lunch on his canoe paddle (**right**).

Concern grows for this special frontier, so inviting to expanding pulp, mining, and hydroelectric operations. Already mercury pollution has poisoned some lakes. Indians seek safeguards for the land. Says Cree chief Andrew Rickard: "We intend to protect our God-given right to live in harmony with nature at any cost."



five years to agree to help us become independent—economically, culturally, and politically. And to 'deprogram' ourselves from government charity. Our goal is the year 2000. We will do whatever we must to survive—even if that means one day an overt revolution."

Out of Despair, a New Beginning

Can the plight of Ontario's Indians really be that grim?

By ski-plane I touch down at villages across seven hundred miles of wintered-in north and find conflicting answers.

The village of Lansdowne House near Fort Hope is a place where most hope has faded away.

Few earned dollars come into the community—though a handful of Indians operates a commercial fishing enterprise. For the most part, though, Lansdowne House lives on welfare. And in government-built houses, without running water, without sewers, many of them uncared-for wrecks. Much of life at Lansdowne House is sullen; some of it is drunken.

Yet a group of Lansdowne House Indians have pointed a way out. By bush plane, canoe, or snowmobile, two hundred of them have moved 45 miles northwest to start a new life. They have taken all their possessions, but left behind and banned from their future both alcohol and drugs.

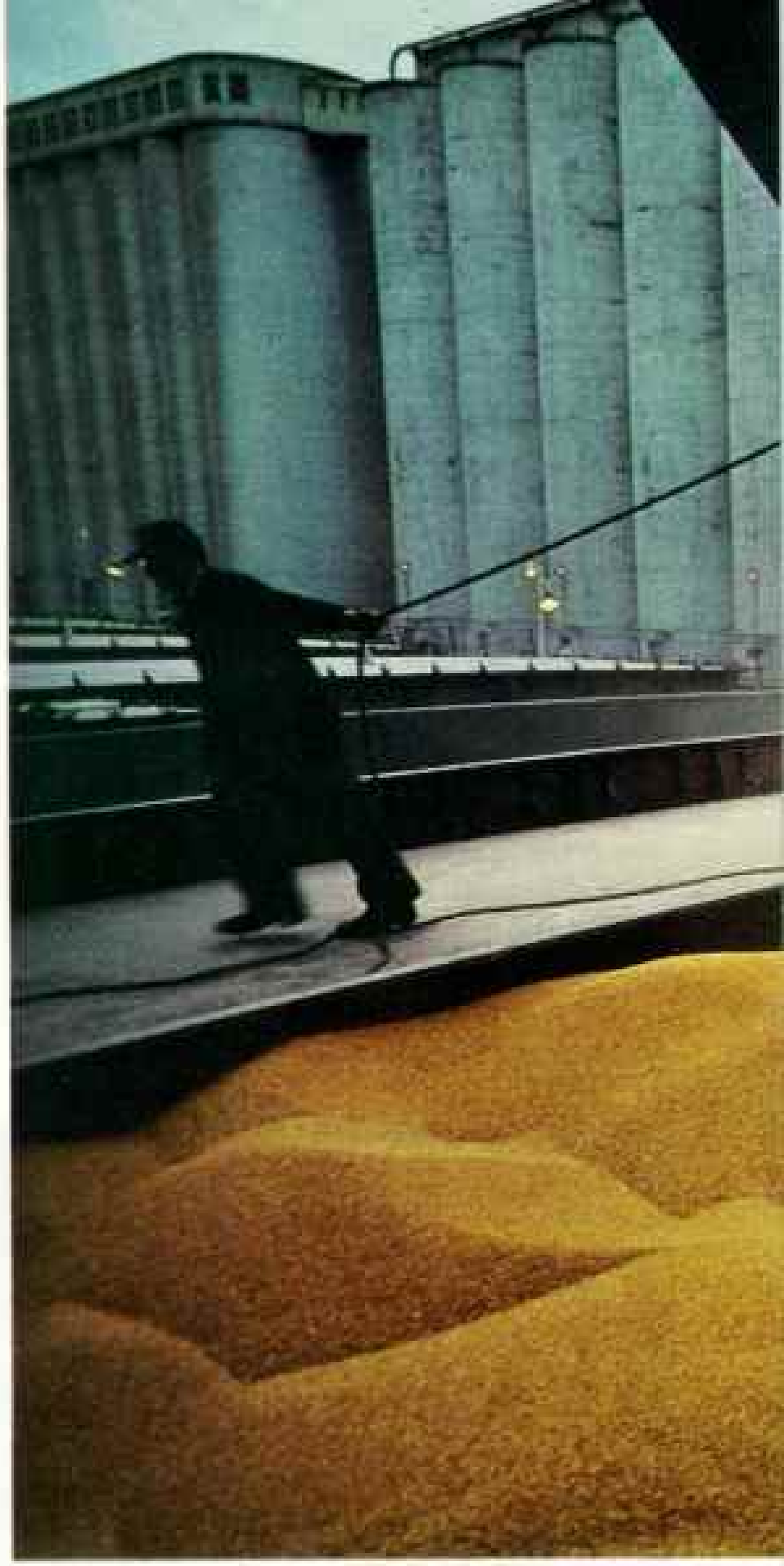
We circle over their new village in the wilderness; they call it Summer Beaver. The houses are of freshly cut spruce logs, the yards neat and tidy. Moose skins dry in the sun and washed blue jeans hang on the lines.

We land in the snow and walk among the houses. At the windows are faces, smiling. Here is the old Indian way—helping each other, building and making things by hand, hunting and fishing for food, being proud and self-reliant.

Daisy Sugarhead is a dark-eyed Summer Beaverite, age 17, demure and dedicated. She helps John and Ellen Woodcock, white teachers from the south, in the three-room

BOTH BY SAM ABELL

Heeding the cry of the wild goose, Claudius Hughie (**left**) will return the call to bring the flock within range. From childhood Crees learn to talk to these birds. During spring hunts the men fill their larders; in fall they guide visitors as well. Audiovisual specialist Vern Cheechoo (**above,** right) travels from his Moose Factory reservation birthplace to his present home in Timmins on the rollicking Moosonee-Cochrane line that stops on request. A summer excursion train here is called the Polar Bear Express.



Gold from the Prairie Provinces comes by rail to Thunder Bay's towering terminals at the head of Lake Superior, where 500 million bushels of grain—more than half of what Canada exports—is cleaned, dried, and certified for shipment. Here a lake freighter receives a million bushels of wheat bound for Europe, North Africa, or South America.

log schoolhouse. "Almost the first thing our band did," Daisy reports, pride in her eyes, "was to build a school. And the government sent teachers. Myself, I'll fly out summertimes to take college courses. I want to teach one day too."

Self-government? Self-sufficiency? By the year 2000? Who knows?

Romance of the Wild Regained

When spring uses her magic key to unlock the icy north, when the lakes laugh again and the rivers run, I paddle into Algonquin Provincial Park, a superb canoeing park half the size of Connecticut.

On a portage between quiet lakes one night I share a campfire, and a few million stars, with well-to-do Boy Scouts from the United States. I also spend an afternoon with a dozen underprivileged kids from Toronto who have never known the sensations of meeting the wilderness—including the terrifying thrill of canoeing into white water on the famous Petawawa River. The Toronto YMCA and the Ontario Ministry of Natural Resources have made it possible.

In Ontario there are a quarter of a *million* lakes—interlaced by streams and rivers. Some Hudson's Bay Company outposts offer rent-a-canoe: Drop it off at another outpost. Across the lakeland north the wilderness beckons; its symbol, the call of the loon, luring and lonely. Out there in the silence you could meet an Indian, or a bear—a white one, if you paddle as far as Polar Bear Provincial Park on Hudson Bay (page 783).

Nowhere is the heritage of the Indian birchbark canoe better demonstrated than near Thunder Bay on Lake Superior.

At 600 feet above sea level (and 2,200 miles inland by water) Thunder Bay is Canada's third largest ocean-vessel port in sheer tonnage—mainly grain and coal. But here nearly two hundred years ago stood Fort William, rendezvous of Canadian voyageurs. Plying their canoes for the British-Canadian North West Company, those tough French Canadians traveled to far-flung trading posts in the West, collecting Indian-trapped beaver pelts prized for making hats in Europe.

Fort William exists again, complete with its rebuilt palisade, its hand-hewn buildings, and its panoply of frontier life. You can watch the arrival of a voyageur canoe or Indians cooking before their tepees, visit with blacksmiths forging tools that helped in the conquest of western Canada.

Ontarians have a love affair with their

SAM ARELL

history. Romantic pioneer settlements dot the province. One, Upper Canada Village, near Morrisburg, is another scene of living history, where you can step into the lives and original colonial homes of United Empire Loyalists who settled Ontario during the American Revolution.

You encounter the English heritage throughout the province. I find it at Stratford (on Ontario's River Avon, naturally), and at Niagara-on-the-Lake, a few miles downriver from Niagara Falls.

"Last year we spent a week watching a repertory of Shakespeare at Stratford," Dave Bentley tells me, "and this year a week of plays by George Bernard Shaw." Dave and his wife, Pat, have come from Detroit, together with tens of thousands of other theater lovers from the U. S. and Canada, to Ontario's Stratford and Shaw Festivals.

Seated next to us, as actors regale us with the acid wisdom and philosophy of GBS, is Arthur Vesey, a seed distributor from Prince Edward Island. He has flown a thousand miles to immerse himself in some of the finest professional theater in North America.

Energy: A Continuing Quest

If Niagara brings in thousands of theater buffs and newlyweds and millions of tourists, it sends out millions of dollars' worth of hydroelectric power.

Racing a rainbow-edged storm, the Canadian *pulls past towering elevators*

The people of Ontario seldom use the words "power" or even "electricity." It all comes under the neat term "hydro." ("Our hydro bill last month was out of sight!")

"It's out of sight because we've run out of cheap, dammable rivers." That's the word from an official at Ontario Hydro, the provincial government's power agency. "Fossil fuel costs have skyrocketed, too, but we have plenty of uranium right here. So nuclear seems a viable alternative."

By 1986 nearly half of Ontario's "hydro" will come from three nuclear plants on the shores of Lakes Ontario and Huron. The Bruce complex, still building, largest in the world, is a magnetic goal for tourists.

Unlike Bruce and the other plants, which produce power, the Chalk River Nuclear Laboratories on the Ottawa River produce knowledge. During World War II the facility was tied to the military effort. But in the end the Canadian scientists' gift to the world was the cobalt "bomb." To kill cancer.

Contaminated Water Safe to Drink

With Fred Blackstein, assistant to the director of research, I tour the laboratory grounds. At a fuel storage area we pause, and the conversation turns to safety. "No technology is without risks," Fred says, "but the benefits must be weighed against those risks. We did have an unsettling accident here in 1952. An overpower situation in our experimental reactor caused some fuel to melt. No one was injured.

"We prevented any further damage by

SAM ABELL

and into Thunder Bay. It follows the route that once carried immigrants west.

flushing the reactor with water. But we had to dispose of the then-radioactive water."

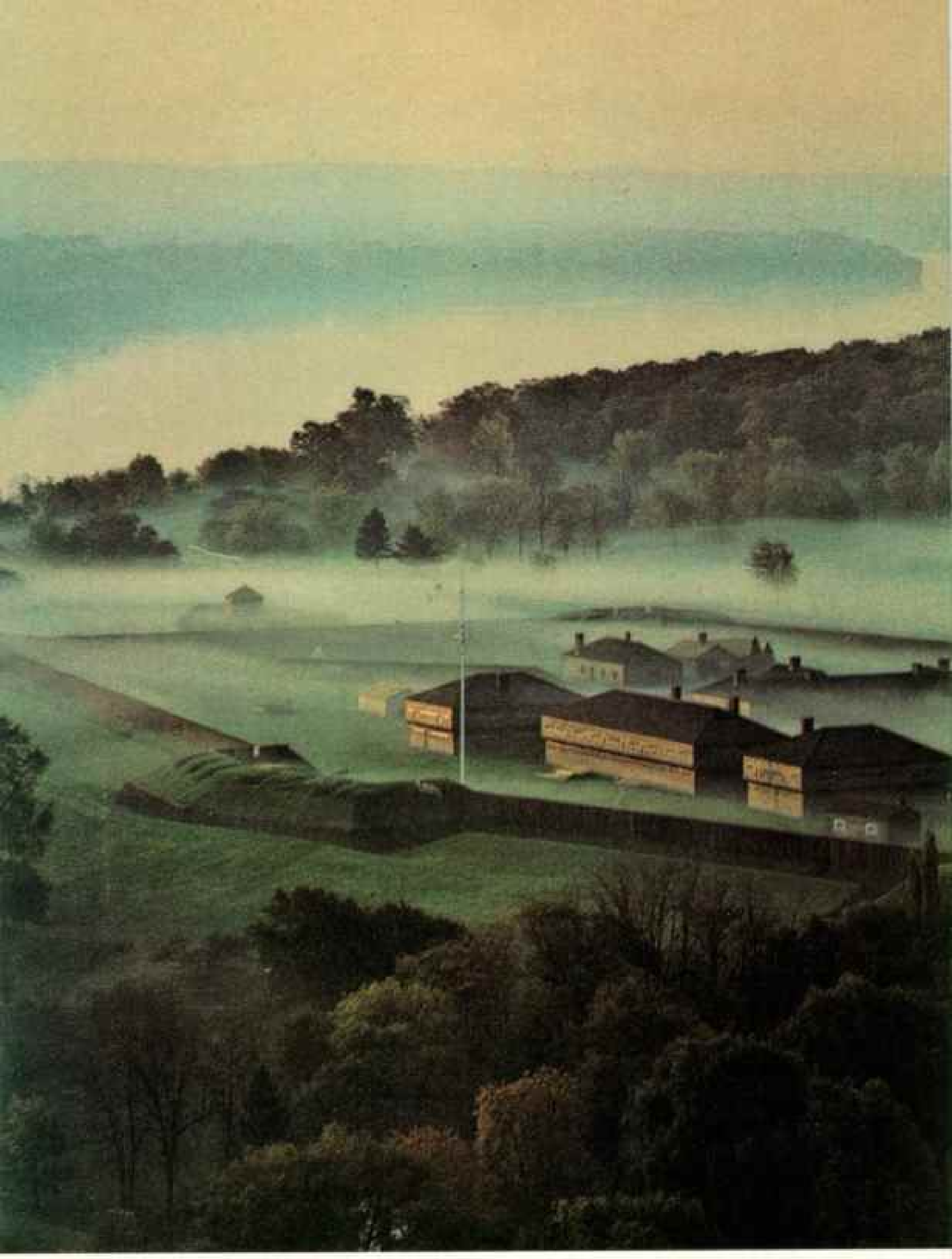
For 25 years scientists have been studying nearby Perch Lake, close to where the radioactive flood was released. Although radiation levels at the lake remain above normal, "water flowing out of the lake meets provincial drinking-water standards," Fred says. "And we have observed that several radioactive elements do not magnify in the food chain."

Later, preparing to leave, I ask Fred about security. "You'd need a whole army of scientists, mad ones, to cause a catastrophe," he says. "I just don't believe saboteurs are likely to bother with reactors."

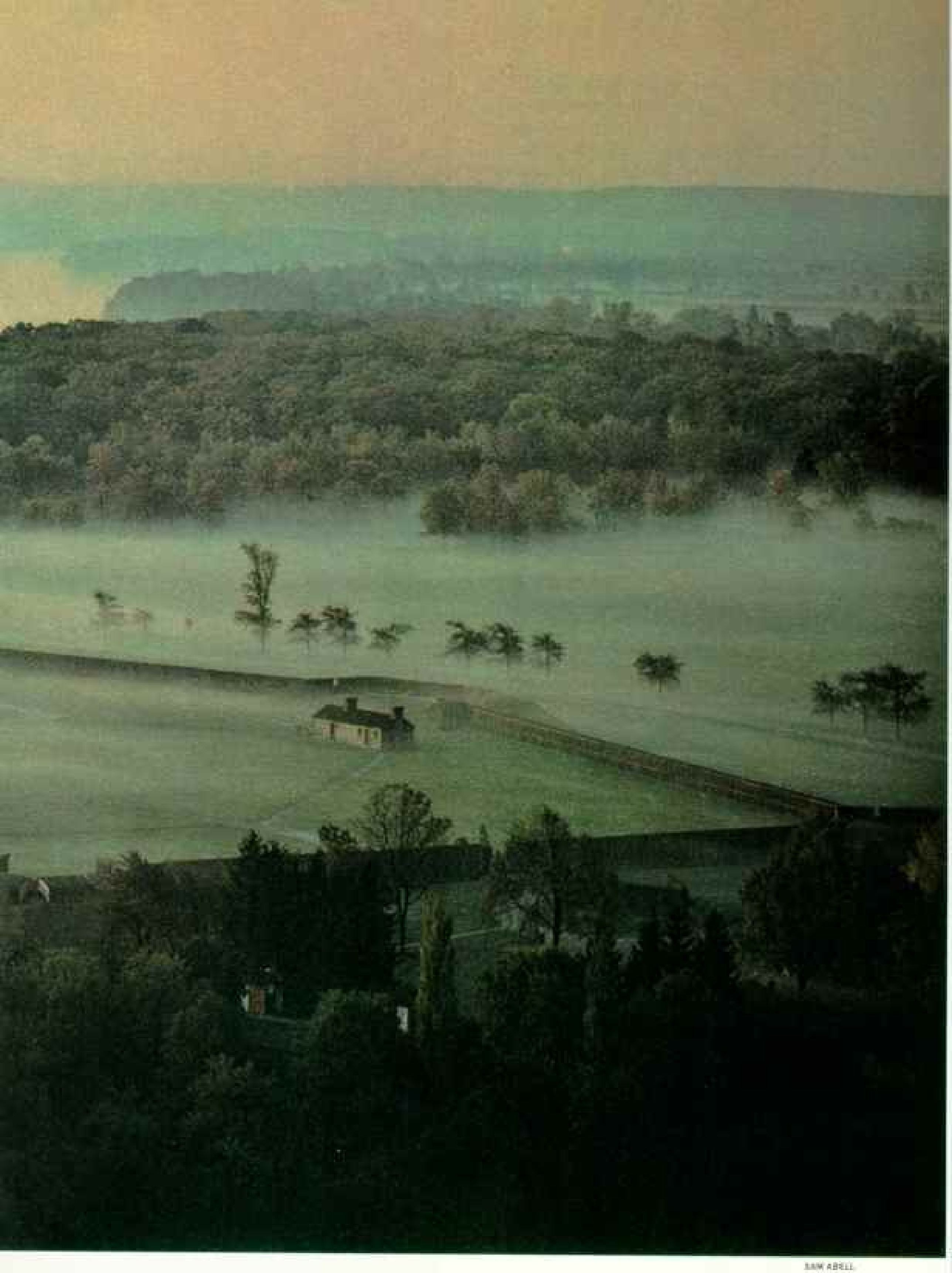
Nuclear questions are high on, but not at the top of, a list of questions confronting Ontario's Premier William Davis (page 765) at Queen's Park in Toronto.

Here, at the home of the provincial government, the premier ponders Canada's economic stability, for that is Ontario's stability. And the question of French-English national unity, for that is even more basic. Also problems of land use, the north, mining, Indians. Political divisions among his people, and their opportunities. Ontario's youth are particularly close to his heart: For eight years he was minister of education.

Meeting and talking with him across his province, I have come to know Bill Davis and his wife, Kathy. Now he takes me to where the two of them grew up together, at island cottages on Georgian Bay. Kathy's family was from the States.



Silent mists of autumn swirl through the Niagara River valley, border between Ontario and New York State beyond, where peace has reigned for 165 years. During the War of 1812 several hundred British regulars and Canadian militiamen here in Fort George exchanged red-hot



SAM ABELL

cannonballs with Fort Niagara across the river. In May 1813 some four thousand Americans overwhelmed the defenders, but war's end saw a return to the status quo. Meticulously restored, the fort vividly recalls military life on an early frontier—and a subsequent good-neighbor policy.

"**I just love my Maple Leaf flag,**" says Sister Mary Ann, reflecting the intense nationalism felt by many of Ontario's Francophones. On St. Jean-Baptiste Day in the village of Vankleek Hill, the nun climbed a fire escape for a better view of Prime Minister Pierre Elliott Trudeau. His appearance dramatized the success of such French-English communities of eastern Ontario, where descendants of the founding cultures live congenially and feel at home as Canadians.

In baggy shorts and bare feet, Bill stands on the rocky island where they met. "There's Kathy's island!" He points with his pipe, squinting, recollecting. Then the pipe sweeps in a great arc toward the mainland:

"We still allow Americans to buy land to live on in Ontario. But we've got laws to discourage speculation. Our land has become too precious. My grandfather bought this island 50 years ago for 50 dollars."

Bill Davis, a man who could one day become prime minister of Canada, is known as a man who leads by compromise.

"Ontario is a land of compromise," he says. "Fortunately, Canada is too. It has to be if it is to survive. And by the terms of history, Ontario is at the center of survival."

He talks of Ontario's committee for national unity, headed by Ian Macdonald, president of York University in Toronto: "One of our finest statesmen. You should talk to him."

A very busy Ian Macdonald offers me a sandwich in his office. Besides being president of York, he travels the province, making speeches day and night. He tells me what he tells Ontarians, and in his peroration I find crystallized the true importance of Ontario to Canada today:

"If any one province can orchestrate the power and the spirit to coordinate everything Canadian, to foster an integrated French-English society, and to achieve an economically sound country that can happily fly the Maple Leaf from the Atlantic to the Pacific, it has to be Ontario. Particularly since Ontario has the most to lose.

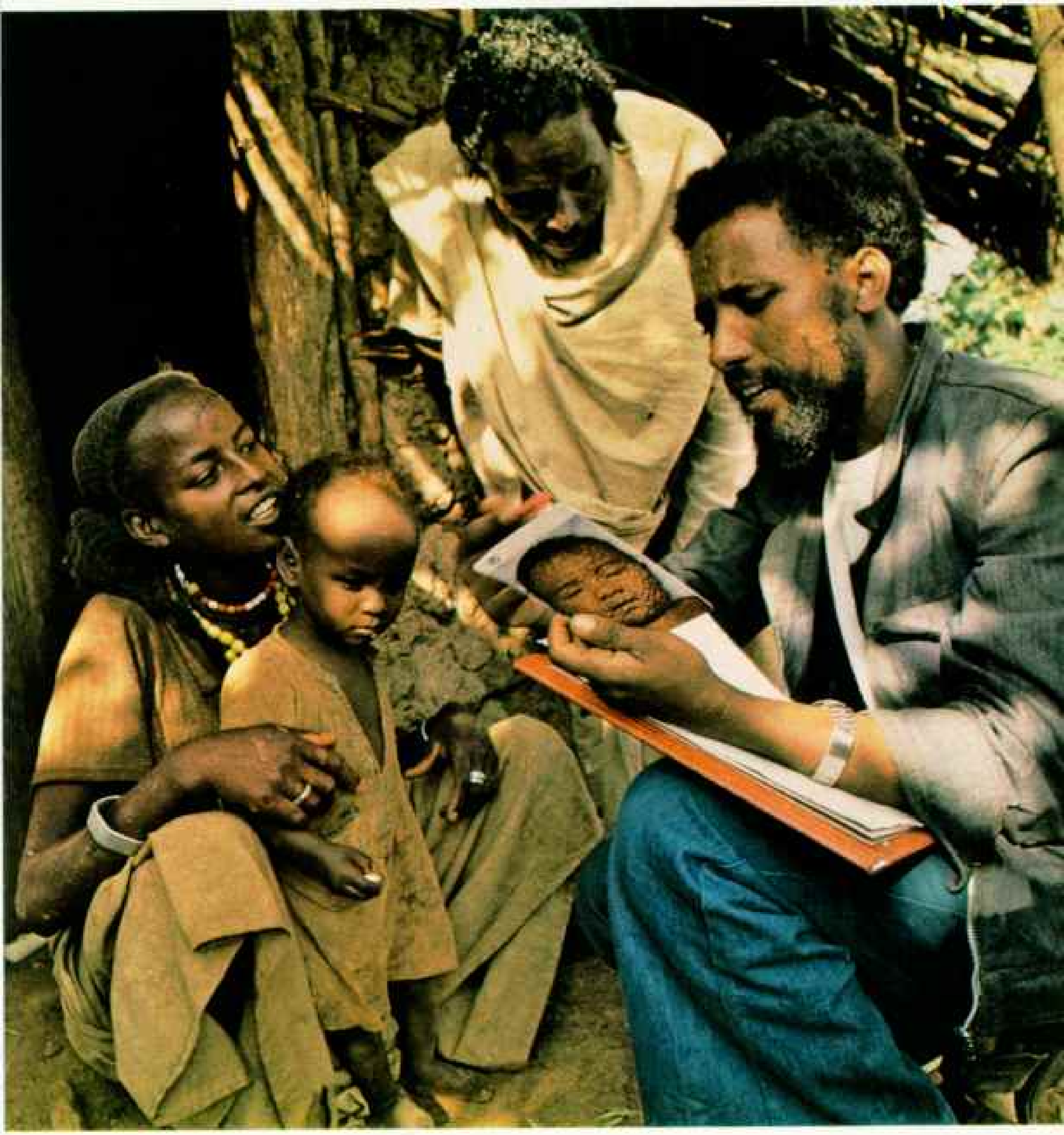
"Ontario is our heartland. So it is in our hearts and minds, more than any others', that Canada's future may be decided." □

SAM ARCILL

Smallpox—

By DONALD A. HENDERSON, M.D.
DEAN, SCHOOL OF HYGIENE AND PUBLIC HEALTH
THE JOHNS HOPKINS UNIVERSITY

Photographs by MARION KAPLAN



Rumor of smallpox is checked out by an Ethiopian health officer, who shows a victim's picture and asks, "Have you seen anyone with a rash like this?" "No" is the answer here and worldwide as the onetime killer of millions itself faces death.

Epitaph for a Killer?

APRIL 17, 1978. The telegram from Nairobi, Kenya, lay on my desk.

"Search complete. No cases discovered. Ali Maow Maalin is world's last known smallpox case."

For ten arduous years I had directed the campaign of the World Health Organization (WHO), a campaign that had enlisted close to 700 advisers from 55 countries and upwards of 200,000 national health officers and volunteers to eradicate smallpox once and for all.

Now, it seemed, we had reached our goal: zero cases of the most devastating and feared of the great pestilences—the first disease to be eradicated by man.

I could comprehend that victory was at hand; emotionally, I was numb.

Six months earlier Maalin, a hospital cook in Merca, Somalia, had become severely ill with high fever and the typical smallpox rash (page 805). Five days later he was discovered. Somali health teams and WHO staff at once isolated him under guard and began the painstaking search to find and vaccinate 161 people who had been in contact with him. None developed smallpox.

The search spread, house by house, through the town of forty thousand, then into the surrounding Ogaden desert and across adjacent areas of Kenya, Ethiopia, and Djibouti. Thousands of people with chicken pox and other skin rashes were examined and a thousand laboratory specimens taken. None was smallpox.

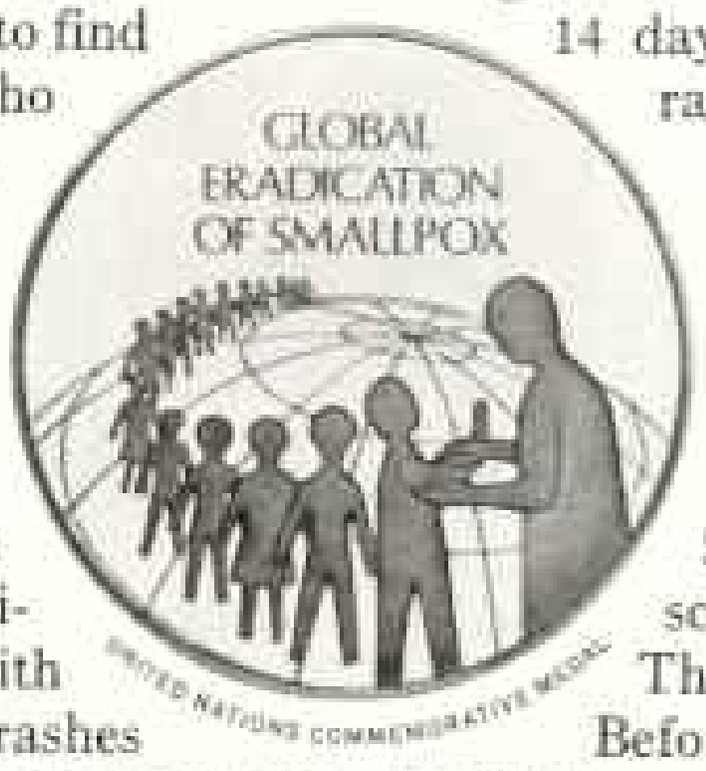
Final confirmation of eradication requires at least two years of search in every infected area. Certification is thus not possible before October 1979. But on April 17 we were confident that the name Ali Maalin would be recorded as the world's last case in a chain of infection that began long before written history.

In late August, however, a mishap at a university laboratory in Birmingham, England, underscored my concern about live virus kept in laboratories. Preventive measures failed to confine the virus, and a medical photographer contracted smallpox and died. Her mother also became infected.

The lesson was clear: the more labs with stocks of live virus, the greater the risk. Requests by WHO have already reduced the number of facilities using smallpox virus from at least 76 to 12 (bottom map, page 800); others are expected to comply.

Smallpox has been called one of the most loathsome diseases. I know that no matter how many visits I made to smallpox wards, filled with seriously ill and dying patients, I always came away shaken.

The disease is caused by a virus usually transmitted from person to person in minute droplets expelled from the mouth and nose. Someone not vaccinated or previously infected who inhales the droplets develops a high fever and aching pains after 10 to 14 days. Two to four days later a rash spreads over the body. Blisterlike vesicles fill with pus, and, after another 10 to 14 days, scabs form.



In the past, 20 to 30 percent of those afflicted with the severe Asian strain died. Survivors were permanently scarred and sometimes blinded. There is no treatment.

Before vaccines, everyone was susceptible to smallpox. The disease spread in any climate, anywhere. It repeatedly altered the course of history. Brought by Cortés to the New World, it eventually killed an estimated 3.5 million Indians and contributed to the collapse of the Inca and Aztec civilizations. Decimation of North American Indians paved the way for European settlement.

In Europe the problem was no less severe. Lord Macaulay wrote of its effects in 17th-

century England: "That disease . . . was then the most terrible of all the ministers of death. . . . smallpox was always present, filling the churchyards with corpses . . . and making the eyes and cheeks of the betrothed maiden objects of horror to the lover."

In 1796 English country physician Edward Jenner showed that a mild infection acquired from cows, called cowpox, gave immunity from smallpox. Material taken from a cowpox pustule could be used to protect others. Within years, cowpox vaccine was being distributed around the world. Yet, until the present century, problems in producing and preserving vaccine precluded more than partial control.

Not until the 1940's were Europe and North America rid of smallpox. In developing countries it remained epidemic, and cases were often exported into smallpox-free areas. Health officials feared it as no other disease. In all countries vaccination programs continued, and quarantine inspectors tried to enforce the international edict that all travelers be vaccinated.

In 1959 an initial attempt by WHO to eradicate smallpox was begun, but the effort failed. Most countries had too few resources, and WHO could offer little help.

I had been working on a measles-smallpox program for 18 West African nations, sponsored by the Agency for International Development and the Center for Disease Control in Atlanta. I was learning firsthand in seven-day weeks the problems of planning, logistics, and personnel. Then in May 1966 WHO was authorized to begin a global smallpox-eradication campaign.

The goal was to stamp out smallpox within ten years. As I was to learn, few believed that smallpox, or any other disease, could really be eliminated. Malaria and yellow fever eradication had failed. Reservations were understandable. Smallpox moved readily across open borders. It seemed unreasonable to expect that programs could be orchestrated in fifty affected countries, including the world's least developed, many with large, remote areas and populations that had never seen a health worker.

Shortly I was surprised by a call from WHO's director-general, who asked me to head the campaign. I was hesitant, and my doubts were confirmed by a respected colleague, who said: "If you think you have problems now in coping with bureaucracy, multiply the problems by the number of UN countries. You don't stand a chance."

Convinced that it would be a waste of time, I so informed the surgeon general of the U. S. Public Health Service, my superior then. He, in turn, informed me that I was ordered to go—for at least nine months. Reluctantly my wife and I stored our furniture and left with our children for Geneva, Switzerland, WHO *(Continued on page 803)*

Front lines in a global battle shifted to some of the world's most hostile terrain as smallpox was tracked to its final outposts.

In the Ogaden region of the Horn of Africa, disputed by Ethiopia and Somalia, a health officer questions a nomad woman (**right**). Despite civil unrest, scattered populations, and fractured terrain, smallpox was extinguished here in 1976.

The campaign's international scope is reflected in stamps issued by (**left**, from top) the United Nations, Guinea, and Egypt, among many others.

Mounted from the Geneva headquarters of the World Health Organization (WHO), the eradication campaign enlisted specialists from around the world, physicians and administrators from countries affected, paramedical personnel, and thousands of volunteers, such as teachers and Boy Scouts, trained in the field.

Smallpox erased in a decade

FORTY-FOUR COUNTRIES
The assault on smallpox begins under the author's direction, although some experts are skeptical that the effort can succeed.

To mass vaccination is added the strategy of surveillance-containment —patient isolation and intense vaccination in areas of reported disease—to break the chain of human transmission.

NINETEEN COUNTRIES
The strategy works. Smallpox is eliminated in the Western Hemisphere and in most of Africa. A few cases imported into Europe are quickly contained but illustrate the need for total eradication.

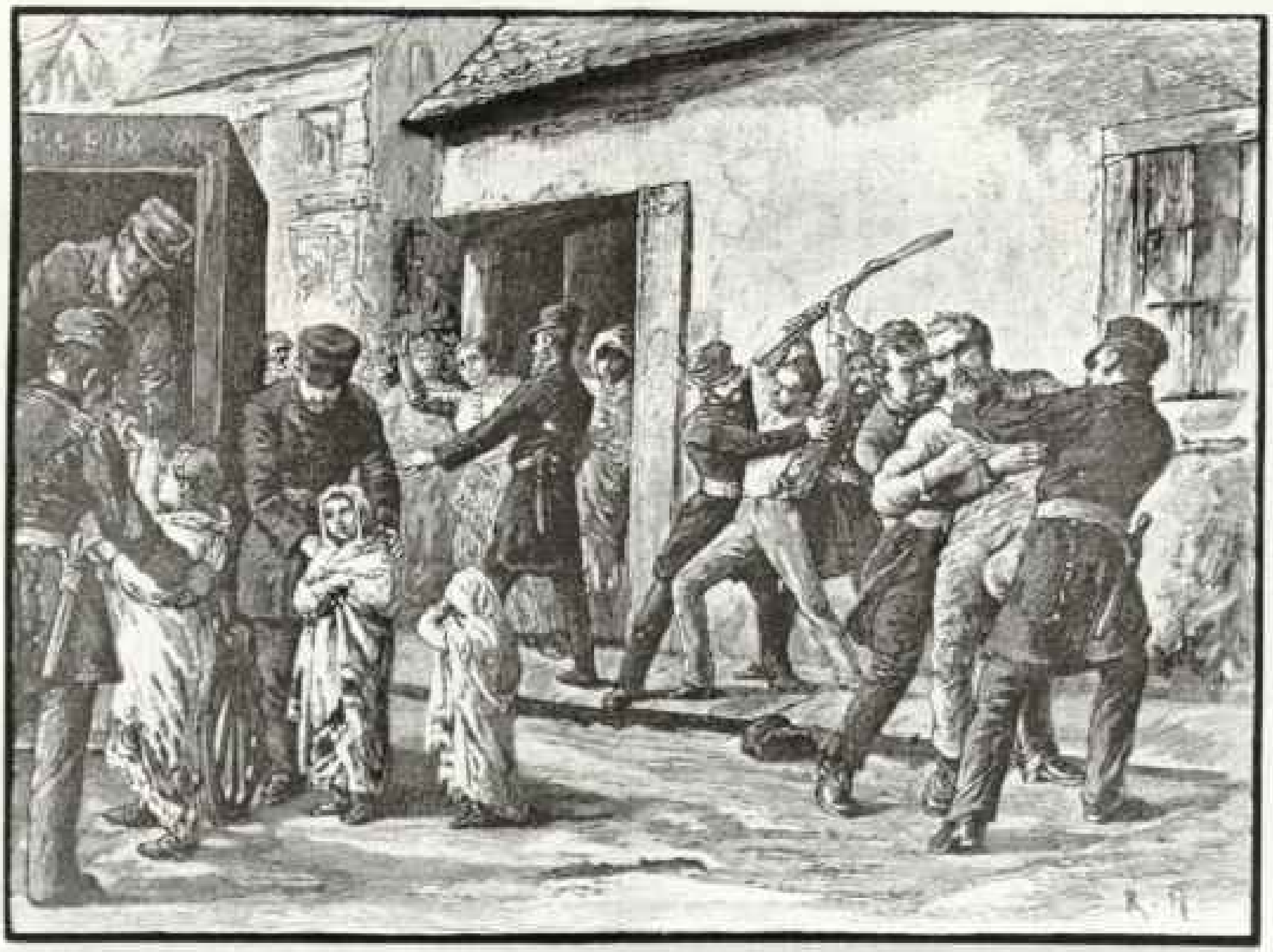
Populations massed in Asia and dispersed on the Horn of Africa offer formidable challenges as the global campaign moves toward "target zero."

FIVE COUNTRIES
Rewards for reporting smallpox help pinpoint outbreaks and motivate health workers and the public to aid the campaign. Vigorous containment measures then stop further spread. Though forty thousand die in Asia in 1974, the tide is turned. By 1976 Asian smallpox—the most virulent strain—has disappeared, and the largest continent is rid of the disease.

NO COUNTRIES
Since October 1977 no cases have been reported in the field, though at least two cases resulted from an accidental exposure in August 1978 at one of the 12 labs that still retained smallpox virus, essential for medical research. To lessen the risk of such lab infections, all facilities except four—in Atlanta, London, Moscow, and Tokyo—have been asked by WHO to give up their virus stocks.

DRAWN BY IBRAHIM BADAT, COMPILED BY SUE PLATIS
NATIONAL GEOGRAPHIC ART DIVISION

National Geographic, December 1978



AN INCIDENT OF THE SMALLPOX EPIDEMIC IN MONTREAL.—DRAWN BY ROBERT BARRY.—[See Page 1214.]

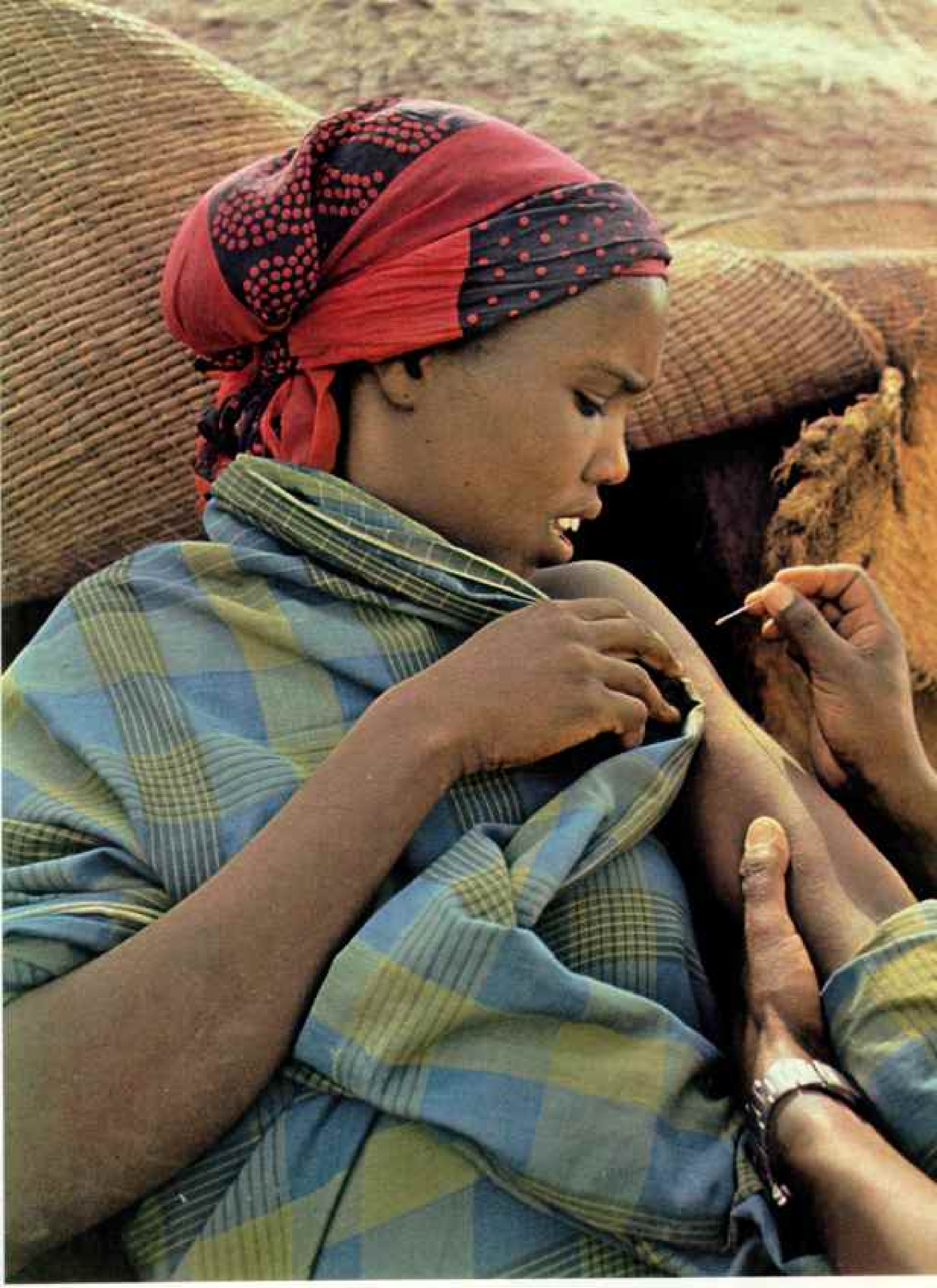
"HARPER'S WEEKLY," NOVEMBER 28, 1885.

Suspicion, fear, and hostility have long thwarted attempts to control smallpox. In 1885 some resistance occurred in Montreal (**above**) when affected children were forcibly removed from their parents and placed in isolation.

For thousands of years smallpox, an accepted fact of life that killed millions and often blinded or disfigured survivors, was as dreaded as plague or cholera. Returning Crusaders spread it through Europe. Conquistadores and colonists infected the Indians of the Americas.

Then a curious fact emerged: Milkmaids who contracted cowpox were spared smallpox. In 1796 English physician Edward Jenner applied that knowledge by scratching material from cowpox into the arm of a healthy boy. When exposed to smallpox virus, he was protected. That cowpox virus was the historical antecedent of today's vaccinia virus.

Immunity is still conferred by vaccination. For the global campaign, the technology of freeze-drying gave vaccine long life at assured potency. Field kits were simplified so that laymen could easily administer vaccine. But workers (**left**) had to employ charm, guile, ire, or shame to convince some patients to submit.



A few quick jabs with the special two-tined needle, and a drop of vaccine

protects an Ogaden woman.

(Continued from page 798) headquarters. I hardly anticipated the saga ahead, or that 11 years would pass before we would see our furniture again.

Despite the enormity of the task, the nature of smallpox gave grounds for optimism. Unlike many diseases, smallpox virus has no known reservoir other than man. Transmission normally occurs from face-to-face contact, and a victim rarely infects more than five others. The disease spreads slowly and, in scarred survivors, leaves visible evidence that it was present.

To stop the spread, much less to eliminate it, we had to know where the cases were. In 1967 the reporting system was a shambles. Some countries reported irregularly; some denied they had smallpox. That year 131,000 cases were reported. We now estimate there were actually 10 to 15 million cases in 44 countries (top map, page 800).

Survey Paints Grim Picture

We put roving teams into the field. They began to piece together a reporting network of hospitals and health centers and to discover more and more cases as they investigated outbreaks. Gradually we began to see the true size of what we had undertaken.

We had to have vaccine, 200 to 250 million doses annually, but tests showed that only 10 percent of the vaccine then in use met acceptable standards—some contained no vaccine virus whatever. Hat in hand, we went from government to government for donations. The Soviet Union, whose proposal initiated the campaign, and the United States were the principal donors, but more than forty other countries also contributed. Using their contributions and WHO funds, we established vaccine-producing laboratories, most of them in infected countries, and devised a system of quality control.

Now we needed a simple, effective, and economical way to administer vaccine in the field. We found it in a two-tined needle developed by Wyeth Laboratories, which generously waived its patent charges.

When the needle was dipped into vaccine, the two tines captured enough of it between them for vaccination, administered by 15 rapid jabs to the arm. Vaccinators could be trained in minutes, and the needles could be sterilized and reused. Virtually all the

vaccinations were positive, and, most important, one vial now protected a hundred people rather than 25 by previous methods.

While we worked to assure adequate supplies of needles and vaccine—the guns and bullets of the campaign—we started programs in country after country. Most were begun by 1969 and all by 1971. Until 1967 mass vaccination had been the standard strategy, but even when 95 percent were vaccinated, the disease would sometimes continue to spread.

We added a second strategy, called surveillance-containment, by forming "fire-fighting" teams to improve reporting and discover outbreaks. The teams rushed to infected areas, isolated patients, and vaccinated entire villages. By hunting for the source of infection, they found other outbreaks and contained them—breaking, one by one, the chains of transmission.

New Strategy Proves a Blessing

The experiences of Bill Foege, an AID-CDC adviser in Nigeria, showed the new approach to be far more effective than we had expected, and we gave it priority over mass vaccination. Bill arrived before most of his supplies. Losing no time, he set up a reporting network, using radios already operated by missionaries. Then he began vaccination and containment of known outbreaks. By the time supplies arrived, no smallpox could be found, yet less than half the population had been vaccinated.

By 1970 the number of countries where smallpox was endemic, or continuously present, had dropped from 33 to 17, and by 1973 to only six. But among these were India, Bangladesh, Pakistan, and Nepal—with more than 700 million people. A professor from England warned me: "Bear in mind that Asia is the ancient home of smallpox. Eradication in South America or Africa is one thing; Asia is quite impossible."

I wondered if he might not be right, but 1973 marked a turning point. All that intensely hot summer, we worked with Indian colleagues to develop new procedures, training programs, and reporting forms. The offensive began in autumn. Tens of thousands of new cases were found, but more rigorous containment slowed the spread. Guards were hired for 24-hour duty to prevent patients from leaving their homes and to vaccinate all visitors. Health workers and villagers searched for and vaccinated everyone in affected villages and for a five-mile radius around them. With better reporting, the number of recorded cases increased, and the newspapers proclaimed disaster.

But now, I knew, the end was in sight. Steadily we tightened the noose. In 1974 the last case occurred in Pakistan; in 1975 in Nepal and India; and on October 16, 1975, Rahima Banu, a 3-year-old Bangladesh girl, contracted the last case of the severe Asian strain of smallpox. She survived.

As 1976 began, Ethiopia alone remained infected by a far milder strain of smallpox. However, the logistics were all but insuperable. The country was torn by civil war, by famine, by heavy summer rains.

To the civil war was added a war with Somalia. Our surveillance teams were kidnapped by guerrillas and vanished for days to weeks at a time. Their helicopters were hit by rifle fire, and one was blown up by a grenade. Some staffers were wounded, and a few were killed. But a determined Ethiopian and WHO staff was not to be denied. In August 1976 the last known case occurred in a nomad encampment in the Ogaden desert.

I believed that victory finally was at hand. But at the time of the last cases in Ethiopia, smallpox was imported into previously uninfected Somalia. Tragic delays hampered our efforts. More than three thousand were stricken, but by early October 1977 only two cases remained. It was from them that Ali Maalin was infected.

Smallpox no longer afflicts humanity, and remaining virus will be confined to a few laboratories under high security.

Prudence Dictates Vaccine Storage

Routine vaccinations will be stopped everywhere, but can we abandon our first and oldest vaccine? Are we sure there is no animal reservoir? Might not old scabs be a risk? All outbreaks in smallpox-free areas have been investigated for more than a decade; all have been traced to a source in a known infected area. No "spontaneous" cases or outbreaks have ever been detected.

Finally there remains the chance that smallpox or other biological agents might be used in warfare, an unlikely possibility with

smallpox since it spreads slowly and can be contained with vaccination.

As insurance, WHO and many governments are storing vaccine, which at low temperatures retains its potency for decades. The chances of another outbreak are remote, but we are ready. For the first time, children are being born in a smallpox-free world. I am confident their children and grandchildren will enjoy that freedom.

For this, the credit belongs to the tens of thousands of health workers from around the world and to the WHO staff that, again and again, devised ingenious solutions to never ending, almost impossible problems.

I remember a hot, steaming night in a small village in Bangladesh. We were a dirty, unshaven, intense group ranged around a table—several Bengalis, a Soviet, an Indonesian, two Americans, a Brazilian, and a Swiss. The debate was heated, but the differences had nothing to do with nationality. They focused entirely on the best strategy to use against our common enemy.

And against it, we—all of us everywhere—have prevailed. □

JASON WEISFELD, M.D.

The final chapter? Somali cook Ali Maow Maalin developed smallpox on October 26, 1977. Since then, no other cases have been detected in the field.

Victory in this finest international mobilization and battle—where all the combatants can be called heroes—awaits the final dispatch: Without a hiding place in nature apart from man, an ancient enemy is vanquished.

TIGRIS SAILS INTO THE PAST

By THOR HEYERDAHL

PHOTOGRAPHS BY CARLO MAURI AND THE CREW OF THE *TIGRIS*

Winds of history belly the sails of the reed ship *Tigris* (**right**) as she searches for sea links among antiquity's Sumer, Egypt, and Indus Valley. In a vessel similar to that on a 4,000-year-old seal from Mesopotamia (**left**), Thor Heyerdahl confirms that the ocean posed no unbridgeable barriers between the world's oldest civilizations.

COURTESY TRUSTEES OF THE BRITISH MUSEUM

I WOKE UP to roaring sounds. My body had been bouncing so violently I'd dreamed I was riding in a car with one wheel off the road.

Instinctively I grabbed a bamboo post beside me as rivulets of water from the cabin wall streamed down my face. Through the roaring I heard a shout outside, "All hands on deck!" I knew we were in trouble.

The deck was a nightmare. In the darkness a sudden gale had overtaken us. Comber after comber swept aboard, threatening to carry us overside. "Tie yourselves fast!" I yelled to anyone who could hear above the storm, then grabbed for my own safety line.

As the wind ripped at the mast and rigging, I thanked God for the hull beneath my feet. Actually it was two hulls, each built of reed bundles and lashed together in a style thousands of years old. Like a giant sieve the ship simply strained the waves and allowed them to pass harmlessly back into the sea.

In such a violent gale a normal hull of wooden planks might well be stove in or capsized. Thanks to its unique construction, our own ship was as stable as a catamaran and as flexible as an Eskimo sledge.

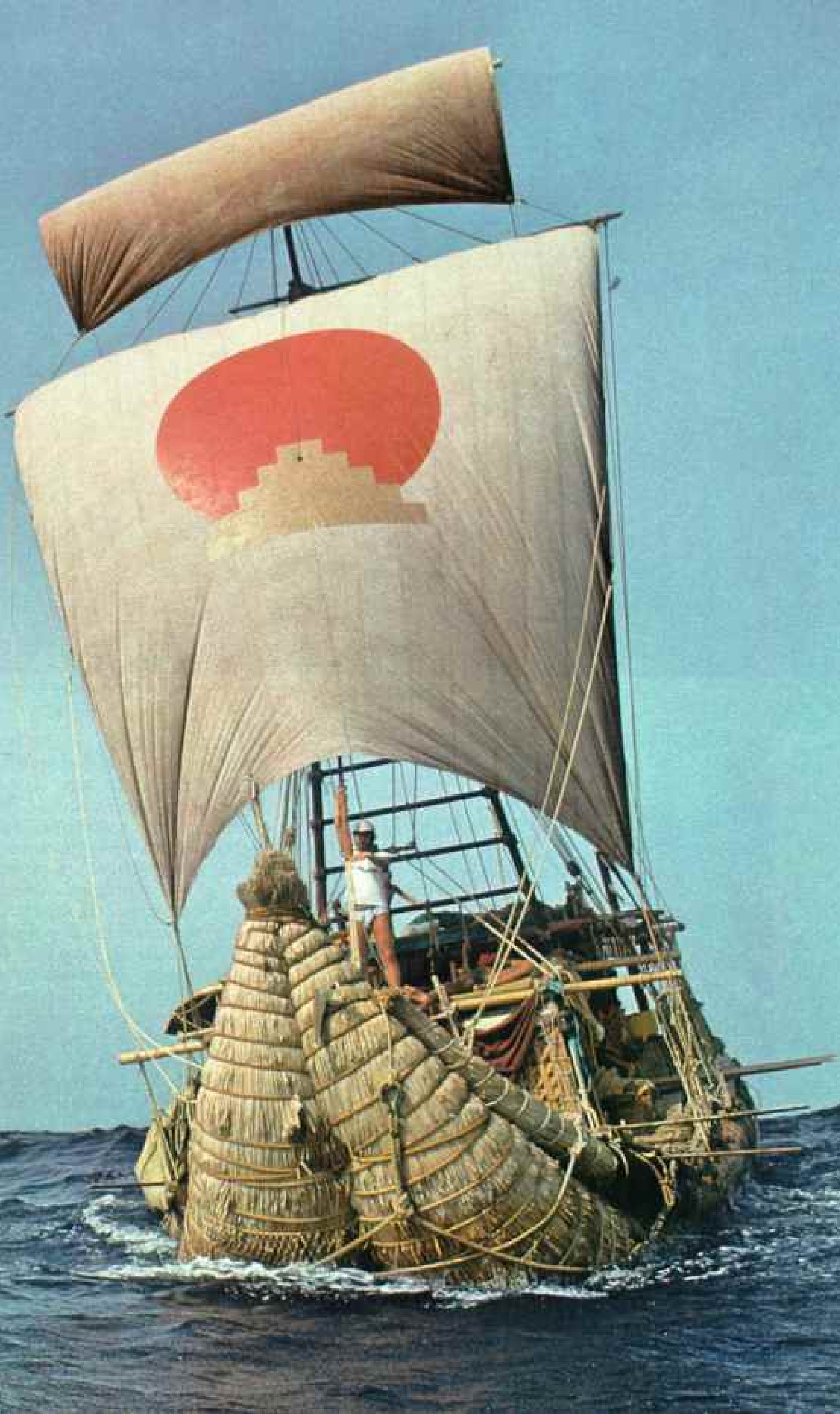
Above deck level it was a different story. At the height of the gale our topmast gave way and jettisoned our sail overboard. Amid shouts in half a dozen languages we wrestled the canvas and yardarm back aboard, but the topmast was shattered.

With dawn the storm abated and we surveyed the damage: Aside from the topmast and a split in the sail, we had suffered surprisingly little. Rigging a rowing oar as a mast, we continued southwestward across the Indian Ocean.

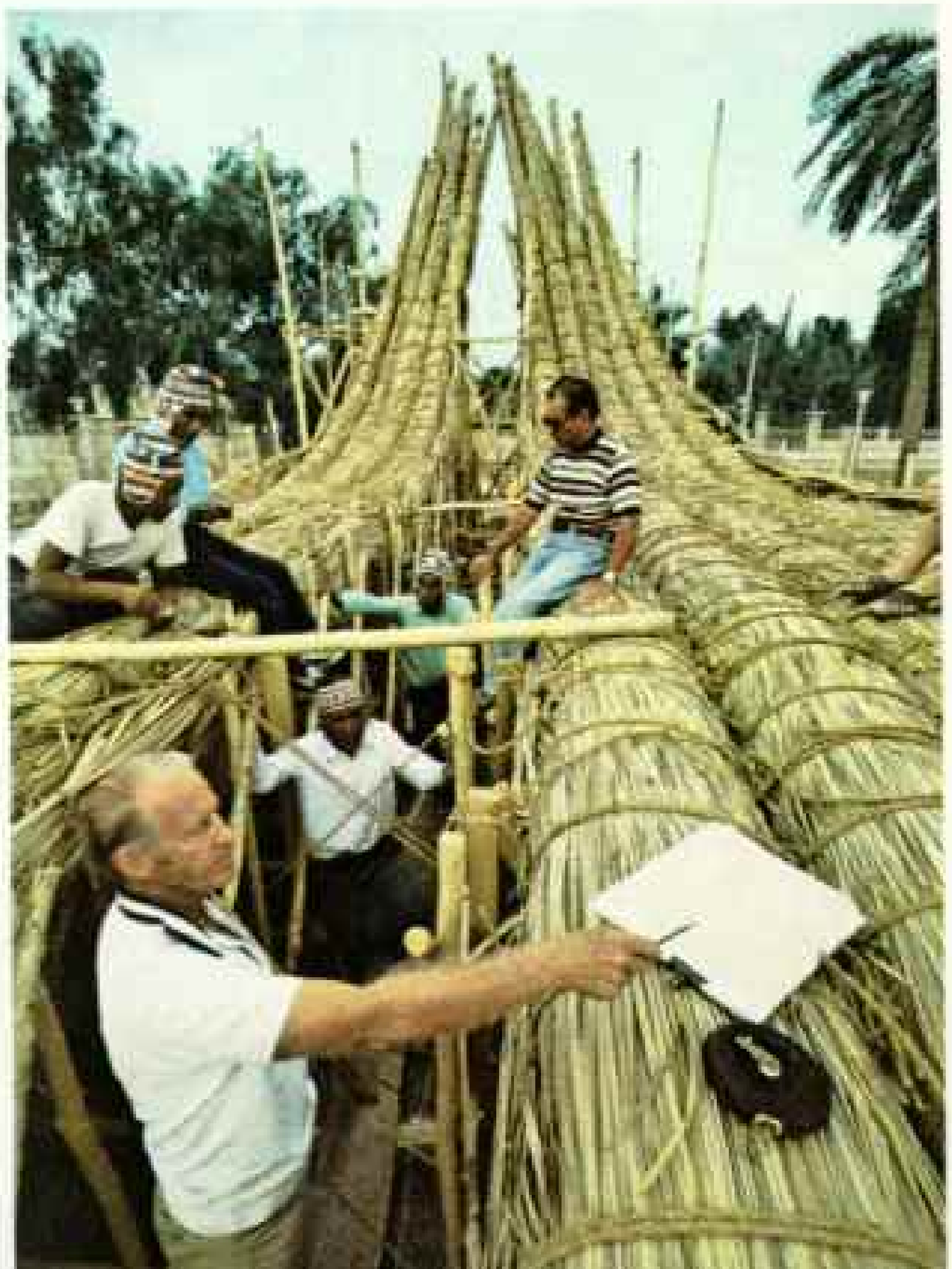
"I would say we won that battle, Thor," my old friend and shipmate Yuri Senkevitch said with a grin. "Not bad for a 5,000-year-old ship."

In a sense Yuri was right: Our ship's style was millennia old, and we were bound on an equally ancient voyage—tracing the long-ago trade routes of a seafaring people known as the Sumerians (map, pages 812-13). Located in Mesopotamia—the present-day site of Iraq—the Sumerian civilization flourished at the junction of the Euphrates and Tigris for more than a thousand years, beginning about 3500 B.C.

Nobody knows where the Sumerians came from. But the influence of their amazing civilization *(Continued on page 811)*



MARTIN BELL (ABOVE); DAVID GRAHAM (BELOW); AND RIK WHEELER



Ancestral traditions of reed-boat design are all but lost to southern Iraq's Marsh Arabs, who may be descendants of the Sumerians. But dwellings and communal halls (**right**) are still fashioned from reeds.

The author visited these reed homes in 1972, shortly after his east-west drift crossing of the Atlantic on the Egyptian papyrus ship *Ra II*. Five years later he returned, determined to build a boat of Mesopotamian reeds and to learn how far ancient Sumerian mariners could have navigated with such vessels.

Local wisdom of the Marsh Arabs (**above**) directed that the reeds be cut in August to retain buoyancy. They bound the reeds in 60-foot bundles. Heyerdahl (**left**, foreground) was then joined by four Aymara Indians with an interpreter from Bolivia's Lake Titicaca—New World experts in construction of reed boats, a dying skill.

Toiling in the "Garden of Eden," Arabs and Bolivian Indians work together at the confluence (**above**) of the Tigris River with the Euphrates, mentioned in Genesis as flowing out of the first homeland of Adam and Eve. Twin hulls made up of many smaller bundles give *Tigris* the stability of a catamaran. Spiral hemp bindings hold the hulls together and, when tightened, keep bow and stern upraised in the classic shape of many ancient vessels.

After five weeks of work, the ship was ready. Over the author's objections, Arab workers sacrificed six sheep and dedicated the hull with bloody handprints (**left**). Sad headshaking followed a near-disastrous launching accident—proof to the Arabs that Heyerdahl himself should have sacrificed a bull.

BOTH BY JONATHAN WRIGHT

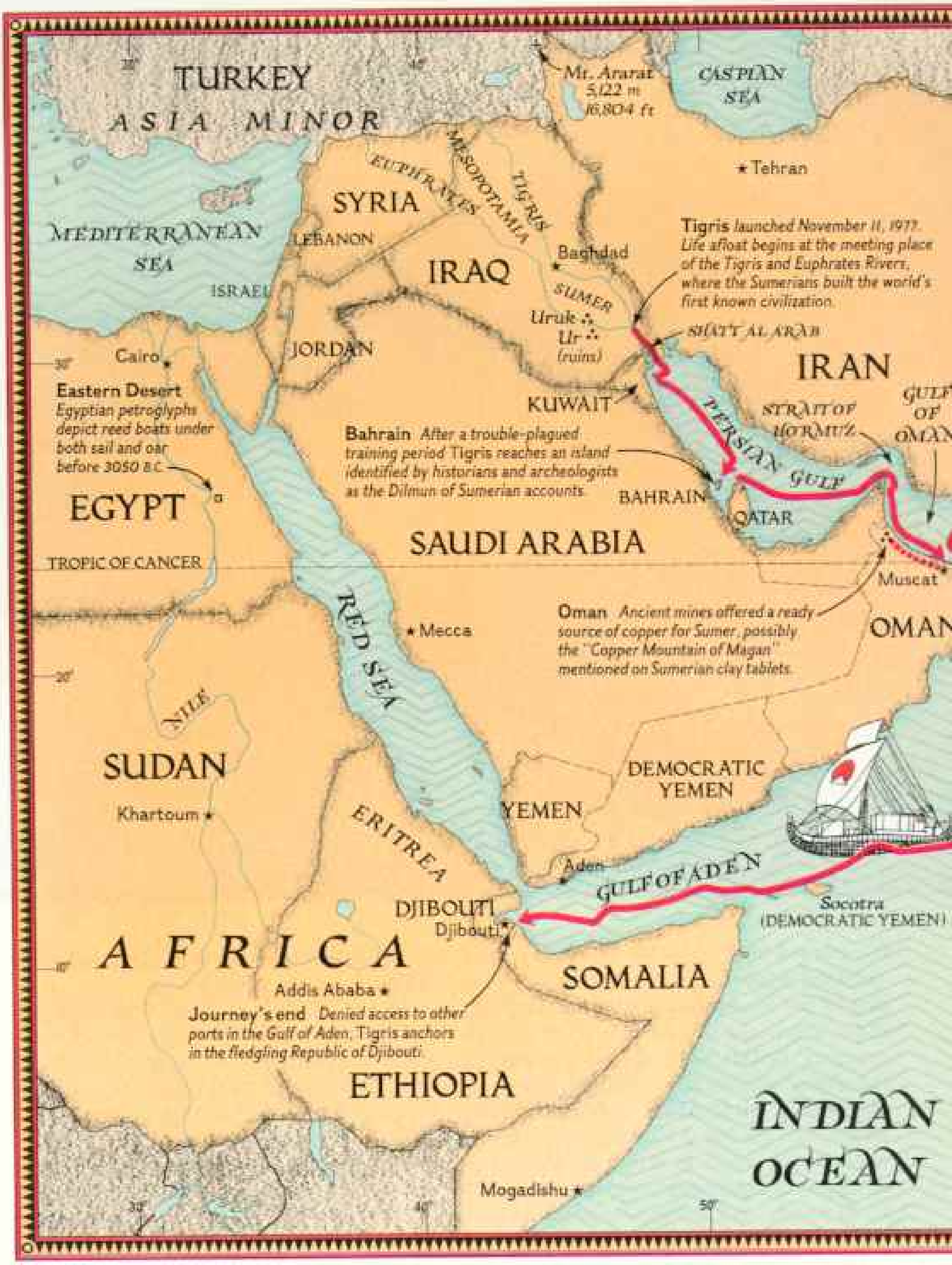
(Continued from page 806) soon spread overland through Asia Minor and to the peoples of the Mediterranean world. How far did their sailors go in other directions? Could overseas contact have played any part in the almost simultaneous birth of seemingly independent civilizations in Mesopotamia, Egypt, and the Indus Valley? Later texts incised with cuneiform script on Mesopotamian clay tablets speak of voyages to distant lands known as Dilmun, Magan, and Meluhha, across the sea toward the rising sun.

How far could the Sumerians have ventured with the primitive raft-ships illustrated in their earliest art?

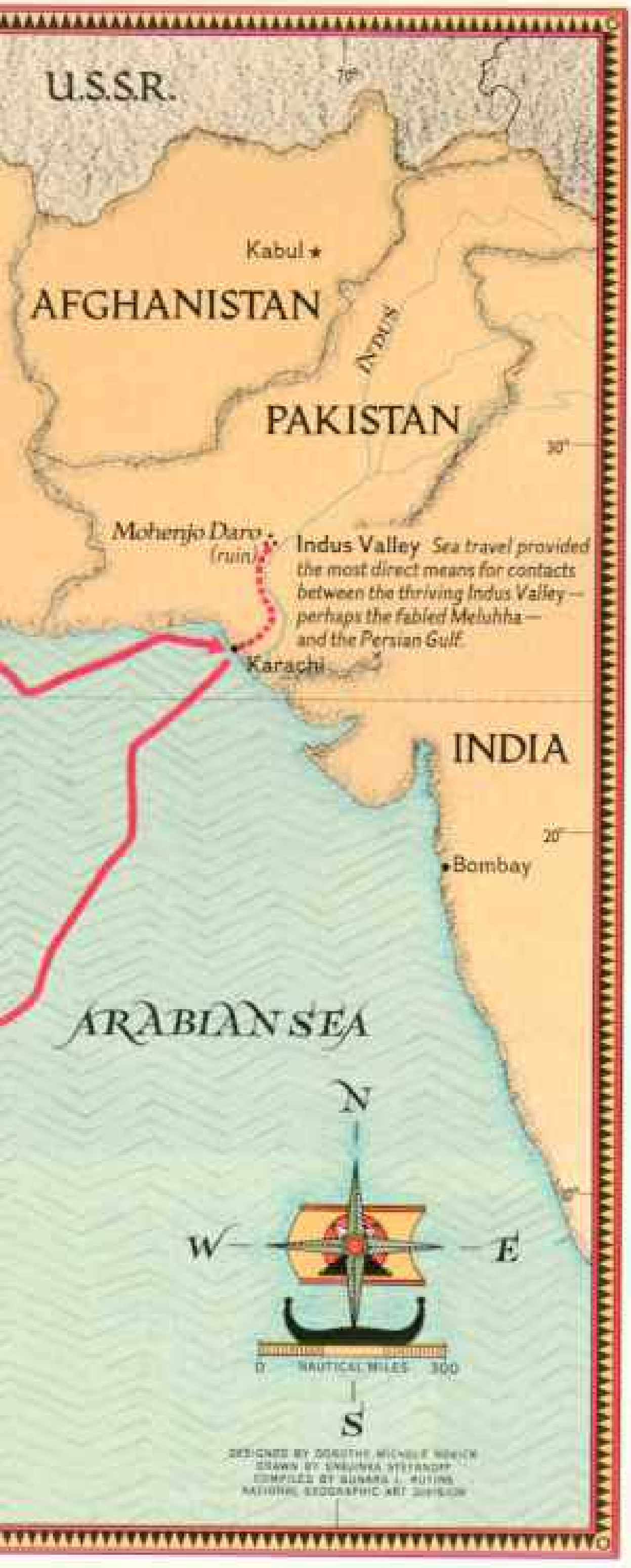
The role of the oceans as man's early highways has always fascinated me, and I have spent the better part of my life trying to disprove that the sea was a barrier to human travel and cultural exchange.

In 1947 I built and sailed an Inca-type balsa-log raft, *Kon-Tiki*, from South America across the Pacific to show that the Western Hemisphere might have contributed early to Polynesian cultures. Similarly, in 1969, I built a papyrus-reed boat along ancient Egyptian lines, calling her *Ra I* after the Egyptian sun-god. I sailed her from Africa into the western Atlantic, where I had to abandon her when the reed bundles came apart. A year later *Ra II*, an improved version, made the transatlantic voyage from Africa to Barbados, proving that ancient man could have done the same.*

* "The Voyage of *Ra II*" was described in the January 1971 NATIONAL GEOGRAPHIC.



Trackless paths of the sea leave no clues to routes followed by early mariners. But written accounts speak of seaborne trade with Dilmun, Magan, and Meluhha, lands long hidden in mystery and still the subject of intense speculation by scholars. Visiting their probable locales, *Tigris*'s crew saw trade goods and other evidence of communication by ancient seafarers. Along the way the reed ship faced storms, unseasonal winds, and a hazard unknown to its precursors—metal giants filled with oil, plying one of the world's busiest sea-lanes.



From Karachi *Tigris* turned southwest, riding toward ancient Egyptian trade routes in the Red Sea. In perfect shape after 4,200 miles and 144 days afloat, the ship dropped her sails in Djibouti, the only hospitable port in that war-torn region on Africa's Horn.

The success of *Ra II* led to my study of the Sumerians, but here I encountered major differences, both in building materials and in sailing conditions. *Kon-Tiki* and *Ra I* and *Ra II* represented "drift" voyages—that is, voyages dependent on favorable winds and currents. I found no such reliable "conveyor belts" in the waters adjacent to Mesopotamia. To ply these waters, one cannot merely drift, one must navigate, utilizing variable winds and currents.

Ancient carvings and illustrations offer clues as to how the ancients, including both the Egyptians and Sumerians, accomplished this feat (page 806). Examples appear on artifacts in the British Museum. One pot, a product of predynastic Egypt, dates from before 3100 B.C. The pot bears a painting of a sickle-shaped sailing vessel that seemed to me to be built of reeds, complete with deck cabins and centerboard.

Similar scenes in the form of petroglyphs found in the desert east of the Nile may date from even earlier times. Some depict vessels so large that their deck cargoes of livestock are dwarfed by comparison.

A Legacy for Later Sailors

Such evidence convinces me that the ancient Egyptians and their contemporaries were far more accomplished mariners than once believed. In fact, the rigging and square sails of these reed craft were the forerunners of those of later vessels, from Viking longships to the great clippers of the 19th century.

Based on Mesopotamian carvings and cuneiform records I have seen, I feel that the Sumerians, precursors and contemporaries of the Egyptian pharaohs, were master builders of reed ships. Two years ago I decided to construct such a reed vessel and to explore the ancient sea routes of the Sumerians. That is how *Tigris* was born.

Iraq is proud of its great seafaring heritage, and I was met with enthusiasm in Baghdad. The late Fuad Safar of the Directorate of Antiquities and his staff offered me valuable assistance, and I digested so much material on Sumerian trade, navigation, and marine design that I almost felt like a Sumerian ship captain myself. All I needed now were the vessel and crew.

For construction of the ship I assembled

Taking a beating under tow, *Tigris* (**above**) travels to Bahrain behind the Soviet freighter *Slavsk*. Earlier, adverse winds and heavy shipping drove the reed ship into a maze of reefs rimming Kuwait's Faylakah Island. An attempted rescue by a launch from the *Slavsk* succeeded only with the aid of a local dhow—at a cost of two thousand dollars. The Russians then towed *Tigris* to her first port of call at no charge, but the pounding she took necessitated repairs with palm stalks (**left**).

an international team—Marsh Arabs from the Tigris-Euphrates area in Iraq and Aymara Indians from Bolivia's Lake Titicaca. Although the Marsh Arabs today use wood rather than reeds to build canoes, they fashion magnificent houses using *bardi*, probably the same reed once used by Sumerian shipwrights (pages 808-809).* The Aymara Indians, on the other hand, are still specialists in reed-boat construction. Accompanied by interpreter Luis Zeballos, my Aymara friends Paolino, Juan, José, and Demetrio had helped build *Ra II*.

For a shipyard I chose an ideal site at the confluence of the Tigris and Euphrates Rivers. To millions of Muslims, Christians, and Jews, this is the Garden of Eden. A tree stump displays a plaque designating the spot as the home of Adam.

On the advice of my Marsh Arab friends we began harvesting bardi in August. "If they are cut in any other month," they said, "the reeds absorb water. When they are harvested in August, they float much longer."

International Crew Flies UN Flag

As work proceeded, my crew gradually assembled. It, too, was international, and United Nations Secretary-General Kurt Waldheim gave me permission to fly the UN flag. Three members had sailed with me on previous voyages: Yuri Senkevitch, our Russian physician; Norman Baker, our American navigator; and Carlo Mauri, an Italian mountaineer. Other countries represented were West Germany, Japan, Mexico, Iraq, Norway, and Denmark. Eleven men with widely different backgrounds, yet drawn together by a unique adventure.

As harvesting teams supplied us with bardi from surrounding marshes, twenty Marsh Arab craftsmen bound the reeds into 46 huge cylinders, more than 60 feet long. With these the Aymara fashioned the body of our ship—a sickle-shaped hull 60 feet long by 20 feet wide (pages 810-11).

On November 11, 1977, we launched our vessel into the Tigris and bestowed the river's name on her. A last-minute snag almost turned the event into a disaster. As *Tigris* slid down toward the water, the steel launching cradle buckled and broke, threatening to slice through the hull and its rope fastenings. But *Tigris* neither buckled nor broke, and before long she floated high and proud in the river.

I laid the mishap to a faulty cradle, but my Arab friends knew better. "You refused to sacrifice a bull for the launching," they commented bitterly.

During the final week we fitted out the hull, adding two bamboo deck cabins, an elevated steering platform, the mast and rigging, two large rudder oars aft, and a 96-square-yard sail of Egyptian cotton.

On November 23 we cast off from the Garden of Eden and headed down the Shatt al Arab, the river connecting the Tigris and Euphrates with the Persian Gulf.

Ship Gets off to Shaky Start

We inaugurated what was to be nearly a five-month voyage with all the mishaps and blunders that only novices can manage. Although four of us were veteran reed-boat "drifters," *Tigris* had to be navigated. At the first bend in the river we lost steering control and literally plowed the banks with our rudder oars. Tying up to the first available pier for adjustments, we found ourselves afloat in the chemical waste of a neighboring plant—a paper mill that converted reeds into pulp!

At length we reached the mouth of the Shatt al Arab, only to be grounded for nine hours on the mud flats. Lifting off with the incoming tide, we set a course southward, expecting the normal north wind.

It didn't come. Instead, a brisk southerly breeze sprang up, threatening to drive us into an anchorage of some forty huge cargo ships awaiting their turn to head upriver. With more luck than skill we avoided the trap and sailed toward the open sea.

It was Yuri's connections that helped rescue us from the next crisis. Approaching the island of Faylakah off Kuwait at night, we ran into a vast area of reefs and shallows. We threw out our two anchors but lost them to the reefs. By morning we found ourselves driven far into the great labyrinth. Clearly it was time for assistance.

I radioed Kuwait for a tug and was interrupted by a cheerful voice in Russian. As Yuri took over the set, the voice announced: "This is the Soviet freighter *Slavsk*, Capt.

*See "Water Dwellers in a Desert World," by Gavin Young, NATIONAL GEOGRAPHIC, April 1976.

Igor Usakowsky. We will come at once and tow you off." Like many Soviet citizens, Captain Usakowsky knew Yuri as the popular television announcer of exploration programs. The captain took obvious pride in his countryman's presence aboard *Tigris*.

In the end the job proved too difficult for *Slavsk*'s motor launch; the force of the wind against our reed ship was too much. As *Slavsk* stood helplessly by at a distance, a motor dhow appeared and anchored nearby, waiting for our situation to become desperate. The crew of the dhow finally agreed to help the motor launch pull us out, for a ransom of two thousand dollars.

Once *Tigris* was clear of the reefs, *Slavsk* took us in tow and delivered us to the island of Bahrain.

Bahrain an Important Trade Link

Bahrain marked a turning point in our fortunes and provided a dramatic view of Sumerian history. My friend Geoffrey Bibby, the distinguished archeologist who has excavated on Bahrain for years, had flown from Copenhagen to meet us. He was eager to inspect our oceangoing reproduction of a Sumerian ship and to guide us through his excavations (right).

Dr. Bibby was the first to find archeological evidence that Bahrain was part of the land called Dilmun by the Sumerians. His discoveries showed that Sumerian influence extended farther to the east than previously recognized.

According to Sumerian legend, the figure known as Ziusudra—the counterpart of our Biblical Noah—settled at Dilmun after surviving the universal flood in his ark. Here, too, fleets of merchant vessels called, for Dilmun was Sumer's principal overseas-trade center.

For several days Dr. Bibby led us through his excavations, beginning with a 4,000-year-old port located on the island's north coast. At the northern edge of the town's public square a massive stone gate faced directly on the sea.

"Here," Dr. Bibby said, "ships such as *Tigris* could have moored beside the gate to load and unload. Our excavations have uncovered such items as copper fishhooks, soapstone printing seals, scraps of refined copper, pieces of ivory, and beads made

COURTESY TRUSTEES OF THE BRITISH MUSEUM

Silence rules the largest known ancient cemetery, the hundred thousand burial mounds of Bahrain (**above**). Finds at a port under excavation by archeologist Geoffrey Bibby have convinced him that the island was part of Dilmun, a trading port of Sumer and a logical way station between Mesopotamia and the Indus Valley.

At Bahrain's oldest ruins (**right**) Dr. Bibby, left, and the author examine limestone blocks perhaps quarried in Sumerian times on Jiddah, another island in the Bahrain archipelago. The author believes that such cargo could have been transported on large vessels like that appearing on this pot (**left**) from predynastic Egypt.

from a type of stone known as carnelian.

"Mind you," he added, "all these materials are foreign to Bahrain. The copper could have come from Oman, the ivory from India or Africa, and the carnelian from Pakistan or India. We have also found a flint measuring weight that we're certain could have come only from the Indus Valley. Obviously, Dilmun was a major port for transshipment of trade goods."

Shallow Draft Allowed Weighty Cargo

Tigris's design offered significant proof of the bulk trade that flourished in Dilmun: "If Sumerian ships had a three-foot draft as the *Tigris* does, then they could have cleared the shallows off this port, even with tons of copper aboard."

Tigris's forerunners may have been used for other bulk jobs. At the end of our tour Dr. Bibby showed us a temple he had excavated that I thought bore certain similarities to the ziggurats of Mesopotamia—the distinctive stepped pyramids erected by Sumerians in their homeland. The stonework was as fine as any found among the Egyptian pyramids, and the limestone blocks, of a kind foreign to Bahrain, were massive. I asked Dr. Bibby their origin.

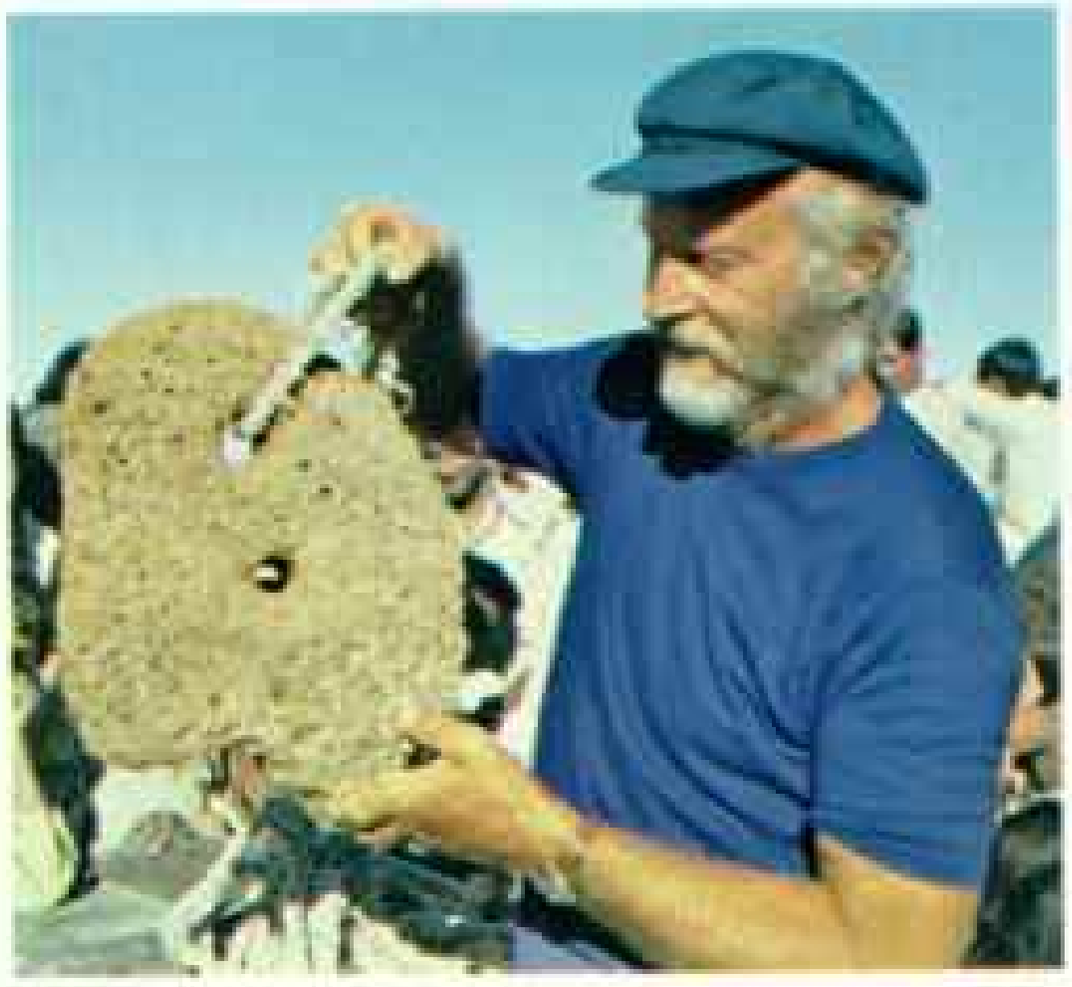
"Probably the island of Jiddah, just west of here," he said. "But it's a prison colony and is closed to visitors."

The Bahrain Government, however, allowed me to visit Jiddah. The island was one vast series of limestone quarries, possibly worked in Sumerian times. Surveying the great cavities left by removal of the blocks, I concluded that in ancient days only a vessel of very light draft such as *Tigris* could have transported these massive loads across the shallows surrounding the island.

Leaving Bahrain, we steered for the Strait of Hormuz, the channel between Iran and Oman, some 400 miles to the east. Despite rough seas we caught a fair wind and reached the strait in less than a week.

With its continuous file of huge tankers shuttling between *(Continued on page 824)*

Portal to vanished riches, only an arched entrance remains where ancient copper mining apparently leveled a mountain in Oman (**facing page**), a short voyage away from Sumer. Guided to the remote site by Italian archeologist Dr. Paolo Costa, Heyerdahl felt a thrill of recognition—was this the lost "Copper Mountain of Magan"? A ruin discovered nearby (**below**) reminds the author of a Sumerian ziggurat. Did Sumerian traders travel even farther afield? Stone anchors of ancient ships are found from Iraq to Pakistan, devices still used in the Indus Valley today (**right**).



A United Nations of names lines a pegboard carved by Heyerdahl to list crew watches (**left**). Ten men of nine nations sailed with the Norwegian leader. One of two Americans, navigator Norman Baker (**far left**) plots a course, observed by—from his right—Heyerdahl, Russian physician Yuri Senkevitch, Mexican industrialist German Carrasco, West German merchant-marine captain Detlef Soitzek, and Japanese photographer Toru Suzuki. Other crewmen were Italian mountaineer Carlo Mauri, American cameraman Norris Brock, and students Asbjörn Dambus of Denmark, Rashad Salim Nazir of Iraq, and Hans Peter Böhn of Norway.

Cold kiss of a red snapper wielded by Asbjörn startles Hans Peter in a moment of relaxation (**above**). Friendship welded the crew together. "We often discussed politics or religion," Heyerdahl relates. "Although we may never completely agree, it is fantastic how men with absolutely opposite beliefs can understand each other's views." He and Detlef share one of many stretches at the oars (**left**)—good exercise, and useful both for increasing speed and for avoiding ships and hostile shores.

A city flowered on the banks of the Indus River around 2300 B.C., only to wither perhaps five hundred years later. It is known to present generations (**above**) as Mohenjo Daro, Mound of the Dead; its original name is lost with the language of the Indus Valley civilization that built it. Even the meandering river has deserted the once mighty citadel with its acres of ruins (**left**).

Yet at its height, this civilization reached across vast distances to contact others. Specimens of the valley's distinctive seals have been discovered in Mesopotamia, along with objects of non-native carnelian and ivory, materials that could have come from sources along the Indus. But did they travel by sea?

A familiar sight greeted the *Tigris*'s crew when they arrived at the river in search of the answer: fields of *bardi* reeds, a resource of ancient shipwrights. From far upstream at Mohenjo Daro, a soapstone seal (**below**) displays a sickle-shaped vessel with hatch-marked hull—a reed boat of the land that Heyerdahl feels was known to the Sumerians as Meluhha.

(Continued from page 818) Middle East oil ports and industrial nations, the Strait of Hormuz is one of the world's busiest sea-lanes. Traffic never stops; it really can't. The goliaths we now encountered require more than a mile to turn or stop.

With the wind at our backs we flew safely through the strait and sailed down Oman's coast to the port capital of Muscat.

Several years ago we would have been denied entry into Muscat, for the country was closed to outsiders. But in 1970 the present sultan, Qabus, exiled his father and set about modernizing the nation, though Oman still discourages tourism. One of Qabus's foresighted moves was to appoint a noted Italian archeologist, Paolo Costa, as Oman's archeological adviser. Dr. Costa greeted us in Muscat.

I was especially eager to meet Dr. Costa, for I had heard reports that the remains of a structure somewhat similar to a Sumerian ziggurat had recently been discovered in Oman. The country is considerably more distant from Iraq than is Bahrain, and if the reports were true, it was a major discovery.

Monument Marks Mining Region

Dr. Costa confirmed the discovery, but withheld final judgment. A team of scholars from Harvard University had found the ruin near the ancient port of Suhar on Oman's north coast.

"There is nothing like it on the entire Arabian Peninsula," Dr. Costa explained, "but whether it is Sumerian, I cannot say. It seems to share the main characteristics of a ziggurat. But come and see for yourself."

Traveling to Suhar by car, we drove inland to where a riverbed known as Wadi al

"It had no beginning and no end," says Heyerdahl of a riverlike streak of red tide encountered on the last leg of the voyage. He found encouragingly less pollution and floating oil than on previous expeditions. "I hope it's because something is being done. I know that shipowners are terribly concerned. In the beginning, like everyone else, they didn't realize that there is a limit to the ocean."

Jizi issues from the mountains onto a sandy coastal plain. There, emerging from the sand, lay the structure, its upper walls fashioned from great boulders (page 818).

To my mind it was probably a small ziggurat. "No excavation has been completed," Dr. Costa remarked, then glanced toward the mountains. "But I can say that this site has been important to man for thousands of years."

I followed his glance and suddenly noticed that the terrain between us and the mountains was strewn with unmistakable evidence of a copper mine. Slag carpeted the ground everywhere. It seemed a nearby mountain had been razed, and all that remained of a more distant one was a monumental stone arch, testimony to the entrance of some long-ago mine shaft (page 819).

"Magan!" I exclaimed, and Dr. Costa nodded. Instantly I recalled the references to Magan in Sumerian records—Magan, the distant copper mountain, from which shiploads of the coveted metal were brought home by way of Dilmun.

Copper's importance to a Bronze Age society can hardly be overestimated, and it is little wonder that Magan was so highly regarded by the Sumerians. What more natural than to build a place of worship beside the source of such a vital substance? Magan and modern Oman would seem to be one and the same.

Next, the Elusive Meluhha

I left Muscat with a third and final Sumerian reference in my thoughts—Meluhha. I had originally planned to sail southward from Oman toward Africa, but I had begun to agree that Meluhha might well be the Indus Valley. The suspicion caused a change of plans: We set sail for Pakistan.

My suspicion was based on more than mere theory. By way of the sea the Indus Valley was the nearest major civilization with respect to Mesopotamia. Moreover, examples of the still undeciphered Indus Valley script have been found in widely scattered areas of Mesopotamia. With luck we might find further links between the two civilizations and confirm the third great Sumerian trade partner.

Once again we steered *Tigris* into the path of giant vessels plying the great oil routes. For three days we battled heavy winds and rain, while trying to take evasive action against the colossal tankers and freighters bearing down on us from all sides.

"Watch out! Here comes another one," was the constant warning to the helmsman when an approaching vessel was sighted. At night and with a shroud of rain, we had to rely solely on our ears, and the warning often came perilously late. On one memorable occasion a ship passed so close that we could not only hear it and smell the diesel fumes, but could also actually *feel* the heat radiating from the engine room.

Somehow we avoided disaster, and on January 27, 1978, we raised the coast of Pakistan northwest of the Indus River Delta. As we approached the shore at evening, a sudden gale caught us from seaward and very nearly beached us. But our anchors finally took hold, and all night long *Tigris* breasted the thundering surf, her sickle-shaped hull with its high bow and stern riding like a great seabird.

Our quest came to an end beside the Indus River northeast of Karachi, Pakistan's chief seaport. Here, in Sumerian times, lay the Indus Valley city of Mohenjo Daro, one of the major metropolises of the time. A small museum beside the archeological excavations displays artifacts recovered from the ruins. One of the items caught my eye: a soapstone seal incised with a miniature sickle-shaped vessel, complete with a deck cabin between two masts and twin steering oars astern (page 823). Hatch marks along the hull indicated that the subject of the carving had been a reed ship.

The building material for that ancient craft presented no mystery; all along the lower Indus, thick stands of bardi thrive in swampy areas. I believe that thousands of years ago the shipwrights of Mohenjo Daro built ships like those of their seafaring neighbors to the west, the Sumerians. The suggestion seems logical to me that Meluhha was the great Indus Valley civilization.

Three months had passed since we launched *Tigris* into her namesake river, and we turned at last toward Africa. As our Marsh Arab friends had predicted, our vessel still rode high upon the sea. Her reed bottom supported an upside-down meadow of luxuriant life. There were barnacles and

In fiery protest against the accelerating arms race and fighting in Africa, *Tigris*'s crew set the ship aflame in Djibouti when barred from proceeding farther by violent politics. How much, they ask, has mankind really learned from history?

crabs as well as a variety of small fish that attracted schools of dolphins, rainbow runners, triggerfish, pilotfish, and sharks. We dined regularly on flying fish that crash-landed aboard *Tigris*.

At the Gulf of Aden on the Horn of Africa we were abruptly returned to the second millennium A.D. Our ship's radio began to crackle with evidence that contact among nations has improved not at all since the founders of civilization sailed the seas: "Calling *Tigris*, calling *Tigris*. Do not put in at Socotra, you will be in danger." "Avoid Somalia, the country is at war." "Permission denied to enter Democratic Yemen's waters." "The war is still raging in Eritrea."

It had been my hope to sail *Tigris* into the Red Sea to Ethiopia, where the papyrus reeds for her predecessors, *Ra I* and *Ra II*, had been gathered. It seemed an appropriate goal for our voyage, but conflict on all sides barred the way.

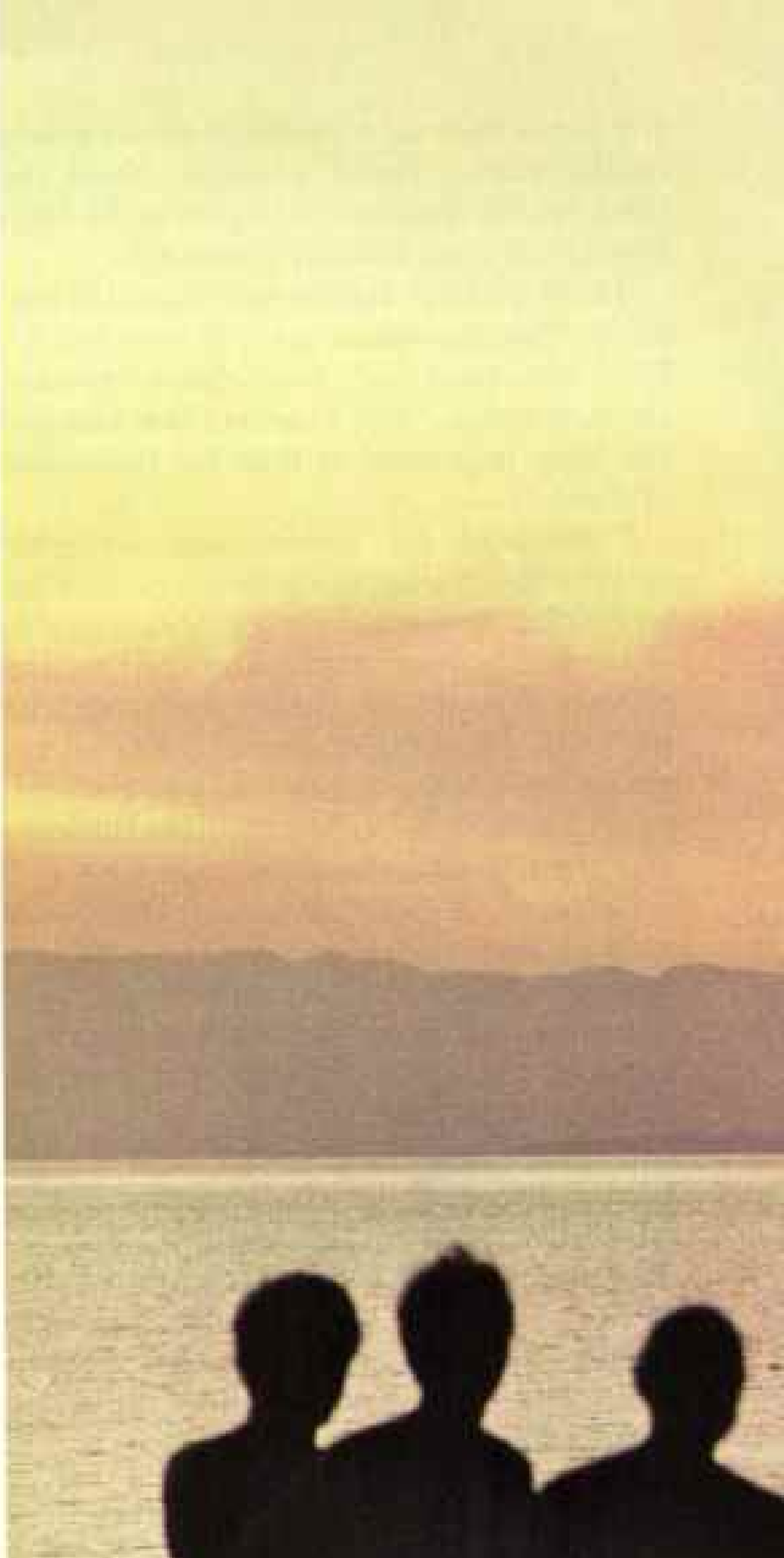
Tigris Dies as Torch for Peace

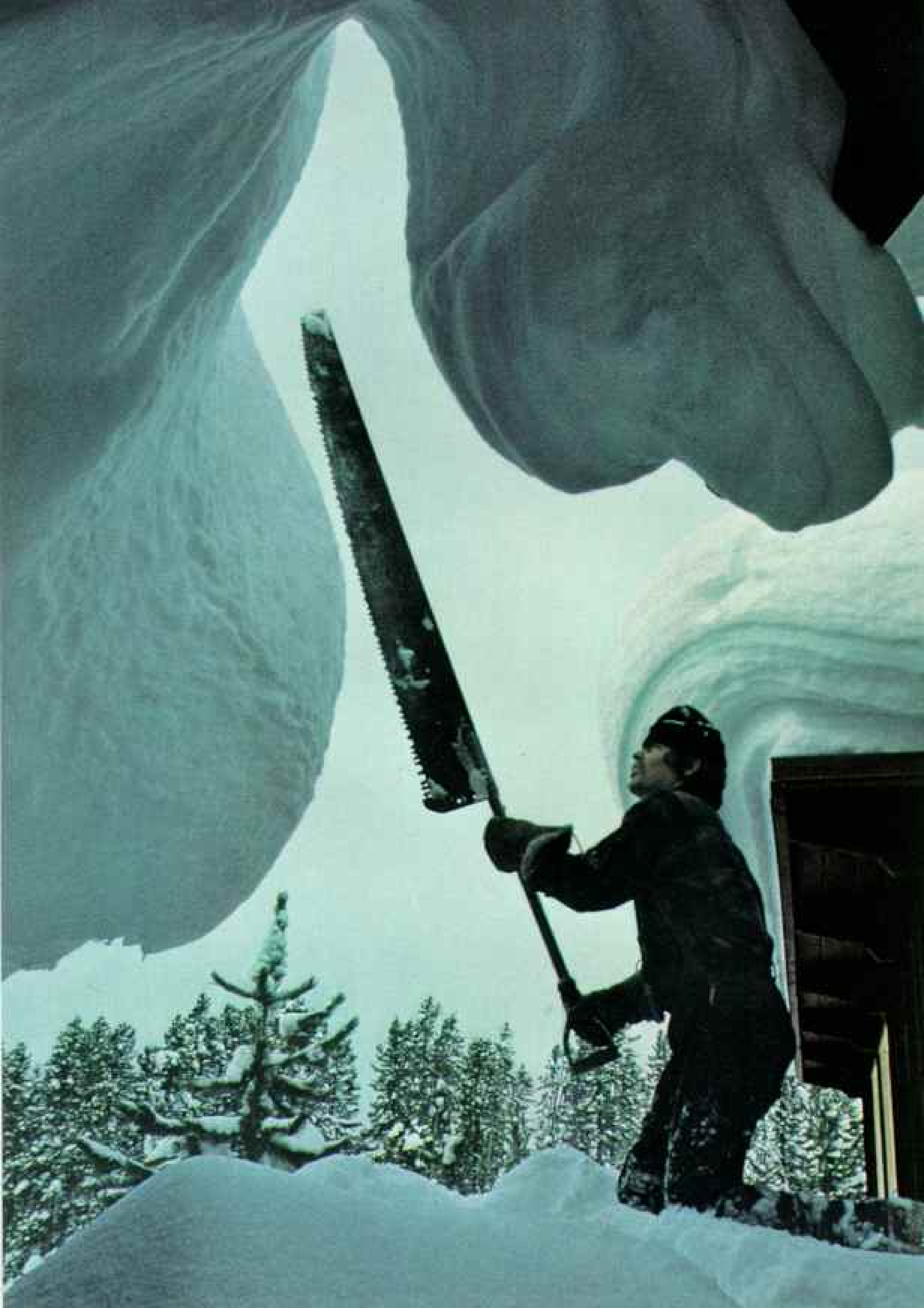
Djibouti alone, at the head of the Gulf of Aden, finally permitted us to enter its harbor. We refused to leave our proud ship to rot there, and we felt the urge to protest what was happening in this war-torn region.

After 144 days afloat *Tigris* was still in perfect shape. The 11 of us had sailed her some 4,200 miles together in friendship, under the United Nations flag.

One evening we lowered the flag and towed *Tigris* outside the harbor, where we set her afire, with sails set. In that gesture we sought to appeal to men of reason to resume the cause of peace in a corner of the world where civilization first dawned. □

EDITOR'S NOTE: *Tigris*'s 4,200-mile voyage will be the subject of a forthcoming National Geographic Society television documentary.





Winterkeeping in Yellowstone

ARTICLE AND PHOTOGRAPHS BY
R. STEVEN FULLER

TO MILLIONS OF PEOPLE Yellowstone National Park is traffic congestion, crowds, a few hours or days in July. But by early September, when the nights are growing colder and workmen are boarding up lodges and curio shops, a different kind of Yellowstone begins to appear.

There are more animals and fewer people. Buffalo and moose wander across deserted parking lots. Early in October a dusting of snow appears on the surrounding mountain summits; gradually it works its way lower, until one morning we wake up to find that the snow has reached us.

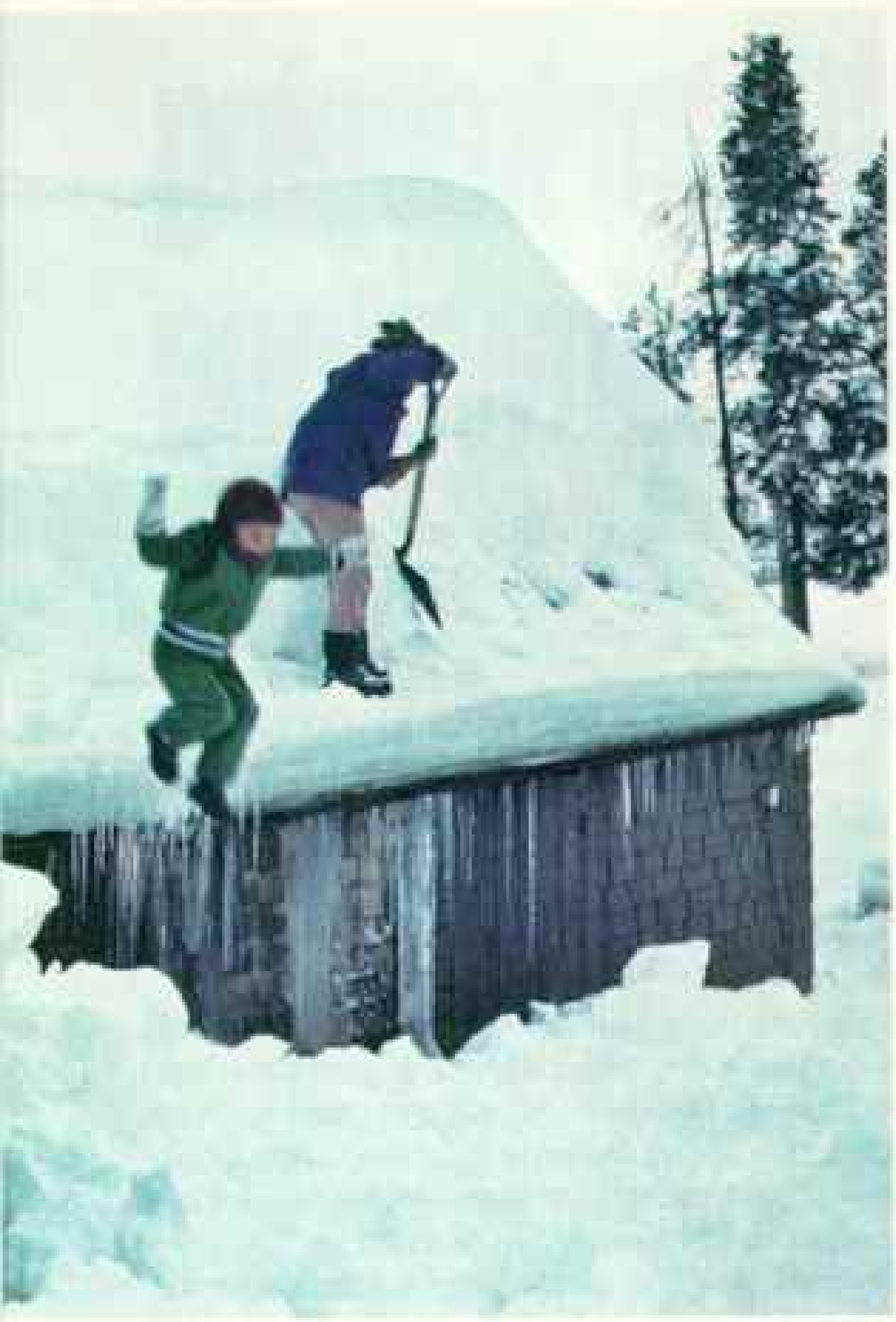
My wife, Angela, and I are the winterkeepers at the Grand Canyon of the Yellowstone River in the heart of the park. Together with our two small children we are among a handful of people, scattered over 3,472 square miles, who will be snowbound in Yellowstone.

When we spent our first winter here five years ago, our nearest neighbors were the ranger and his wife and two winterkeepers at Yellowstone Lake, 16 miles to the south. Other neighbors were farther away, separated by mountain ranges or by miles-deep forests. But like many things, a winterkeeper's life in Yellowstone has changed.

The first of the permanent snow falls in late October or early November. For the next six months I will be a winterkeeper employed by Yellowstone Park Company—caretaker of shuttered

"**Hardest work in Wyoming!**" claimed an old-timer when I took the job as winterkeeper in Yellowstone National Park. My main chore: cutting snow cornices off shuttered tourist cabins to keep their beams from breaking under the weight of an average winter's 150-inch snowfall.

ANGELA FULLER



A community of four, my wife, Angela, our two daughters, and I live in an old house overlooking the famous falls of the Yellowstone River. In the summer the roar of tourist traffic on the nearby road drowns out the thunder of the falls. But for five months a year the roads are erased, and we are snowbound. By December the snow becomes much too deep to walk through, making skis or snowshoes essential beyond our front door. A day trip to a nearby thermal area is a minor expedition (**right**). Emma, 6, skis on her own. Skye, 3, rides a pack frame; she has skied for two winters but doesn't yet have the speed to keep up. On longer trips we go by snowmobile or hitch a ride on a snow tractor that carries visitors on winter tours. Angela (**above**) clears snow from our roof. Good exercise, she says, and a chance for the children to play outside.

National Geographic, December 1978

DEAN KRAKEL

tourist facilities and cutter of great snow cornices. With a shovel and a seven-foot saw I remove snow, drifted sometimes 12 feet deep, from the empty lodges and cabins.

There is a freedom from tensions at Canyon Village in the winter. Life rhythms are set by the sun and the weather more than by the clock or the day of the week. A warmth of family life grows out of the natural pace of winter, and there is leisure to take pleasure in one another's company.

Always Time for Teatime

Angela is English. We met when I was a student overseas at a British university. After graduation we spent three years teaching in East Africa. We arrived in Yellowstone shortly after the birth of our first child, Emma; her sister, Skye, was born during our second winter at Canyon Village. After ten years as an expatriate, Angela still refers to England as home, but she is as at home in these Wyoming mountains as she was in the African bush—and 4 p.m. is teatime, regardless of continent or local custom.

When the snows come and the roads in the park's interior are no longer plowed, we put our car in storage and prepare to be snowbound. All our supplies must be stockpiled, for the nearest grocery store is 37 miles away at Gardiner, Montana, 16 hours on skis—two hard days' travel. We can go more easily by snowmobile, or by snowcoach, a ten-passenger snow tractor that carries tourists into Yellowstone during the winter.

The first four years I went to town once a winter, but when Emma came of school age last year I started taking her into kindergarten 36 miles away at Mammoth Hot Springs one day a week on my snowmobile. For the rest of the week, in cooperation with the park school, we tutor Emma. I miss the peace and solitude of earlier winters; then, each was like a long undisturbed dream.

A quarter of a mile below our house runs the raw gash of the great canyon of the Yellowstone River. Throughout the year the roar of its two high waterfalls fills the air. From the base of the larger falls, a thick column of vapor often rises several thousand feet into the sky, a towering genie that overshadows the house. Beyond the canyon we look out over an open valley eight miles wide, dotted with plumes of steam from hot springs and with grazing buffalo and elk. The surrounding forests shelter grizzly and black bears, and mountain peaks ring the far horizon.

The winterkeeper's house was built nearly three-quarters of a century ago, in the tradition of another age. If you came to this place when it was virgin and decided to build a house to overlook the spectacle below, this is where you would put it.

Earthquakes and the gradual slumping of the land into the canyon have broken the straight lines of the house. The floors slope toward the falls, and a child's ball, left alone in a room, will lazily find its way to the canyon side of the house. The shingled walls are weather etched, and here and there are gnawed holes where birds nest in the summer and squirrels pass away the winter.

It is a comfortable house shaped by countless previous winterkeepers, and at ease in its old age. To us it is a warm home, a place to return to after enduring the cold, the wind-driven snow, the physically demanding task of simply being outside in the harsh mountain winter.

Dealing With Uninvited Guests

Besides the weather, our winterkeeper's house has withstood the assaults of bears. Several of the windows have homemade bars over them; the walls outside are patched where bears have torn off shingles, and the back door is pierced by hundreds of rusty nails, their points protruding to discourage entry. In the spring and the fall grizzlies are common near the house.

One early November evening during our second year at Canyon, we sat around the kitchen table eating a supper of stew. Outside two inches of fresh snow lay on the ground, and the big storms were due. As we ate, we heard a noise at the small window above the stove. *(Continued on page 838)*

On a sub-zero morning, shortly after sunrise, steam rises from a hot spring hidden in shadows. In winter a sense of the wild returns to this mother of national parks. The clean perfection of fresh snow and new frost recalls the world before it was man's.

The extraordinary is part of Emma and Skye's everyday world. They have lived all their lives here. Outside it's minus 20°F. Emma (**far left**) scratches pictures in the frost on a window. Skye (**left**) enjoys the drawings in Ernest Thompson Seton's classic story of a grizzly that roamed Yellowstone a century ago. The girls (**below**) play at a window we barred after a grizzly broke into the house. The bar wouldn't keep a bear out for long, but it would buy us time to take action. On the sill of the window is the skull of a grizzly found near Hebgen Mountain, just beyond the west boundary of the park. Skye (**bottom left**) waits out an autumn flurry in my vest. Emma (**bottom right**) warms her hands over a steam vent.

In Hayden Valley below the house, a herd

of shaggy buffalo stands motionless in the cold of a February morning.

(Continued from page 832) Absently, Angela went over and closed it.

Before she could sit down, the window flew open behind her with a bang and was torn from its hinges. For a moment we all gaped, stunned; then I shouted, "My God, it's a bear!" and we were all in motion.

It was a primeval vision, and our reaction was an ancient, instinctive division of labor: Angela, eight months pregnant, grabbed Emma and ran with her to the safety of the back bedroom. I advanced, shouting and waving my arms, and tried to be convincingly threatening. The grizzly just stared at me, unblinking and unhesitating in its destruction. One forepaw, tipped with three-inch claws, swept clean a shelf lined with jars of spices. With a crash, shards of glass scattered across the linoleum floor. The paw groped around seeking a clawhold stout enough to pull the animal into the room.

Never have I felt so helpless. Single-minded, the bear kept coming. When the upper half of its body was inside, I abandoned the field and joined Angela and Emma in the bedroom.

We climbed out another window into the night and ran to the car. Safely away from the house, I stopped and called the ranger at Yellowstone Lake. It was the first time I'd ever used the walkie-talkie, and I just hol-loed into it until Jerry Mernin answered.

I said, "A grizzly just busted the kitchen window. I think it's inside. We're all safe."

In a calm voice he replied, "Hang on, I'm on my way."

"The baby is kicking like crazy," Angela told me as we watched the flashing lights of the ranger's pickup truck approaching 15 minutes later. By then my hands had stopped shaking.

Bear Finds Stew to Go

Cautiously Jerry and I went up to the house. The bear ambled off into some trees at our approach. We discovered that it hadn't succeeded in getting all the way inside. But it had managed to reach across to the stove, hook the handle of our stewpot, and dexterously draw the bubbling stew out the window without spilling a drop. The next morning I found the pot behind the house, licked shiny clean.

While I boarded up the window, the park ranger went off to get a live trap, a ten-foot section of steel culvert welded to a small trailer. The sliding metal door was linked to a trigger smeared with peanut butter.

The next morning the grizzly, a 16-year-old female weighing 275 pounds, was in the trap. Ear tags identified her as having been captured by the National Park Service on four previous occasions. She was driven 45 miles to a valley on the other side of a mountain range and released.

Return of the Grizzly

Three days later I found fresh bear tracks in the snow below the kitchen window. I spent the remaining hours of daylight bolting iron bars on all the windows of the house. Jerry came up just before dusk and set two traps. We slept lightly that night.

The next morning was sunny and beautiful, probably our last opportunity to go visiting before the heavy snows, so we drove to the other side of the park to see friends. While we were away, the bear came back, broke out three windows, and tried in four places to tear her way through the walls of the house. By the most incredible luck she failed again to get inside.

When we drove up to the house that night, she charged the car. Then, while we watched, she climbed into one of the traps and ate the bait, but the trigger mechanism had jammed and she climbed out again. A few minutes later she caught herself in the second trap.

In modern America, unfortunately, there is no place for such bears. She had shown herself fearless of human beings and without respect for their buildings. She would be a very dangerous critter to meet in the backcountry. In recent years the management of Yellowstone's grizzlies has been a topic of heated controversy in the national press. The fate of this bear was a question of considerable political consequence. After consultations and ruminations, the National Park Service decided to destroy her.

The next afternoon, sitting in the cage trap, she was given a deliberate overdose of drugs and died quietly. Parts of the carcass were sent to a wildlife laboratory in Montana. The Yellowstone ecosystem was made a little poorer—and our lives a lot easier. In the days that followed, while I repaired the

extensive damage to the house, the winter snows began. We would see no more bears until spring.

With the first snowfall the contours of the land are softened. Snow fills gullies and covers tangles of fallen trees. Roads are drifted over, and to a person on skis they lose much of their meaning. The snows of early winter are fluffy and soft, and when waist-deep they are exhausting to walk through. But on skis you skim over the surface like a water bug—on skis the world is again wide open.

There are lots of tracks that tell of the comings and goings of buffalo, deer, moose, rabbit, squirrel, mice, ermine, otter, pine marten, porcupine, and birds. Sometimes a bloody patch of snow, a few feathers, some coyote tracks.*

Within ten miles there are five thermal areas, all visible from the house. Each is revealed by plumes of steam rising from hot springs, fumaroles, geysers, and mud pots. Many animals, especially elk, moose, and buffalo, are attracted to the warm patches of ground that remain free of snow throughout the winter; movement is easier and sometimes clumps of dried grass are exposed. They are worlds unto themselves, temperate islands in a sea of snow.

Weak animals—the old, the young, the sick—sometimes die in thermal areas. I watched an aged buffalo bull grow tattered and bony during the last months of one winter (page 847), until on a trip late in the season I found him dead, his legs straight up, his great body strange in its emptiness. Several other buffalo grazed a few feet away. As I approached, they jogged off, the long tangles of hair and ice hanging from their undersides tinkling like wind chimes. The ravens came and took the eyes of the dead one, the coyotes opened the belly. A week later there remained only hair and bones.

Heat and Cold Produce Strange Forms

In thermal areas unique combinations of hot water and sub-zero temperatures produce extravagant displays of frost and ice (pages 844-5). During the cold months steam freezes within moments of escaping the earth. Trees bow under the weight of exquisite drapes of sparkling snow and frost. On the ground, where a geyser's spray falls, grow clusters of egg-shaped knobs of ice. In the brilliant sunlight they look like a spilled hoard of jewels.

These areas remind me of lost worlds out of a Victorian adventure story. Surrounded by monumental snows and killing cold, they shelter gardens of green moss, nourished by constantly melting snow falling on the warm ground. Rocks and fallen trees provide insulation from the warmth, and strange snow shapes grow atop them. In the winter landscape these areas seem alien places, containing surprises and curiosities.

Geysers Pose Dangers to Wildlife

On one walk through a thermal area I found the body of a coyote lying in the drainage of a large boiling crater geyser. Every 15 or 20 minutes the geyser erupted, spilling hundreds of gallons of boiling water over the dead animal. It was as tenderly cooked as a Sunday roast.

Walking down the steaming drainage, I cut a trail of elk pellets, a broken string of beads across my path. Each pellet had swollen to the size of a walnut and trailed long filaments of algae that waved rhythmically in the running water; each one resembled a giant tadpole going vigorously upstream.

While visiting another geyser, I was caught in a spurt of hot spray. A few days later a pattern of about three dozen holes appeared on my parka where each of the corrosive droplets had eaten through the cloth.

Sometimes water birds land on the surface of hot pools and are scalded. On the bottom of one pool I found a bird skeleton, every bone in place, laid out like a fossil on a sheet of Bavarian shale.

In very cold weather the ground between the hot pools, vents, and pots is covered by large clumps of unusual frost crystals. Subsurface steam forces its way upward until it contacts the sub-zero air and freezes. Water vapor continues to emerge so that a long, sinuous kind of frost grows up out of the ground, often to a foot or more in height, resembling tall clumps of dried grass. The frost shatters like glass at the slightest touch.

A thermal basin in winter is a pristine crystalline garden full of fragile forms that reflect the sun's brilliance off one another a million times. *(Continued on page 848)*

*See "Yellowstone Wildlife in Winter," by William Albert Allard, GEOGRAPHIC, November 1967.

In the early morning's meager warmth, a pair of trumpeter swans

stirs after a frigid night on the ice beside the Yellowstone River.

Winterkeeping's not all work. It's a life with lots of latitude—time for hobbies, time with the family, and time to spend by myself. I made clay models (**above**) for a chess set, eventually to be cast in bronze or aluminum in a small foundry I built.

Snowfall and weather determine my schedule. Sometimes I'm free to take an afternoon off and play with the children; Skye (**left**) demonstrates her pleasure in the fact. There is time to return to favorite haunts, to soak on a bleak winter's day in a remote creek fed by hot springs (**right**). Since prehistoric times, visitors to Yellowstone have found physical and spiritual renewal in the region's warm waters. But an activity that's harmless when indulged in by a few can become devastating when enjoyed by many, so for two decades it has been illegal to bathe in the ecologically fragile hot springs themselves. How to enjoy without destroying—that is the crucial problem to be solved in the world's diminishing wilderness.

ANGELA FULLER (TOP AND ABOVE) AND DOUG PEACOCK

Conflict between hot and cold creates a fantastic winter landscape in Yellowstone. Pockets of bare ground warmed by subsurface magma have their own microclimates. Surrounded by crushing snows and killing cold, green plants hug the warm earth. Steamy pools, thick with algae mats, support a complex community of insects. Windblown geyser spray (**far left**) encrusts a gravel bar with jewel-like nodules. Large "snow mushrooms" (**above left**) grow where wood or a rock provides insulation from warmth below, allowing snow to accumulate normally.

Carpets of green moss, watered by snowmelt, grace an old crater (**above right**) that is dry and lifeless in summer heat. Ornate forms, precipitated from mineral-laden water, surround a geyser vent (**left**). Early visitors to Yellowstone, eager for souvenirs, often attacked similar formations with crowbars and axes. Taken from their natural environment the specimens lost their magic and turned gray and crumbly.

Bones of a coyote still lie in a pool at the edge of a geyser (**left**) where I found its body four winters ago. Coated with silica dissolved in the hot water, the bones are becoming fossilized. Despite much speculation, I have never been able to understand how it came to die in so peculiar a place. Yellowstone Park contains many small mysteries, and hints at larger questions.

An old buffalo (**right**) grazes on the banks of the Yellowstone River in late October—early winter here. In the chill morning air, wool and grass are crusted with frost. His ribs show already, at the beginning of this season of testing. Weakened by age, the bull's chances of survival were poor. Toward the end of winter he became too feeble to stand. For days three coyotes hung around nearby, gnawing old bones and sitting on their haunches—watching and waiting. Then the old bull died. His death was life to the coyotes, succor during their season of famine. Now the bull's substance fuels the cries of coyotes.

(Continued from page 839) To walk through such a basin is an awesome experience each time. Once again one is the first human on earth, the first morning after creation, in a world of undisturbed perfection.

It is remarkable, too, to encounter life, especially delicate life, amid crushing snows and killing cold. Hot springs sustain a stable, life-supporting environment that is much the same in January as in July; pools as warm as bathwater are soupy with life.

Thick mats of algae support the minute larvae of a specialized brine fly. The adults, in their thousands, skim just over the surface of warm, still waters. But they must remain within a shallow zone, an inch or two high; beyond, the intensely cold air will shrivel them as certainly as fire. Beneath the blanket of steam, carnivorous flies and spiders feed on the brine flies.

The hot springs display subtle gradations of color and texture, revealing temperature gradients, acidity, mineral content, and varieties of algae and bacteria. The springs themselves resemble colorful, large flat organisms spread out on the ground. At their outer edges, where deathly cold extinguishes life, a lacy ring of ice crystals and frost feathers makes a thermal map that reveals patterns of warmth and cold invisible in milder seasons.

Rooftop Labor Has Its Rewards

A mile from the winterkeeper's house is Canyon Village, a cluster of lodges, curio shops, and cabins that service the crush of summer visitors. In winter everything is boarded up, half hidden beneath drifting snow. On the lee side of each roof an overhanging snow cornice enlarges with every storm. Left to grow, cornices can come to weigh tons and break roof beams and eaves.

With my snow saw I cut off the cornices before they become large enough to do damage. The job dwarfs a man working with simple hand tools; drifts are commonly eight feet deep, and sometimes more. I cut the snow into blocks weighing several hundred pounds, then pop them free with a shovel and skid them off the roof. It is physically demanding work, but the air is clear and crisp and the mountains shine all around. Ravens wheel and caw, and there is pleasure in the quiet rhythm of solitary work.

My mind wanders and wonders at the ephemeral nature of the job: grunting and straining to move heavy blocks of snow that soon will be water vapor. Winterkeeping provides the excuse to be out every day, sniffing the ever changing, always interesting mountain weather, a chance to watch the sun arch across the day's sky and to see, a few times a winter, a big full moon rise at dusk behind columns of thermal steam, turning them into dancing ghosts dotting the valley spread out below.

When first we came here, I imagined winters would last forever, but now they fly by and are never long enough to do everything planned. Boredom is rare. For entertainment I have a ceramic kiln in which I fire stoneware and porcelain chess sets. The children join me in the playing with clay, and as we work, we talk of childish things.

Also I have a foundry in which to melt bronze and aluminum to cast small lost-wax sculptures. Books offer immediate transportation to a different time and place. Photography gives me an excuse to be out among animals and thermals for a few hours two or three times a week.

Each year we manage to take several ski-camping trips into remoter areas of the park. Sometimes I go with Dave Smith, one of the winterkeepers at Lake. He is great friends with Emma and Skye, and once each winter he baby-sits for a few days so Angela and I can go on a camping trip together.

Last winter Emma and I went on our first overnight ski trip together. Burdened with a heavy pack, I could hardly keep up with her in her excitement, though she was only 5. Then it was Angela's turn. I stayed home with the children while she skied 16 miles to Yellowstone Lake to visit the ranger and his wife, Roger and Nancy Rudolph. A spell in the backcountry imparts a physical glow and a clearness of mind. Afterward, reunion with the family and home gives a sense of renewal to everyone.

Solitude Brings Closeness

Angela enjoys life in Yellowstone, though not all women would find pleasure in it. She always has half a dozen projects going. She is skilled in the often maligned art of homemaking and has developed a philosophy that combines elements of both feminism and

tradition. It serves her well, and I can live happily with it. "To each thing its season," she says, and these are the years for mothering and wifeing.

The children have only each other for playmates and they have grown close; they are friends, as sisters should be. We all ski together every day, except in the most severe weather. The winter climate promotes robust health. Colds and other common winter ailments come only after contact with someone from the outside world.

Until the park authorities established a weekly service two years ago, our mail arrived about once a month, big canvas sacks of it. Always it was cause to declare a half-day holiday. Winter visitors are rare and appreciated. Sometimes a party of cross-country skiers, bent under packs heavy with winter survival gear, spends a night with us—an occasion to bring out a few bottles of homemade dandelion wine.

Once two snowmobilers, who had run out of gas and wandered lost, saw our light about midnight and made their way up to the house. Before a ranger was stationed at Canyon Village, I used to leave a light on all night for just such eventualities. Their banging on the door woke us, and we drank tea with them around the table until they stopped shivering and were ready to be bedded down in front of the living-room stove.

The Ultimate Christmas Gift

The community at Canyon Village grew to four during our second winter, when our second daughter was born a couple of days before Christmas. Angela got up a few hours before dawn that day and began cooking and cleaning the house. She didn't have to say her time had come; it was obvious.

About noon we caught a ride on the tourist snowcoach and rode forty rough miles into town. Our two fellow passengers forgot all about the wonders of winter in Yellowstone they had come so far to see and concentrated with Angela on each contraction. We arrived at the local doctor's office in West Yellowstone about dark. At 11 p.m., after a reasonable labor that Emma, the doctor, and I shared with Angela, Skye Canyon was born. After showing off the baby the next day, we caught the snowcoach home to Canyon Village on Christmas Day.

In later years Skye's birthday came to mark the beginning of the Christmas holidays. Christmas is a time for friends and neighbors to gather; they come and stay for two or three days. In preparation, Angela, Emma, and Skye make up sausage rolls, steak and kidney pies, and Christmas puddings. In my work shed I complete gifts: a doll's cradle for Skye and a play horse barn for Emma. Each girl comes out to help with the other's present. The excitement grows.

Old Friends Share Holiday Cheer

Dave Smith and Hod Coburn come up: single young men, old friends, the winterkeepers from Lake. Hod arrives on a snowmobile towing a sled piled high with skis, gear, presents, and a turkey he won at a turkey shoot. He tells me the valley is rough; the passage took three hours, and he got stuck more times than he can remember—perfect weather for the occasion, we agree.

Dave has decided to ski the 16 miles and arrives a few hours later in a blizzard. The eyelashes on the windward side of his face are frozen together. A fitting entrance for a winterkeeper. While I decant a bottle of stout, he frees his beard of icicles.

The house is hung with balloons and decorations and spruce-bough wreaths. Emma and Skye look very pretty in the new holiday dresses Angela has made for them. Dave and I talk of the weather, the condition of the snow on the roofs, and of the peculiar little things we have seen in Yellowstone since last we met weeks before.

We eat of the dainties Angela has made, and sample my collection of special beers. During the days we ski, burning off the sloth and bloat of feasting. In the evenings we play children's games—dart throwing at a board of balloons, pinning the tail on the buffalo—and the girls are read countless stories. Then the holiday is over. Dave and Hod pack up one morning, and happily we say good-bye. It has been a good visit, but we are all ready to be alone again.

In January ice sheathes the 308-foot Lower Falls of the Yellowstone River below the house. The river continues to plunge over the brink at the upper end of the canyon, but it is hidden from view behind a mass of icicles. As winter wears on, frozen spray forms a blue

(Continued on page 856)

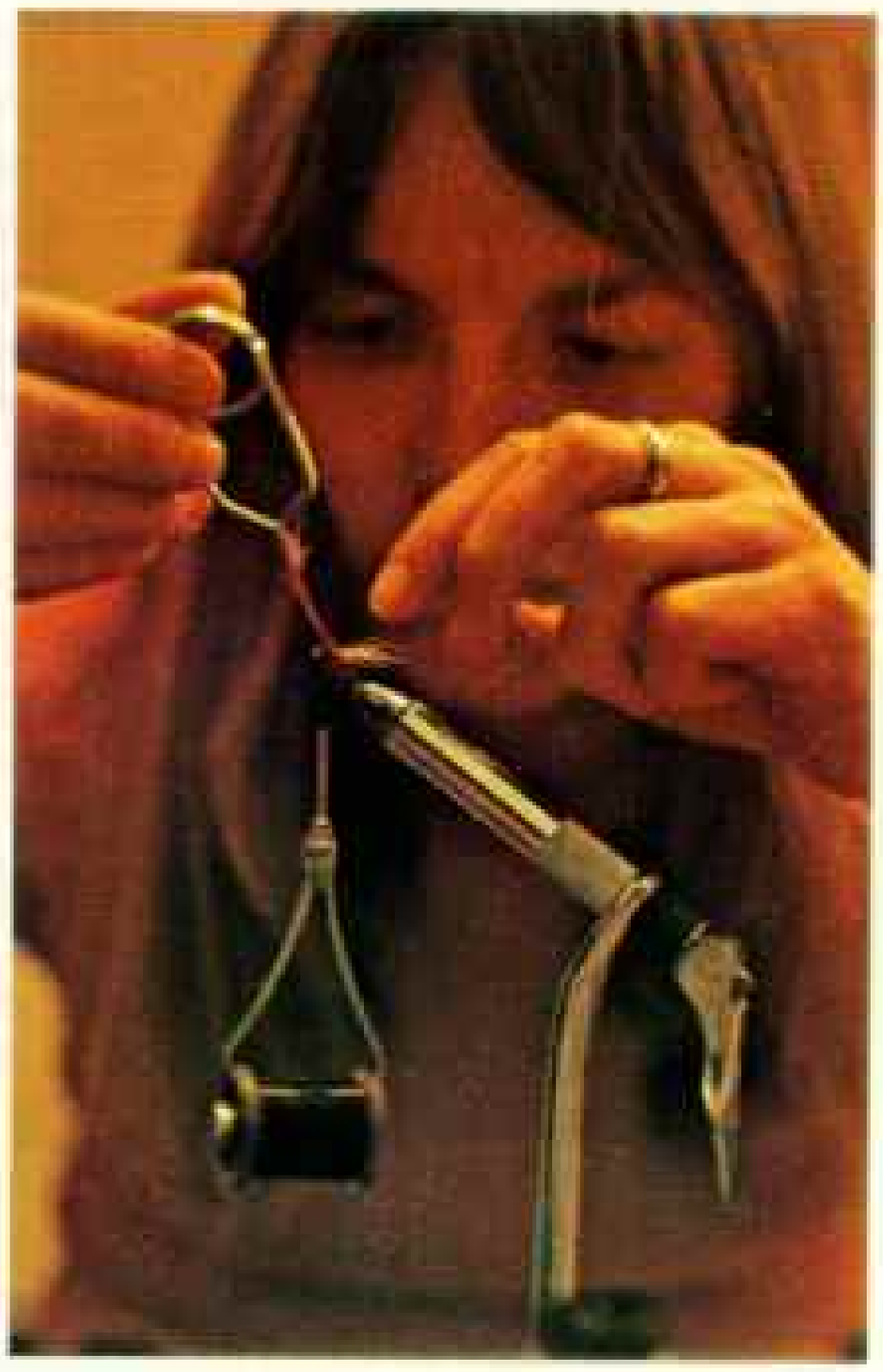
A creek warmed by hot springs remains ice free during even the coldest

months. Moist air rising from its mild waters rimes stalks of grass with frost.

Every new snowfall creates an unmarked slate on which the affairs of even the most secretive animals are recorded. Tracks of a snowshoe hare (**left**) remain in bas-relief after its weight compacted the snow and a breeze blew away the surrounding softer cover. During the night clusters of frost covered the surface.

A squirrel's trip from its nest to a cache of pinecones is told in its tracks (**below**). Bounding movements of a marten (**right**) leave dimples in the snow behind our house; a pair of the large weasels spends the winter beneath our living-room floorboards.

Covered by each new storm, such tracks reappear for a day or two in the spring when thaw melts away overlying snow strata.



At home in Yellowstone: After a day out on skis, Angela and Skye (**left**) warm up on our living-room stove. Overhead, wet gear dries quickly in the low humidity of the house. Gautama, our dog, came with us to Yellowstone. When the grizzly broke in, Gautama was forgotten in our scramble to get out the back window. Later we returned to find the dog hidden—very sensibly—under the bed.

Angela (**above**) enjoys a winter evening tying flies, delicate little jewels of feather and hair. When Yellowstone turns mild again in spring, she will use them to angle in neighboring streams and lakes for cutthroat and rainbow trout.

From scraps of material Angela braids a rug (**upper right**). It grows in a colorful spiral; by May it will cover our living-room floor—a gift of the winter now gone.

Every evening there are exercises (**right**). Angela enjoyed ballet lessons as a child and passes on her pleasure to the children. While I sit watching in the living room, the company of dancers—Angela, Emma, and Skye—comes trouping from the back bedroom in leotards. For an hour we are all entertained by pirouettes and pliés. Laughter escapes the house, unheard in the snow-swept darkness all around us.

(Continued from page 849) ice cone more than half the height of the falls.

By late April, when the snows begin to melt and there is the incessant sound of dripping water from the roof, the waterfalls begin to roar louder. At its peak in June the crashing spring flood rattles our windows.

On south-facing slopes bare patches spread. As the snow melts down, sometimes half a foot a day, old tracks appear like fossils out of the snow strata of the past winter. They too soon melt, but for a few hours they mark the passage months before of a buffalo, a skier, or a snowmobiler.

Only the Strong Survive

This is the great time of dying. Animals have spent months expending more energy than they can take in, and now they are at their lowest ebb. It seems ironic that when the days are turning warm and the first green shoots are appearing, winterkill should reach its peak. The carcasses of elk, buffalo, and deer are marked by coveys of ravens and nervous gatherings of coyotes.

The lean winter of the coyotes is at an end. More meat is available than even their starved bodies can ever hope to process. The sweet stench greets bears emerging from their sleeping holes. For a few weeks grizzlies or their tracks are again a common sight on the rolling hills near the house.

There are newborn animals everywhere, wobbly but full of the springtime zest of new life. The surviving adults improve rapidly as the grass grows higher. The herds follow the grass as it greens in the wake of the snow retreating daily higher into the mountains. In these mountains spring doesn't really stop happening until sometime in August, when up high it meets the cold of winter beginning to make its way back down.

In April we hear the snowblowers and plows coming for three days before they make it up to our house. The blades of the monstrous machines chew into the snow and hurl it far to the sides. Hour after hour the plows advance at a walking pace, leaving a high-walled trench and exposing the black pavement again. By mid-April a web of roads has been cut across the park.

One day, down in the valley, I stop my car to watch a big buffalo bull cropping fresh green shoots. I take pleasure in a gentle breeze that carries the scent of crushed grass. A car speeds by, honking, and a woman leans out the window to damn me for blocking the public road. The animals move higher, into the backcountry, and the summer visitors come in their millions. The wilderness is gone with the snow. The seasons have come round again.

Since the 1920's, when Americans in private motor cars became a social phenomenon, this mother of national parks has attracted ever growing numbers of visitors.* Last year two million people experienced the beauties and frustrations of a summer visit. Until recently Yellowstone lay fallow during the remaining three-quarters of the year, and the winter wilderness easily absorbed a few thousand hardy off-season visitors. This is rapidly changing.

On a long weekend 1,500 snowmobiles a day reach Old Faithful. Above a recently opened winter route, a 75-mm recoilless rifle has been installed to bring down snow that might avalanche on road crews or snowmobilers. The report of artillery is a new sound in these ancient mountains.

Interpreting the Sound of Change

Many, maybe most, people say this is right and proper—Yellowstone was created to be used. But winter landscapes are notoriously fragile, and in any natural area human use has its costs. In Yellowstone, winter visitation is reaching a critical stage. Remarkably, no one knows just what the impact of this development will be or the direction it will take.

I came to Yellowstone from Africa, seeking a place on the fringes of what remained of natural America. Since then I've discovered the fringes are burning back. Yellowstone Park isn't threatened with destruction or dissolution, but it is changing.

Increasingly, during the quiet at sundown on winter camping trips eight or ten miles from the roads, I hear the distant noise of snowmobile engines. All around the world the crush of human numbers is trampling the last natural places on this planet, and the roar of the population explosion grows louder. In the quiet of these snow-locked Wyoming mountains I hear it drawing closer. □

*See "Yellowstone's Hundredth Birthday: A Four-part Report," in the May 1972 GEOGRAPHIC.

Out of the infinite patterns on the face of a mud pot emerges the image of man—the arbiter of Yellowstone's future.

"DOUBLE EAGLE II"

Three American balloonists' own account of their

HAS LANDED!

By BEN L. ABRUZZO
with MAXIE L. ANDERSON
and LARRY NEWMAN

historic six-day flight across the Atlantic

LATE. Again we were lifting off late, this time by two hours, forty-five minutes.

The year before, our two-man balloon, *Double Eagle*, had been delayed three hours past scheduled launch time, and Maxie and I found a storm that should have been behind us ahead and waiting. Largely because of that delay, our attempt to be the first to cross the Atlantic Ocean by balloon had ended with a frigid and almost fatal ditching in the sea off the coast of Iceland.

Now, at 8:43 p.m. in Presque Isle, Maine, on Friday, August 11, 1978, *Double Eagle II* and her crew of three eased into an almost windless sky above potato fields. Gradually we moved off, people running below us in the last light. An eddy of wind forced us downward. Larry's hang glider, tethered beneath the gondola, nicked the ground and bounced up. I quickly spilled sand ballast, and we climbed into the dark.

It was a comfort to know that, unlike the year before, we left our families and friends dry eyed and cheerful. They had confidence in us, as we had confidence in ourselves, in our craft, and in our ground team.

What was different this time? One difference was the addition of Larry, an extra hand sharing duties and watches to reduce fatigue. He and his associates had rebuilt our catamaran-shaped gondola, utilizing hang-glider *(Continued on page 864)*

Bubbling over with enthusiasm, a crowd surges around the gondola of *Double Eagle II*, finally at rest in a field near Miserey, France, after the first transatlantic balloon flight. Still in his crash helmet, Larry Newman tries for a swig of champagne but gets a shower instead.

PIERRE VAUTHEY, SYGMA

DICK KENT (ABOVE AND BELOW)

Inhaling helium through its elephant-trunk duct (**above**), the 11-story gas envelope of *Double Eagle II* inflates to its flying shape, a sphere on a cone. Designed by balloonist Ed Yost and made by him of neoprene-coated nylon cloth, the envelope has a capacity of 160,000 cubic feet. But as launch time nears in Presque Isle, Maine, it appears the tank truck cannot pump aboard a full measure of helium.

Nearly three hours late, the balloon lifts off in the night (**right**) with a partly slack envelope. Larry Newman's hang glider—he had hoped to soar with it to a landing in Europe—tags along at the end of a line, while veteran balloonists Ben Abruzzo and Maxie Anderson attend to ballasting. The year before, Ben and Maxie had made a transatlantic attempt. They were forced into the sea off Iceland by a storm, after receiving reports of what Maxie calls "the worst local weather I'd heard about in nearly 30 years of flying."

This time the weather holds fair as the Albuquerque businessmen-turned-balloonists climb to altitude and their rendezvous with the record book.

"DOUBLE EAGLE II" (ABOVE AND FOLLOWING PAGES)

Packed tight as sardines—one of which Larry dispenses to Ben (**above**)—the 6-by-8½-foot interior of the gondola is crammed with gear as it departs the Newfoundland coast. At touchdown 95 percent of all equipment had been jettisoned as ballast. Homey lawn chairs proved vital in reducing fatigue.

Cold and thirsty and chafed by his oxygen mask, Ben stares with weariness (**following pages**) as the balloon reaches 23,000 feet south of Iceland. The greatest danger faces the trio only hours away, a sudden descent to the clouds below.

(Continued from page 859) parts to make it more efficient and comfortable.

A second difference was experience, both Maxie's and mine as balloon pilots and that of our superb ground team, now on its second time around with us. Maxie puts it this way: "I don't think that you can fly the Atlantic without experience, and that's one reason it hadn't been flown before. Success in any venture is just the intelligent application of failure."

THAT FIRST NIGHT, as we ghosted across Maine and New Brunswick, we relaxed a bit to watch northern lights draping the sky in great shimmering waves as meteor showers blazed across our view.

As we sailed on, a failure from the first attempt emerged again despite all our application to avoid it—the radios worked poorly or not at all.

Our communications director, Sid Parks, had put long hours into making sure the radios worked properly, and on the ground they did. But as Larry says, "Things go up in aircraft and they quit. It's like magic."

There we were again, wishing for a long string and two tin cans. We were flying by the seat of our pants, but at least this time the weather was good.

Our announced goal was not just a crossing from continent to continent, but from the United States to Paris. To plan the flight, we had talked endlessly with Bob Rice, chief meteorologist at Weather Services Corp. of Bedford, Massachusetts, and with our in-flight director, physicist Rich Schwoebel, whom Maxie calls "the most brilliant man I know." Together we plotted strategy and tactics unique to long-distance ballooning and attempts on the Atlantic.

Unlike other balloonists who had tried it (pages 870-71), we planned to climb to high altitude quickly and maintain it. As it turned out, for about a third of the flight we were above 15,000 feet and breathing oxygen. At these higher altitudes we could expect stronger winds to speed us along.

Yet going to high altitude is, by itself, not enough. If you just drift with the winds, you can end up going anywhere. Our plan was to pilot the *Double Eagle II* by moving into a migratory high-pressure system of a kind fairly common in the North Atlantic between the storms of spring and autumn.

Such a high-pressure system is basically a mass of air that rotates slowly clockwise as the whole mass moves from west to east. By launching when we did, and despite the delay, we climbed into the heart of the high, which was now squeezed into a ridge by two low-pressure systems, one ahead of us and one behind (page 871). If the high kept its shape and strength, we could ride to Europe with it. And, as it rotated like a giant, sluggish merry-go-round, we would follow a curving path around it and grab the brass ring at Paris.

If all went well, that is. If all went badly, W. C. "Doc" Wiley was again ready to coordinate air-sea rescue operations.

At the beginning things went neither way. Our course was good, but our altitude was lower than we wanted. After about forty hours aloft we abruptly lost 3,500 feet in a downdraft. Maxie and I jettisoned ballast calmly and carefully—our experiences from the first flight paid off here—and we began to rise. To make sure we weren't leaking helium, I climbed on Maxie's shoulders, opened the appendix at the bottom of the gas envelope, and scanned the inside.

Even the smallest leak would admit sunlight and appear as does a tiny star in a black sky. I could not see the faintest pinpoint of light, but I didn't expect to. I knew that Ed Yost, who built our balloon—its neoprene-coated panels cemented with superstrong adhesive—had used the finest materials and the highest standards of workmanship.

Indirectly Ed was responsible for our trying this in the first place. Maxie and I were both hot-air balloon enthusiasts, but neither of us had considered the Atlantic crossing in a helium balloon. Not until one evening.

"I was in my den," Maxie recalls, "and I picked up the February 1977 GEOGRAPHIC that described Ed's solo attempt on the Atlantic.* The article captured my interest, and I thought it over for about a week.

"Then I brought it up to Ben—he's the luckiest man I know. He thought it over for a minute. Maybe two; he's not known for being impetuous. He said, 'Let's do it.' From that was born our first flight."

Maxie and I went to see Ed, a man of few

*See "The Longest Manned Balloon Flight," by Ed Yost, NATIONAL GEOGRAPHIC, February 1977.

words and those well chosen. He agreed to build the *Double Eagle*, and later he built *Double Eagle II*. So here we were, climbing to altitude over open ocean on our second try in less than a year.

By dawn of the second full day out, our flight profile looked good—altitude correct, position in the high-pressure system correct, directly over Newfoundland. Early in the afternoon we passed St. John's, right over the spot where Marconi had received the first transatlantic wireless signal, beamed from Cornwall, England. We could have used him. Our radios continued to cause problems for communications, for navigation, and for Larry.

"It was really a trying time for me," he says, "because both Ben and Maxie were upset about the radios, and I just seemed to be there playing with them. They didn't like it, and they told me so.

"On the third day out, I disconnected all the cables except the ones to the amateur-band radio, and we got our first transmission from a man in England with the call letters G4JY. He came in so loud and clear it almost knocked me out of the gondola. With his help we set up a network all the way back to the ground team in Bedford, northwest of Boston.

"For morale, it was remarkable. It was like a child finding his mother in a crowd."

EVEN WITH EVERYTHING going well, we had little time to sightsee or to relax. Communications, navigation, ballast planning and execution, updating logs, and housekeeping took up 90 percent of our waking hours. Oxygen masks rasped over our growing stubble. Our thirst increased, but our appetites waned. Maxie disciplined us to eat, and we had everything from soup to salami to nuts, ordinary foods of the kind we ate at home, and plenty of juices.

One of the many hard-knock lessons we learned on the first attempt was that goose-down garments are worthless when wet. This time we dressed in layers, using plenty of wool, as well as synthetics and down. I even had battery-powered electric socks for the coldest nights, since one of my feet had been severely frostbitten on that first voyage. The foot had throbbed with intermittent but excruciating pain for months, a sensation I did not want repeated.

Although we had hoped for better speed than the approximate 15 knots we were averaging, our track was just about as planned. But as Bob Rice says, "The weather is what it is; later we figure out what's average."

During the darkness following our fourth sunset aloft, we got a chill reminder of our ill-fated attempt. Again, as they had near Iceland the year before, nodules of ice began to form on the balloon. Then, at 5,500 feet, an accumulation of 900 pounds had almost weighed us into the sea. This time, at 16,500 feet, the ice was less, about 300 pounds, and after the sun came up it began to melt, falling around the gondola first as ice crystals, then as ice flakes, and, finally, as our own private rain shower.

The North Atlantic was not done with us yet. We knew a low-pressure storm had been dogging along behind us, and Maxie was the first to see it, just hours after the ice was gone.

"When I came on watch I looked to the west, and the storm was there within sixty miles of us. The leading edge pointed fingers of high clouds right at *Double Eagle II*, and I looked at it for quite a while.

"By this time we were already climbing on our way to 23,500 feet, and the chances were good that the storm would veer to the north, which it did—and it turned into a full-blown dandy."

As the storm turned, so did we but in another direction, leaving our northeast course as we climbed through the high-pressure ridge and curved southeastward away from Iceland toward the British Isles. Our greatest danger was yet to come, and it was upon us as soon as the storm left our track.

To understand the predicament we faced, it is necessary to understand something of how a helium balloon is piloted. Lighter-than-air helium in the gas envelope makes the balloon rise, whereas ballast attached to the gondola or carried inside as equipment prevents the balloon from rising too far or too fast. Ballast is the "fuel" of a balloon, since releasing some of it overboard is the only way to stop a descent.

So far, so good, but there is a complication. As a result of releasing ballast on previous days, our balloon now weighed less.

Moreover, in daytime, as the sun reheats the helium that has contracted in cool night temperatures, the gas expands again to fill the envelope to maximum volume and lifting capacity. Day by day the balloon wants to go higher and higher, and you can get caught in a yo-yo effect, expending excessive amounts of both helium and ballast—burning your candle at both ends—just to stay aloft.

Our strategy, much easier said than done, was to conserve both by maintaining near equilibrium at an ever increasing altitude.

AFTER our back-to-back episodes with the ice and the storm, the sky above cleared to a deep blue. But by noon three factors conspired against us. The sun stood overhead, beating down only on the top of the gas envelope, sprayed with aluminum paint to reflect heat. Then some high cirrus clouds moved in and screened the sun, a condition we call "partial sunset." Cooled, the balloon began to descend from 23,500 feet.

But still another factor was at work, one we would theorize about later. Whatever it was, it was pushing or sucking us right down into the very center of a perfect circle punched in the cloud deck below.

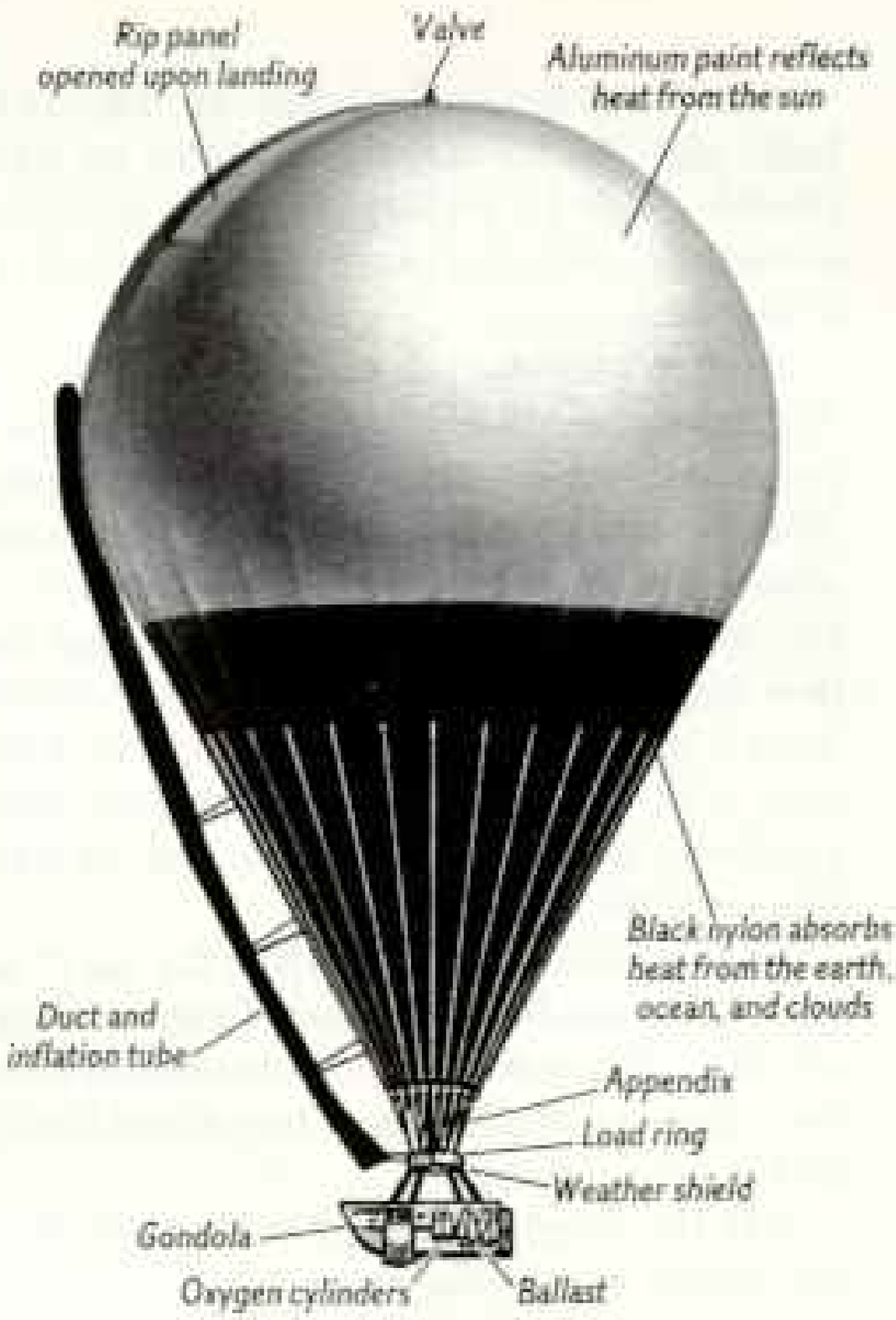
We faced a difficult choice. If we ballasted off heavily and at once, we would pop up like a beach ball released underwater. We would not only waste precious ballast but also would soar through our weight-determined ceiling of 26,500 feet.

If we ascended to 29,000 feet, the gas envelope would automatically vent 26,000 cubic feet of helium. In that event we would then have to drop an additional 800 pounds of ballast at night to stay aloft. Result: We would be short on ballast, and unless we were to saw off the bow and stern of the gondola for ballast, we would fall into the sea short of Ireland.

Instead of throwing ballast over in panic, we ballasted carefully, slowing our rate of descent from 400 feet per minute to about 200 feet.

We continued to drop from our high of 23,500 feet, past 20,000, into the teens, past 10,000. And we kept descending. As we neared 4,000 feet, Larry yelled, "Ben, we're in the clouds."

Larry is an experienced hang-glider and



Unlike a child's balloon, *Double Eagle II* cannot expand beyond its design limits. At that point, it automatically vents helium through the long duct (**above**). Helium in the duct also prevents air from entering. Seen from the gondola, the gas envelope appears plump and buoyant when warm (**below**). When cold, it contracts and seems to disappear (**bottom**). Approaching England (**right**), Ben has valved off helium to slacken the balloon for descent.

"DOUBLE EAGLE II" (ABOVE AND BELOW); ALAIN DEJEAN, SYGMA (RIGHT)

airplane pilot—he soloed at age 12—but this was only his second time in a balloon. No wonder he was anxious. As Larry recalls: "I was really upset, especially since we had been doing so well and seemed so close to success. I said to Ben and Maxie, 'You know, guys, I don't think we're going back up.'

" 'Yeah, we are,' they said.

"I said, 'No, we're not. Tell you what. I'll bet you a hundred dollars we won't go back above 12,500.'

" 'Make it ten dollars,' said Maxie.

" 'Ten dollars—you're crazy! Let's make it a hundred.'

"Sure enough, the balloon finally bottomed out, thanks to the ballast going over, and about thirty minutes later we passed 12,500 feet. I couldn't have been happier. I just threw the hundred dollars at them."

Superheating from the afternoon sun drove us up to 24,950 feet, where, with the cool of dusk, the balloon stabilized. We had come through the big drop without wasting helium or ballast—we had dumped just 300 pounds.

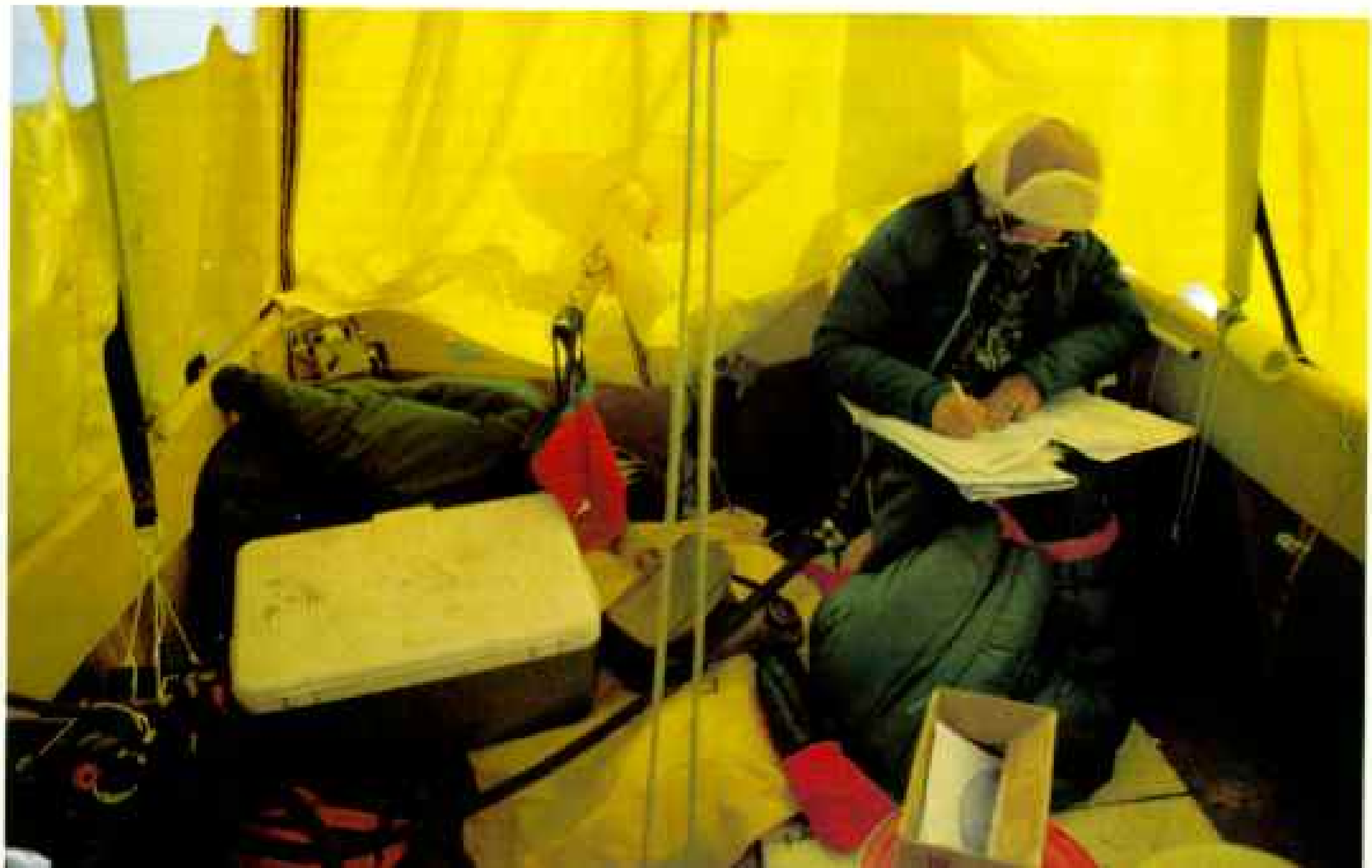
We can only make an educated guess as to what had happened. Here it is: We had been stable in a cool, buoyant air mass. Then the balloon floated into a mass of descending dry air, which grew warmer as it compressed. When that happened, the balloon was no longer in equilibrium, and it dropped down that falling shaft of warmer, less buoyant air.

We had been expending ballast wisely, but as we neared land, not cheaply. We

On oxygen but without lox, Larry holds aloft his dwindling bag of bagels (**below**). In the high altitudes, Ben huddles to work on his logs (**bottom**). The yellow rain skirt raises inside temperatures by 10°F, in this case to just above zero.

At lower, warmer altitudes, Maxie takes a break (**left**) to sightsee as *Double Eagle II* floats above Bournemouth, England, heading for a long crossing of the English Channel—destination France.

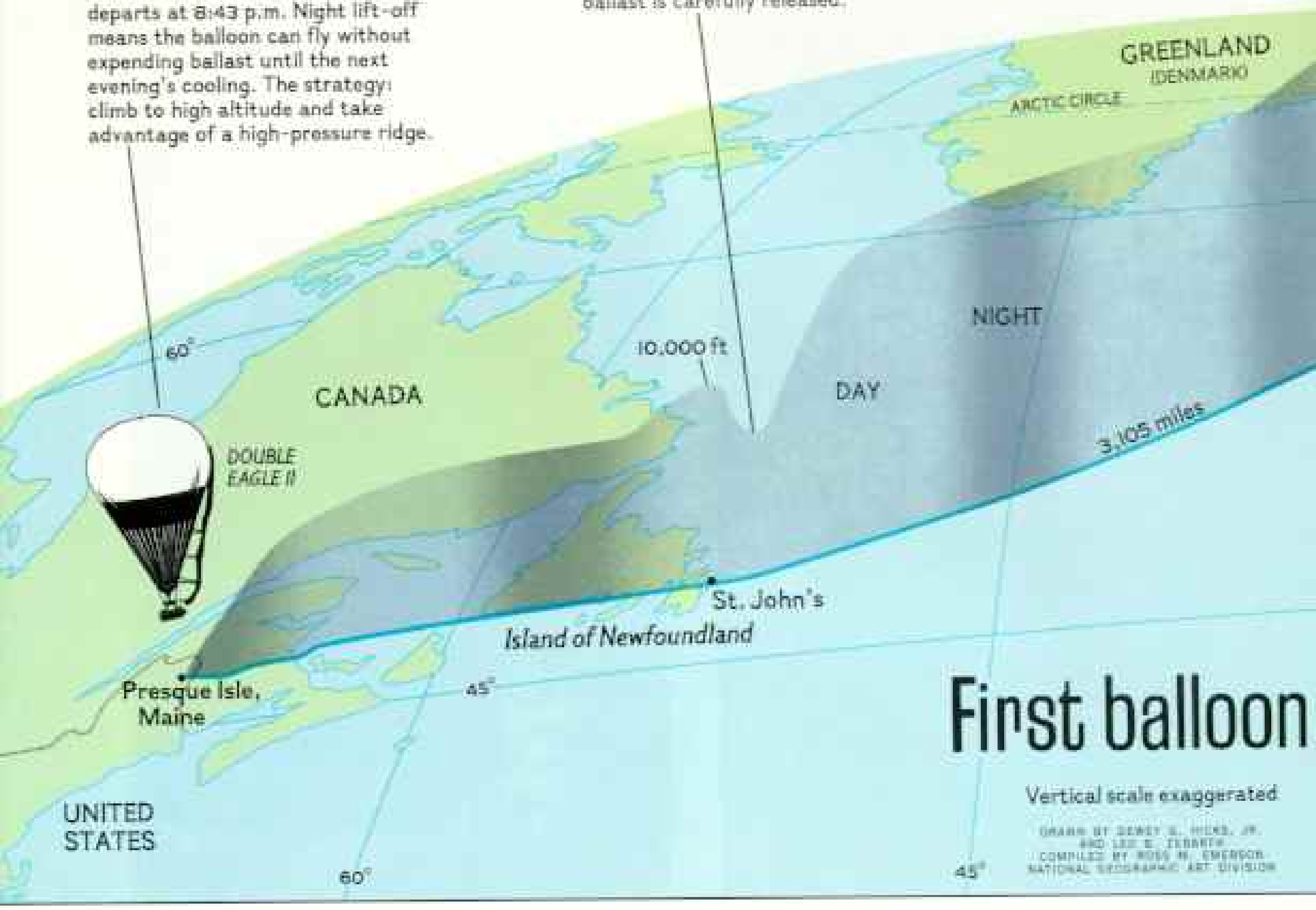
ALL BY "DOUBLE EAGLE II"



LAUNCH
August 11, 1978. Delayed almost three hours, *Double Eagle II* departs at 8:43 p.m. Night lift-off means the balloon can fly without expending ballast until the next evening's cooling. The strategy: climb to high altitude and take advantage of a high-pressure ridge.

August 13, afternoon. Thin clouds screen the sun enough to cool the gas envelope and its helium. Less buoyant, the balloon sinks 3,500 feet. Experience prevents panic, and ballast is carefully released.

August 15. At night south of Iceland the balloon becomes coated with 300 pounds of ice and descends 2,500 feet. As morning sun melts the ice, a storm approaches but turns harmlessly away.



First balloon

Vertical scale exaggerated

DRAWN BY DEWEY G. HICKS, JR. AND LEE E. TEBBETS
COMPILED BY ROSS M. EMERSON
NATIONAL GEOGRAPHIC ART DIVISION

13 unsuccessful attempts 1873-1978

1 *DAILY GRAPHIC*, 1873. Donaldson, Ford, and Hunt make only about 45 miles.
2 *SMALL WORLD*, 1958. Eiloarts and Mudies try east-west route, and up sailing 1,500 miles.
3 *MAPLE LEAF*, 1968. Kostur and Winters ditch southeast of Halifax, Nova Scotia.
4 *THE FREE LIFE*, 1970. Balloon and crew vanish.
5 *YANKEE ZEPHYR*, 1973. Sparks ditches at sea.
6 *LIGHT HEART*, 1974. Gatch is sighted over Atlantic but then disappears.
7 *THE SPIRIT OF MAN*, 1974. Balloon bursts over New Jersey coast, killing Berger.
8 *ODYSSEY*, 1975. On his second try, Sparks goes down south of Cape Cod.
9 *SPIRIT OF 76*, 1976. Thomas rescued near Bermuda.
10 *SILVER FOX*, 1976. Yost ditches near Azores.
11 *DOUBLE EAGLE*, 1977. Abruzzo and Anderson come down near Iceland.
12 *EAGLE*, 1977. Reinhard and Stephenson ditch southeast of Halifax.
13 *ZANUSSI*, 1978. Cameron and Davey come closest to success, ending off France.

August 16, noon. Atmospheric conditions force the balloon to drop 19,500 feet to a low point of 4,000 feet. Again, careful ballasting checks the drop, and the balloon climbs to its high point of 24,950 feet.

24,950 ft

August 16, night. Landfall on the Irish coast. The transatlantic crossing is made, but the goal is Paris.

LANDING
August 17. Piloting to take advantage of wind speed and direction puts the balloon over Wales, England, the English Channel, and the coast of France. With ballast low and daylight fading, *Double Eagle II* touches down near Miserey at 7:49 p.m. local time after 137 hours, 6 minutes in the air.

20,000 feet
15,000
10,000
5,000
SEA LEVEL

ICELAND
11,000 ft
60°
4,000 ft
0°
Dublin
London
IRELAND
ENGLAND
Le Havre
Paris
Miserey
FRANCE
45°
SPAIN
PORTUGAL
30°
Azores
(PORTUGAL)
15°

Atlantic Ocean

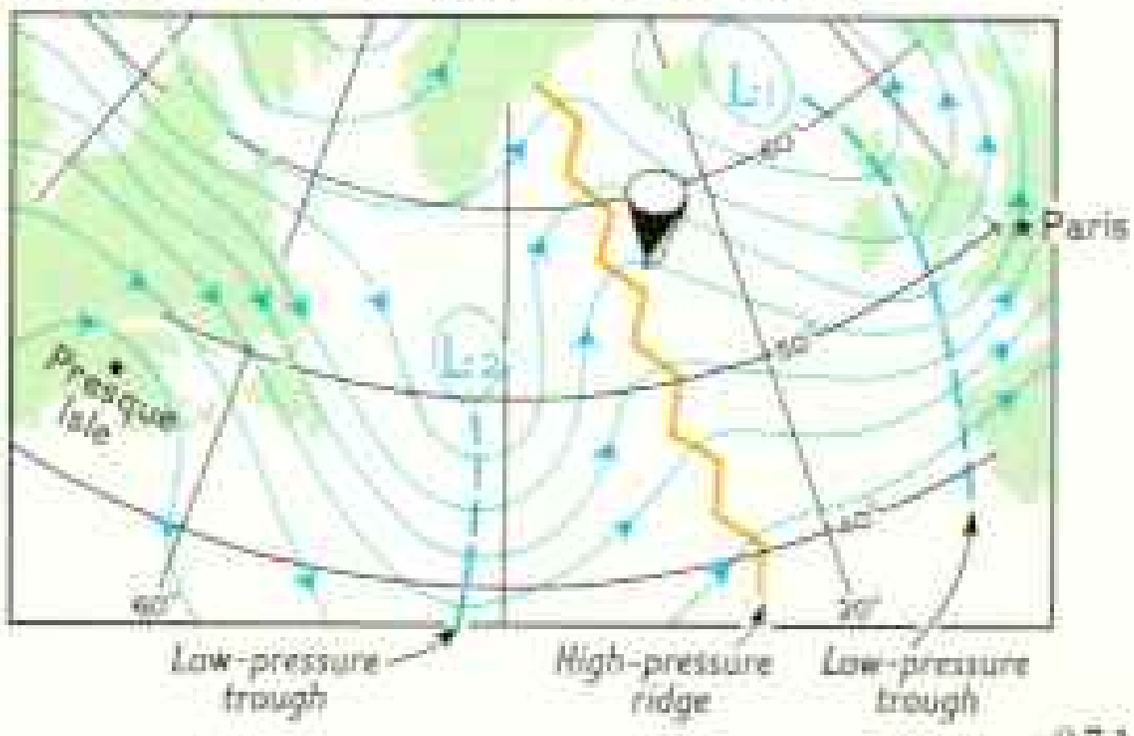
WEATHER DATA FROM WEATHER SERVICES CORPORATION (BELOW)

crossing of the Atlantic

TO CROSS THE ATLANTIC by balloon: As early as 1859 LaMontain and Wise made two trial flights, but never lifted off in an actual attempt. A number of balloons were brought to various states of preparation, and 13 managed to get airborne (**left**). Most were ditched at sea. Two vanished; one burst in the air. In all, five aeronauts died.

Even as sport ballooning soared in popularity during the 1970's, the pace of transatlantic attempts increased. *Silver Fox* and *Double Eagle* made notable flights. A ripped gas bag forced *Zanussi* down just 110 miles from France.

For the success of *Double Eagle II*, pilots Abruzzo and Anderson cite experience and better understanding of weather patterns. As surfers look for the perfect wave, balloonists seek the best atmospheric-pressure system. The *Double Eagle II* floats within a high-pressure ridge moving west to east, bounded by two low-pressure troughs. At mid-flight (**below**) placement is good for riding a clockwise flow to Europe. A ground team relays weather data so the balloonists can fly a precise course by varying altitude to find the best wind speed and direction.



Copilots of home, Patty Anderson, Sandy Newman, and Pat Abruzzo (**below,** from left) begin to relax, having seen and talked to their husbands from a chartered plane. The last landfall made, the balloon drifts above Le Havre (**right**) and French soil.

PETER MARLOW, SYGMA; ALAIN DEJEAN, SYGMA (RIGHT)

couldn't jettison heavy items over populated areas, so, as planned, over went such gear as tape recorder, radios, film magazines, sleeping box, lawn chairs, most of our water, food and the cooler it was in, and our spent oxygen tanks.

At sundown off Ireland, it also came time to ditch the hang glider Larry had hoped to fly from the gondola to a landing in Europe.

"I knew it had to go," Larry says. "When I cut it loose, it dropped below us, then came back up only five feet away. It dropped again, did three tight, perfect loops and a series of turns. It took almost thirty minutes to disappear into the clouds below."

AS NIGHT EDGED OUT from Europe to engulf us, the full moon shone brightly on the cloud deck below and a line of towering cumulus that was rising westward. It was at such moments that I wished my family, all my friends—everybody really—could be in the gondola with me.

Not long after that lovely, silent pause, we received a transmission from air control at Shannon: "*Double Eagle II*, you are over the coast of Ireland."

Larry replied, "Shannon, this is *Double Eagle II*. Are you sure?"

"Yes, sir. Our radar is never wrong."

Strangely, perhaps, we felt no great elation. We were crushed by fatigue and, with our oxygen thrown over, plagued by headaches. Paris, our goal, was still a long, uncertain way off, though Maxie had another definition of success.

"If it's dry below, it counts."

We began to outpace the clouds, and Dublin came brilliantly into view to the northeast. Below, through the scattering clouds, we picked out the occasional wink of lights from the ground as we ballasted off our excess clothing.

We unpacked our survival suits, much like wet suits, unzipped them and threw them over. As they fluttered down, they looked like human shapes swirling above the clouds. I can only imagine someone on the ground watching them swoop downward, and I wonder if tales of banshees were told that night.

As light began faintly to break in the east, we departed Ireland, crossed St. George's Channel, and made landfall above Strumble on the Welsh coast. The landscape unrolled beneath us, green and glowing, a magnificent sight after days of nothing but blue sea and sky and white clouds.

Aircraft now swarmed around us, some too close for comfort. A Royal Air Force jet fighter snapped a series of rolls in salute. The plane we were happiest to see circled with our wives aboard. It was their day as much as ours.

Maxie says that after we made Ireland he "felt like a tourist." Well, maybe, but we had serious flying ahead. Paris was our announced goal, and Paris we would try to make. Doc Wiley stood by in London, using available channels of communication to direct us.

During the cool shank of the night we had dropped to 11,000 feet. Now, with the sun superheating the helium, we climbed to 15,000 feet over southern England. Had we let it, the balloon would have soared higher and higher—up to 29,000 feet before losing helium automatically and stabilizing. Word came from Rich Schwoebel, "You're at 15,000. Descend to 10,000. Course good for Paris." The message confirmed a decision we had already made, based on winds-aloft information we received from a weather station in England.

To descend deliberately within the desired vector, I had to valve off helium through an aperture at the very top of the balloon. I opened it by means of a long lanyard. If we stayed too high, the winds would bend our course eastward over London for a probable landing in Belgium. If we descended too quickly, we would curve south toward Brittany.

We had *flown* across the Atlantic, maneuvering to take advantage of favorable winds, not just drifting. Before us was the final test of our finesse as balloon pilots.

AS WE PASSED over England, we were too high to see people on the ground. They were there, no doubt about it. From every village and town, farm and roadside, the flash of mirrors sparkled up at us. Everybody was shining mirrors, it seemed, everybody. So were we. We signaled back down to that lush countryside sequined with flashes.

Approaching the English Channel at Bournemouth (pages 868-9), we were apprehensive. Our course across that notoriously rough stretch of water was a diagonal some 120 miles long. Larry remembers it well.

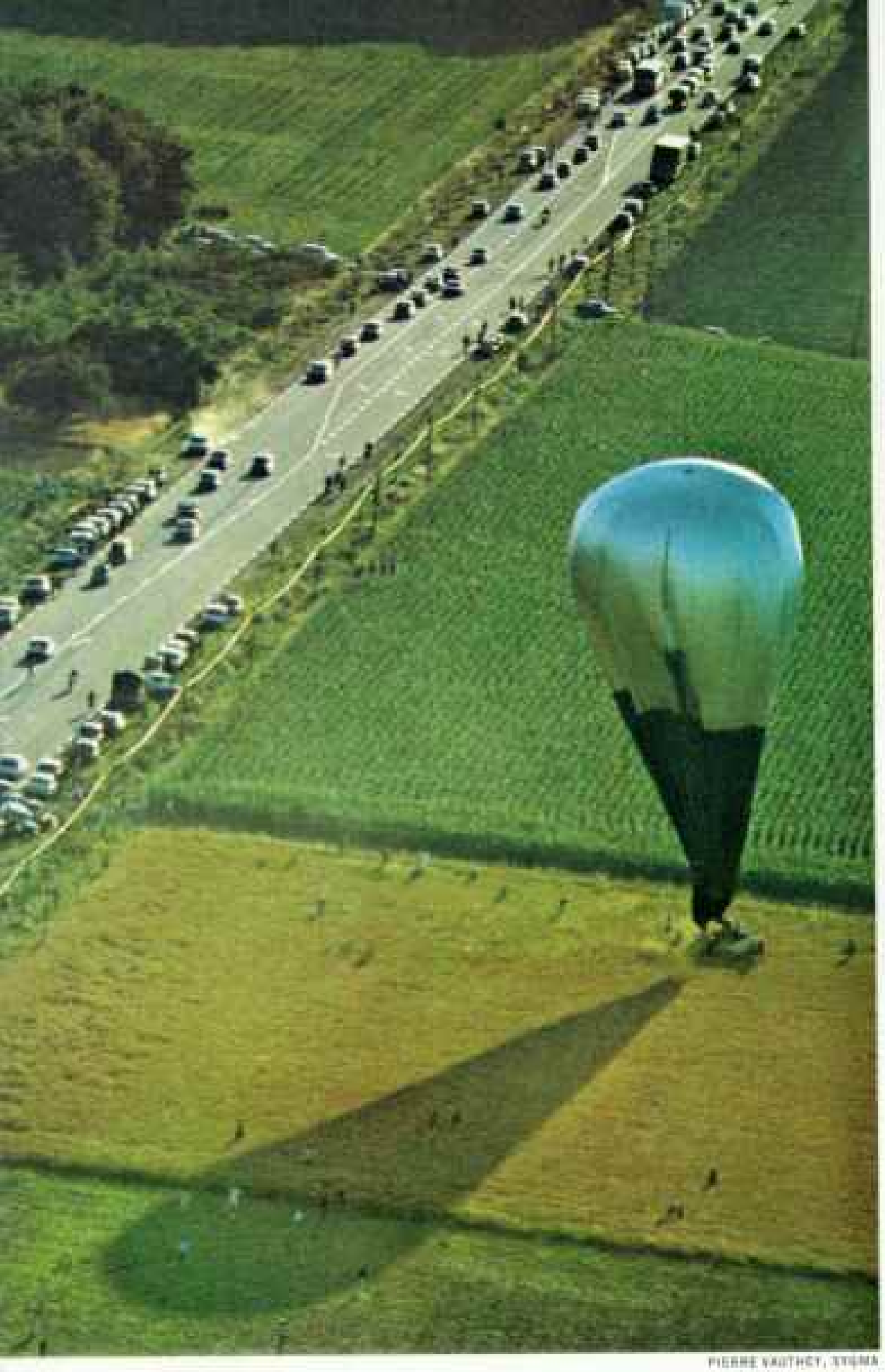
"All the numbers were bad. The track was about the longest way you could go. It was the worst time of day, near noon, the same time we had our big sink the day before. We had no oxygen and little ballast."

Were we pushing our luck? Maxie has considered the part luck played in our voyage.

"A measure of good fortune was required, but success does not depend on it. It may tip the scales, like the final grain of sand. But like success in any undertaking, the requirements are *(Continued on page 880)*

Quiet as a daydream, and as captivating, the balloon distracts a French farmer from his harvest. Aboard, the crew is not so tranquil. Ahead lies their first attempt to land a large helium balloon on the ground. With touchdown only miles ahead, the last obstacles are trees, buildings, and power lines.

DOMINIQUE LÉBAULT, SIPA PRESS/BLACK STAR



PIERRE KAUTHEY, SYGMA

Down! *Double Eagle II* grazes a cornfield and punctuates a swath of barley (**left, above**). Just before landing, Ben yanks a lanyard to rip a panel and spill helium. The

GAMMA-LIAISON (ABOVE AND BOTTOM LEFT)

gondola rocks along the ground (**above**), Larry on the high side, Maxie and Ben bracing on the low. Once crammed 6,240 pounds full, the gondola now carries only 250 pounds of usable ballast. Maxie removes his crash helmet (**left**), no longer needed. Nor were emergency ballasting plans like sawing apart the gondola or, as the ultimate extreme, cutting it away and riding in on the load ring and a prayer.

A trample of well-wishers swarms around the balloon, deflated in triumph. Despite a police line, souvenir hunters made off with most of the crew's logs and charts. Some

GAMMA-LIAISON

even tried to chew the balloon apart. Though tattered, *Double Eagle II* will have a permanent home in the National Air and Space Museum in Washington, D. C.

(Continued from page 874) dedication, preparation, and work."

Finally, as the sun was lowering, we crossed the channel, floating over Le Havre, France (pages 872-3). That was the big one. Then we were jubilant.

We descended very gradually, between 100 and 200 feet per minute. Just by great coincidence, the scattered cumulus clouds below parted behind us, leaving a clear pathway back to Le Havre as precise as a canal in the air. Ahead, the clouds were dissipating. We would seem headed directly for a cloud. When we got there, it was gone.

Features on the ground became sharper and sharper as we dipped lower and lower. Over the radio came word that for our sake authorities had closed the busy airfield at Le Bourget, where Lindbergh had landed. We declined the offer; passing over the suburbs of Paris was too risky, both for us and for the citizens.

As we sank ever lower, we started to look for a place to drop our remaining heavy ballast and for a landing site. It would have been duck soup for Larry in his hang glider, but as he says:

"We were running out of places where we could drop ballast or land, when all of a sudden there was the town of Evreux.

MARC BULKA (LEFT) AND DOMINIQUE LEBRAULT, BOTH SIPA PRESS/BLACK STAR

"They had to land somewhere," was the philosophical view of Mme Rachel Coquerel (**above**), who, with her husband, Roger, contemplates a ruined barley crop.

Even as Maxie, Ben, and Larry (**left**) celebrate, they make arrangements to compensate the Coquerels for their loss.

Several days later, their farm a certified part of history, the Coquerels sign the town of Miserey's Golden Guest Book of Honor (**right**).

"We spotted some plowed fields, descended to 300 feet, and dropped an empty propane tank and a battery. We watched them fall harmlessly and heard the impact: *thump, thump.*"

That gave us about 2,500 feet of altitude to clear Evreux, and we began to look for a landing site near the small village of Miserey.

Below, we could see cars everywhere and wondered, "What's going on here?" Then we realized. They were strung out along our course and converging like the spokes of a wheel. We began to see people on the ground and waved, but not much; we were numb tired. Maxie and I weren't worried about having enough energy for the landing. Adrenaline, we knew, would take over.

At last we were committed to a landing, with one power line to clear and a green, then a golden field to set down in. The long journey was all but ended.

NOW, months later, each of us recalls certain moments during the aftermath.

There was my sadness that the voyage was done, a feeling I hadn't anticipated and can't quite explain.

Maxie vividly remembers the mayor of Evreux giving a speech of welcome from a balcony.

NATIONAL GEOGRAPHIC PHOTOGRAPHER OTIS IMBODEN

Hometown hoopla and ticker tape deluge the balloonists in Albuquerque. They have also been showered with honors; the Senate has resolved to have three gold medals struck, comparable to those given the Wright brothers and Charles A. Lindbergh.

"It could have been the mayor of any small city in the United States on the Fourth of July. The only barrier that existed between us and the French was one of language."

Then the celebration swirled on to Paris, and I cannot forget the small woman in the white dress with a pattern of red flowers. She had a little camera that couldn't have cost more than six or seven dollars. Except for that first time, she never asked for an autograph. She showed up everywhere we went, including private functions that no one knew about, not even the press.

There was Larry partying in Paris, while we two—shall I say, more experienced balloonists—collapsed into our beds. And there was Larry feeling what each of us sensed: an absolutely genuine joy, a shared joy, in our adventure.

Frankly, until we landed, I never understood fully what had motivated me, the real reason for trying what had ended in grief for so many before us. People may not be able to picture themselves in a spacecraft to the moon or beyond, but they can see themselves in the balloon. They can feel with us that when mankind stops crossing frontiers or achieving new goals, it stagnates and moves backward instead of forward. That moving forward was, for me, the long-hidden motive of our voyage.

Everywhere, it seemed, there were speeches and celebrations, medals and honors. Albuquerque, the adopted hometown of each of us, turned itself inside out.

But the landing itself was the most powerful memory of all.

In those final moments we approached earth again, dead tired and six days dirty. Just before Larry cut the wires to stow the radio, we made our last transmission.

"All aircraft in the area, *Double Eagle II* is landing." □

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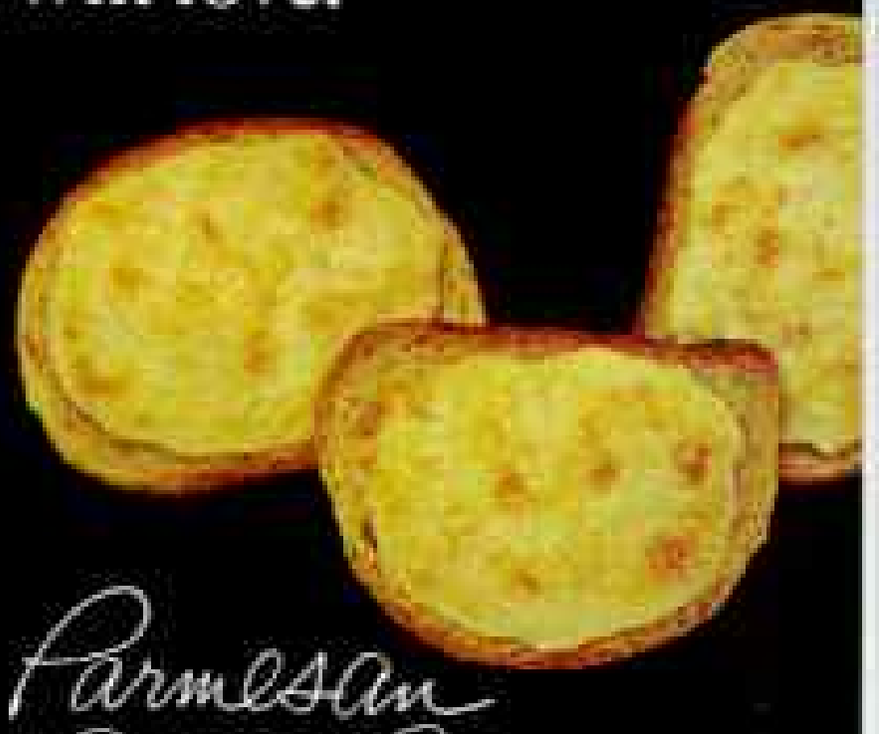
Hors d'Oeuvre Pie

1 frozen (9") pastry shell, thawed
12 oz cream cheese
2 oz blue cheese (optional)
1/2 cup HELLMANN'S® Real Mayonnaise
1/2 tsp onion or garlic salt

Garnishes: Cherry tomato halves, sliced mushrooms, parsley sprigs, chopped hard-cooked egg, sliced ripe olives

On large baking sheet pat pastry into 11" circle. Pierce thoroughly with fork. Bake in 425°F oven 8 minutes or until lightly browned. Cool. Place on serving platter. Beat next 4 ingredients until fluffy; spread evenly on pastry. Cover; chill at least 4 hours. Garnish as shown just before serving. Makes 12 (2 1/2") wedges.



Parmesan Onion Canapes

1 cup HELLMANN'S® Real Mayonnaise
1 cup grated Parmesan cheese
1/2 cup finely chopped onion
1 Tbsp milk
1 loaf sliced cocktail bread, lightly toasted

Mix first 4 ingredients; spread on toast. Place on baking sheets. Broil 4" from source of heat 2 to 3 minutes or until golden and bubbly. Makes 36.

Sesame Chicken with Honey Dip

1/2 cup HELLMANN'S® Real Mayonnaise
1 tsp dry mustard
1 tsp instant minced onion
1/2 cup fine dry bread crumbs
1/4 cup sesame seeds
2 cups cubed cooked chicken or turkey

Mix first 3 ingredients; set aside. Mix crumbs and sesame seeds. Coat chicken with Real Mayonnaise mixture, then crumb mixture. Place on baking sheet. Bake in 425°F oven 12 minutes or until lightly browned. Serve hot with dip. Serves 6.

HONEY DIP: Mix 1 cup HELLMANN'S® Real Mayonnaise with 2 Tbsp honey.

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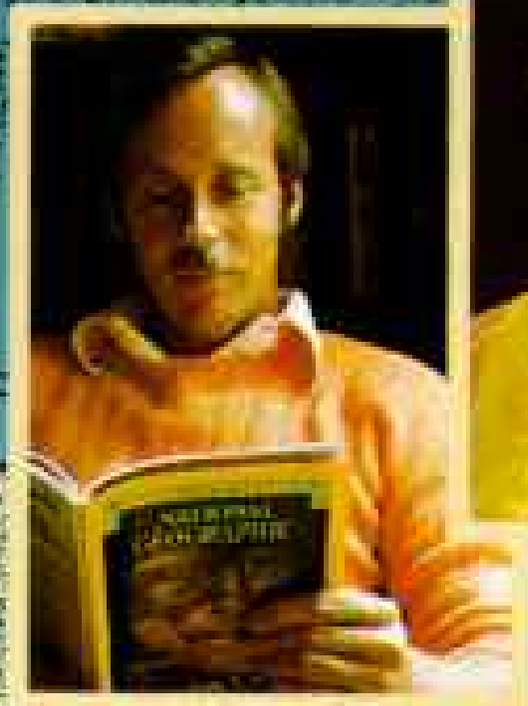
'Twas the month after Christmas...



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"Coal's share of the light bill is declining."

One finds security in our coal stockpile: 1.4 trillion tons. The other wonders at coal's decline in share of power generation.

We have more reserve energy in coal underground than the Middle East has in its oil. Much of it is clean-burning, low sulphur coal ideal for electric generation. And coal can be converted to gas for heating or liquefied for mobile use: cars, aircraft. Coal derivatives can substitute for petroleum in plastics, agricultural and industrial chemicals. Every ton of coal used saves 4 barrels of oil. Experts say, "Coal works. It's here. Let's use it!"

Others point to coal's history. In 1920, 105 million Americans consumed about the same amount of coal as 215 million of us did in 1976. In 1955, coal generated 55% of our electricity. Now it's 46%. Coal has problems. Mining can upset land, ruin streams. Uncontrolled burning can be sooty, smelly, polluting the air. The supply itself has been unreliable. People look at all this and wonder about coal's future.

The problems are not beyond solution. Controls can bring about clean burning, reduce land disturbance. Technology for wider use is here now. And petroleum will, one day run low. Become too valuable to burn. Right now overseas trade dollar outflow from oil imports is a serious strain.

Coal offers the best near-term solutions. Developing those solutions will call for us to re-evaluate some cherished economic and environmental considerations. The compromise between the ideal and the attainable will determine our future.

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Space Efficiency

Inside, Salon is engineered for lots of headroom: 38.7 in. in front, 37.7 rear. Lots of legroom: 42.8 in. up front, 38.0 in back. And plenty of rear hiproom, thanks to armrests tucked in the doors. Plus the comfort of a solid Body by Fisher.

Outside, Salon is engineered to be lean and trim. And it's one nimble machine. Try it. Maneuver through city traffic. Zip in and out of a few tight parking spots. Then you'll really appreciate its response.

Space efficiency applies to the trunk as well. Its 16.1 cubic feet have been designed with the compact spare tire standing to the side, out of the way, to accommodate big pieces of luggage.

Fuel Efficiency

Salon offers outstanding fuel economy because only Oldsmobile offers you a new diesel V8 designed especially for mid-size cars!

With the newly available 4.3-litre diesel V8 and automatic transmission, the EPA ratings are a whopping 32 mpg highway, 24 mpg city! And, it's remarkably smooth-performing and quiet for a diesel. Or choose from a range of gasoline engines, including the standard 3.8-litre (231 CID) V6 or the available 4.3-litre (260 CID) V8 with a 5-speed overdrive transmission (except California).

All EPA ratings are estimates, of course, and your mileage may vary depending on how you drive, your car's condition and equipment. Salons are equipped with GM-built engines produced by various divisions. See your dealer for details.

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Oldsmobile

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Whirlpool
Home Appliances

We believe quality can be beautiful.

This Malagasy boatman steers from here to eternity

He stands over his crew and looks back. He sees a life spent at sea, lightering cargo from ships. And that is his epitaph, sculptured in wood and placed above his grave.

Such Madagascar "tombstones" celebrate life in the Malagasy Republic. One depicts a man beating a drum, another a herdsman tending his cattle. A carving of an airplane denotes that the person entombed once flew. Malagasy chieftains rate a tomb post suggestive of a totem pole. It may be 30 feet high, a panorama of life told in tiers of carvings that show him hunting, protecting his family, slaughtering a zebu, even making love.

Though nominally Christian, the Malagasy cling to ancient beliefs, holding that ancestors dictate health, wealth, and fertility of descendants. From tombs half above ground and half below, the departed are brought into the sunlight every four or five years and wrapped in new silk. Not a sad occasion, the reunion with an ancestor marks a time for singing and dancing. Celebrants joyfully toss the body into the air and catch it again. Cattle are sacrificed, their horns left to adorn the top of the tomb.

The body is re-interred, there to rest until the next *famadihana*, the turning of the dead.

Despite the nearness of Africa, the ancestry of Madagascar's peoples is predominately Malayan and Polynesian. Migrants, historians theorize, sailed across the Indian Ocean in outrigger canoes to colonize an island home like no other on earth. Here they found nightmarish forests of cactuslike *Didierea*. Here roamed monkey-like lemurs with bat's ears and flowing foxtails; primitive tenrecs pincushioned with quills; and aepyornis, the now-extinct flightless bird that weighed half a ton and laid 20-pound eggs.

Independent of France since 1958, Madagascar carves a niche in world society uniquely its own. To follow its saga of development, as well as that of other emerging nations, readers turn each month to the pages of NATIONAL GEOGRAPHIC.

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THE FORD FAIRMONT.

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A roomy interior is quite important in a family car, and in Fairmont's price range it's hard to find a roomier one.

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Cost efficient.

Fairmont sedans and wagons are extremely cost efficient with a wide range of sticker prices that are surprisingly low. Fairmont's prices are actually competitive with many smaller cars.

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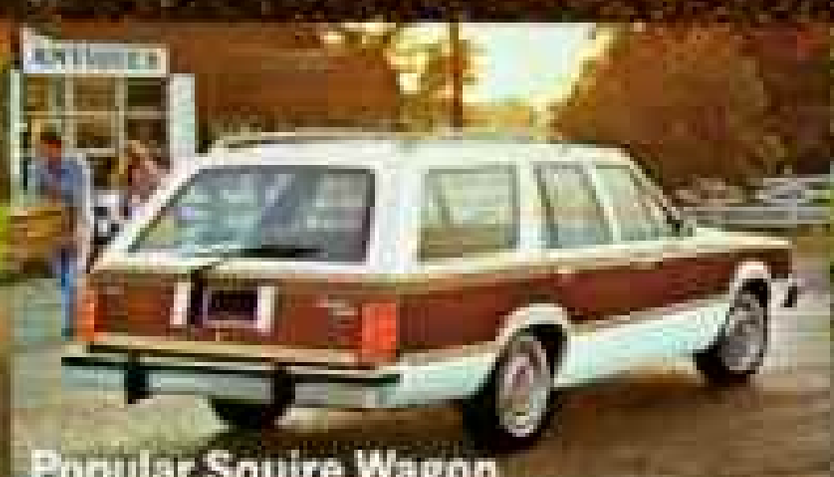
2-Door Sedan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The new Kodak Ektramax camera.

Taken indoors without flash.

Taken with built-in flash.

Kodak gifts say "open me first."
...to save Christmas in pictures.

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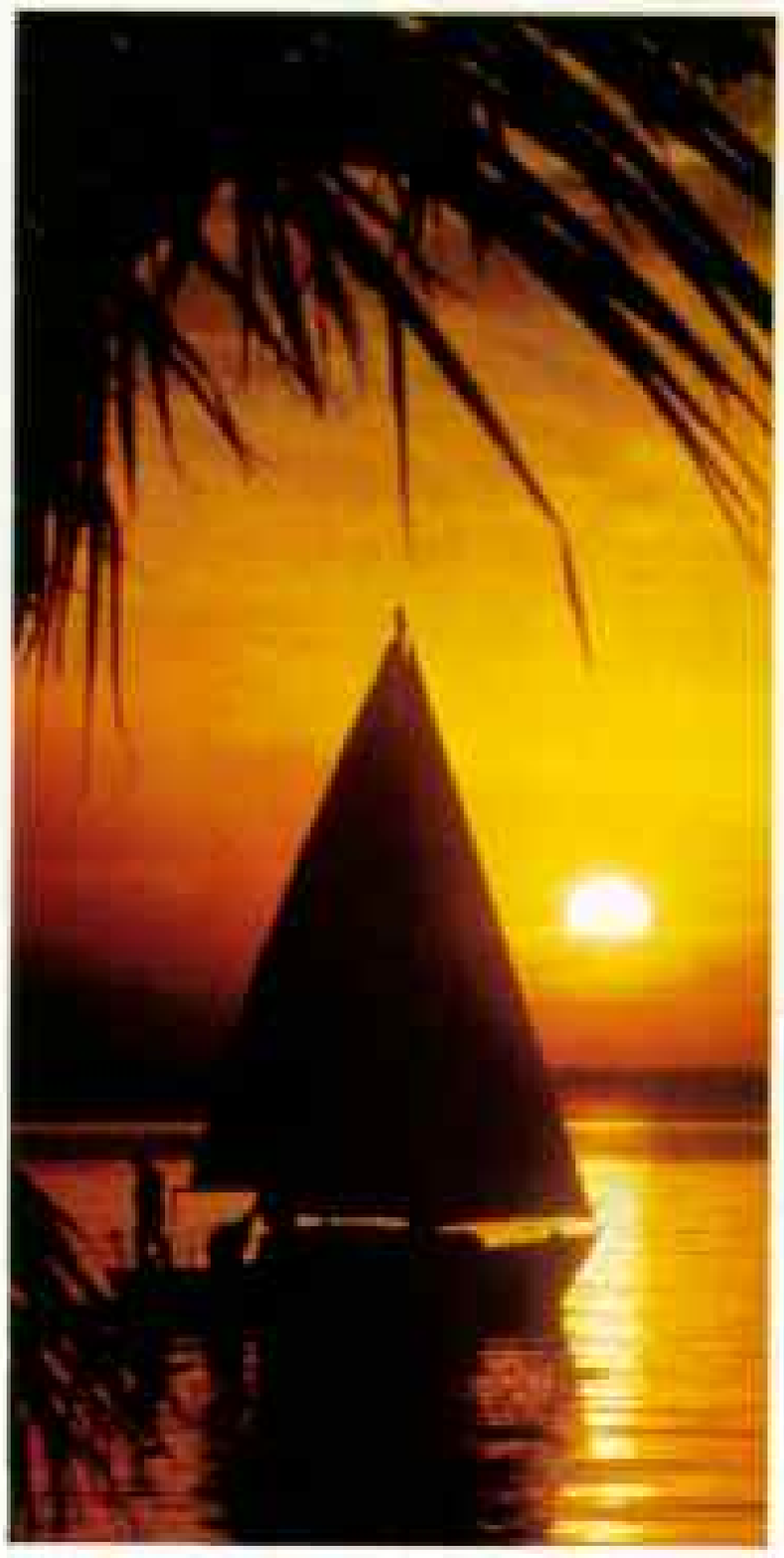

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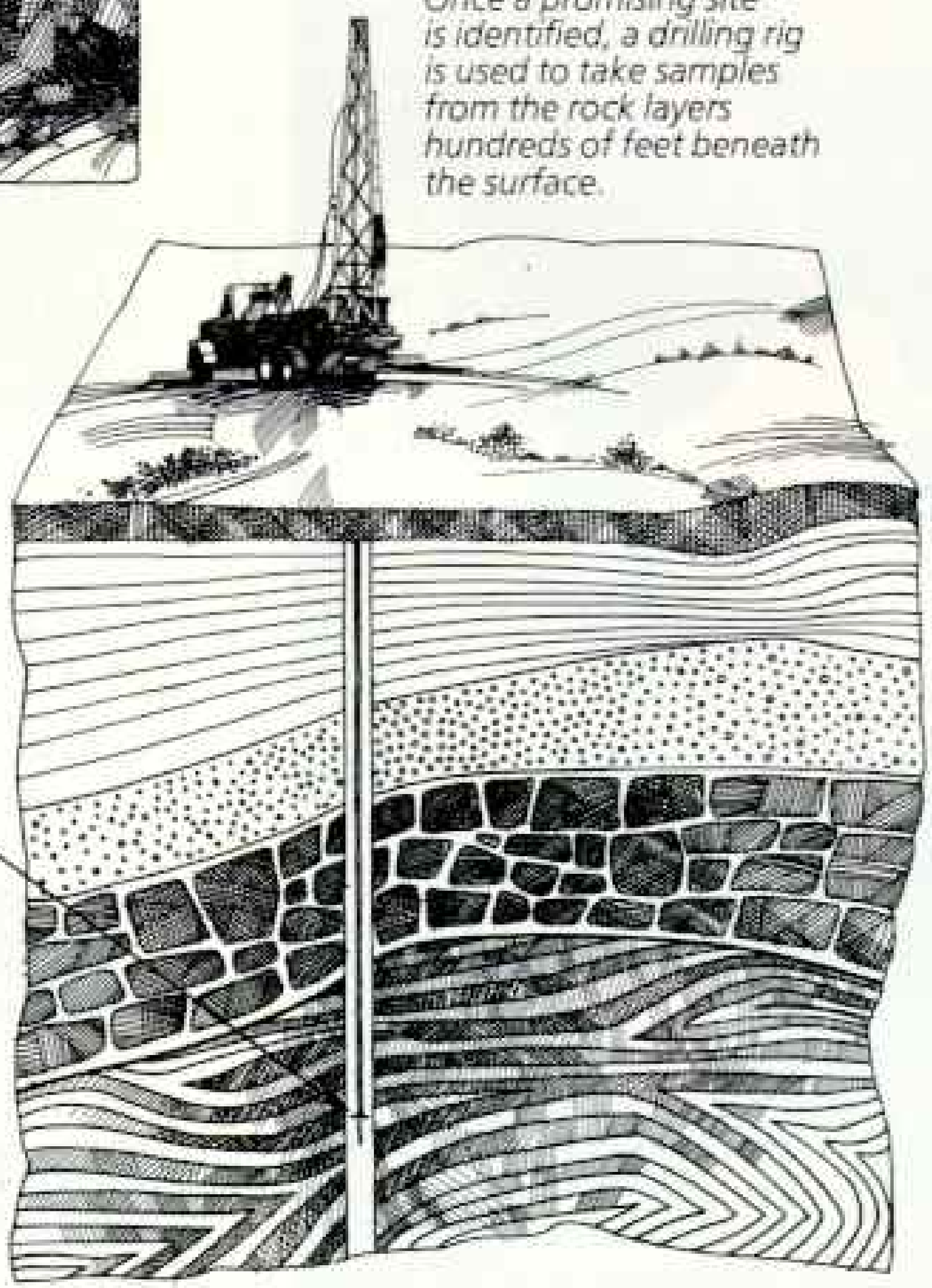
Once a promising site is identified, a drilling rig is used to take samples from the rock layers hundreds of feet beneath the surface.



After drilling is completed, instruments are lowered into the hole to check for natural radiation from uranium.

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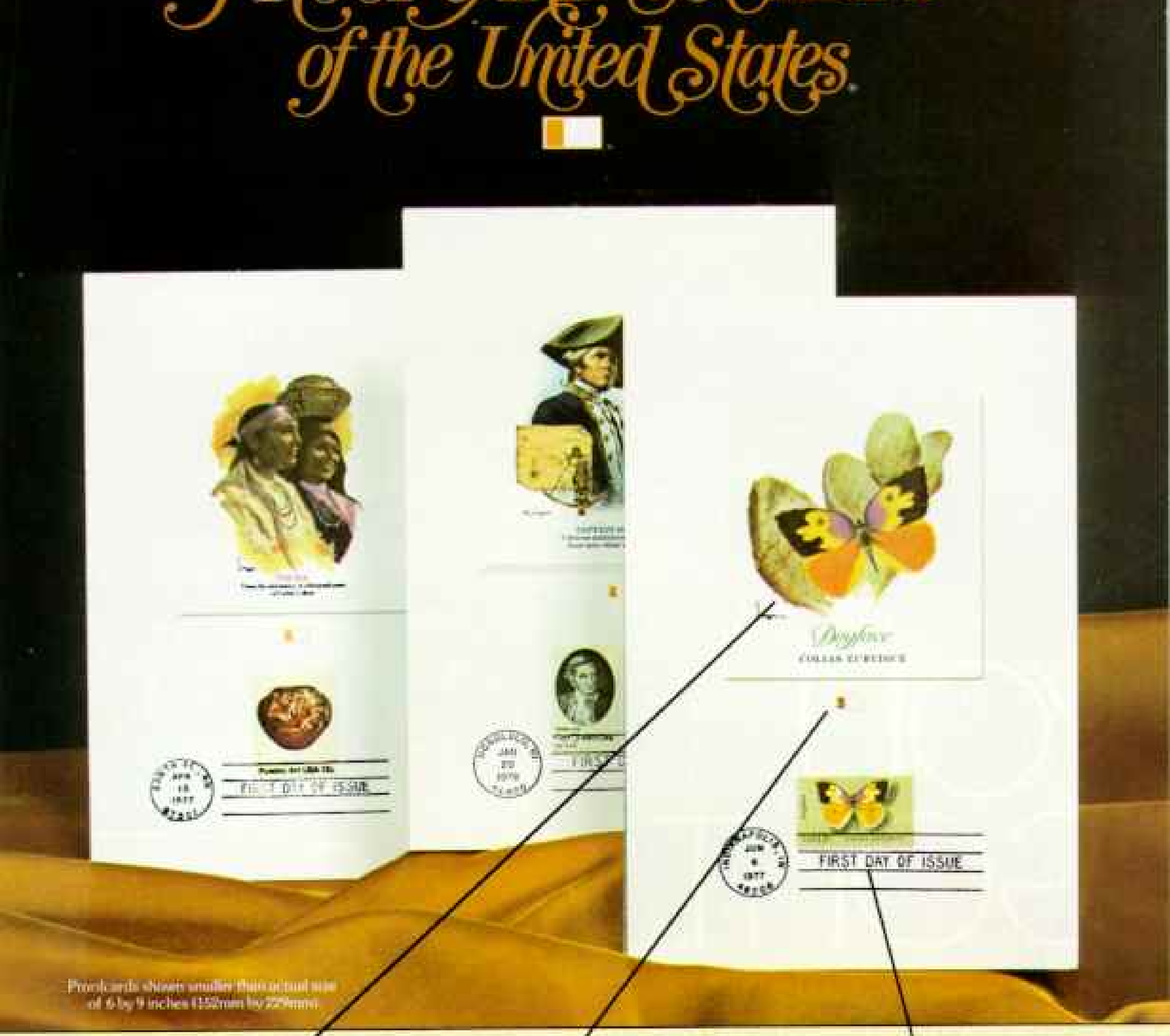

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Often called the ultimate philatelic issue, the Fleetwood Proofcard is a distinctive commemorative

At no additional cost, collectors will receive a handsome gold-stamped Album. Authoritative historical information will accompany each issue.

that brings together a superb proof edition cachet with a historic new United States stamp and a coveted First Day of Issue postmark. The result is a splendid tribute to the American heritage. A truly magnificent issue with an elegantly embossed surface and, as a distinctive certification of individual perfection, the Fleetwood proofmark in pure 24-karat gold.

In addition, each Proofcard bears an original work of art complementing the theme of the stamp and created exclusively for Fleetwood by a leading American artist. Thus, not only do members collect First Editions of America's stamps, but they also build a beautiful collection of First Edition works of art by some of the most sought after artists of today.

Charter Membership gives special benefits

As a Charter Member of *The Proofcard Society of the United States*, you will receive the Proofcard of every United States commemorative stamp on a guaranteed basis. This benefit is particularly important, because due to the time it takes to individually emboss the Proofcards and hallmark them in 24-karat gold, they must be issued in limited quantities. For this reason, membership in the Society will be limited, and many Proofcards will be made available only to Society members. Thus, in many cases, the only way collectors will be able to obtain Proofcards in future years will be from a member.

Another important benefit of Charter Membership is the opportunity to acquire earlier Proofcards, many of which were never before offered to collectors. Significantly, many of these were issued in editions of only 500 to 1,000. Moreover, Charter Members will be entitled to acquire them at 20% less than the prices at which they will be offered to other collectors.

No advance payment required

To become a Charter Member of *The Proofcard Society of the United States*, you need send no money now. You will be billed just $2.75 per Proofcard at the time shipment is made. Or, if you wish, you may arrange to have each shipment automatically billed to a credit card account. Of course, if you are not completely satisfied with any shipment, you may return it within ten days for a full refund or credit.

Remember, Proofcards are available only from Fleetwood, and are not offered even by the finest dealers. *In fact, no comparable edition is available anywhere, at any price.* But membership is limited. You are one of the very first collectors to be invited to join, and your membership will begin with the first issue of 1979. But other collectors may be offered Charter Membership at selected times between now and the end of 1979, Fleetwood's fiftieth anniversary year.

To become a Charter Member, and begin a truly exclusive heirloom collection to be treasured for years to come, mail the attached Application to Fleetwood, One Unicover Center, Cheyenne, Wyoming 82008.

CHARTER MEMBERSHIP APPLICATION

PROOFCARD SOCIETY of the United States

C3

Fleetwood
One Unicover Center
Cheyenne, Wyoming 82008

Please accept my application for membership in *The Proofcard Society of the United States*. As a member, I will receive a Proofcard of every United States commemorative stamp beginning with the first issue of 1979. I understand that stamps are issued irregularly, as announced by the United States Postal Service, and that Proofcards will be shipped to me under separate protective cover about six weeks after the issue date. An Album will be included at no additional cost, and pages will be sent to me with each shipment of Proofcards. *I need send no money now.* I will be billed just $2.75 per Proofcard, shipping and handling included, as shipment is made. If not completely satisfied with any shipment I may return it within ten days for a full credit or refund.

An option to charge all shipments to your Master Charge, Visa/BankAmericard, or American Express account will be made available when you are invoiced for the first shipment.

Signature _____
All orders subject to acceptance by Fleetwood

Mr.
Mrs.
Miss _____
PLEASE PRINT CLEARLY

Address _____

City _____

State _____ Zip _____

First Shipments to Charter Members will be made in late February, 1979. Fleetwood, established 1929, is recognized as America's foremost creator of philatelic commemoratives. It is a division of Unicover Corporation, not affiliated with any governmental agency.

ME sets you free.

If you've quit taking snapshots because the results have been disappointing, don't blame yourself. You've simply outgrown your simple camera. It's time to set yourself free, with the ME from Pentax.

Discover a brand new world of quality 35 millimeter photography. Pentax ME makes it as easy as 1-2-3.

With the Pentax ME, there's no need to learn the complicated theory or jargon associated with 35 millimeter. All you have to remember is set, focus and shoot. Suddenly you're free to capture all the color, beauty and excitement that was previously available to serious photographers only.

Your new ME will accept a full line of quality Super-Multi-Coated Pentax lenses, exotic fisheye to super-telephoto. Which sets you free to explore the tiny world of a butterfly or the expanse of an entire skyline.

Accessory ME Auto-winder opens even more possibilities, with action or sequence photographs at nearly two exciting frames per second. Yet your ME remains the smallest, lightest, full-featured automatic 35 millimeter SLR on today's market.

If you're frustrated by snapshots, you're ready for photographs. See your Pentax dealer now...and let ME set you free.

More . . . from the innovators.

PENTAX

ME

FOR COLOR BROCHURE, WRITE: Pentax ME, P.O. Box 2585, Littleton, CO 80161

Free. The kit that will move you, in no uncertain terms, to a decision on a company airplane.

In deciding what your company should do about the rising cost of business travel, the worst decision is indecision.

Unfortunately, getting the information you need to make a good decision can be very difficult.

But now, in one comprehensive kit, you can get all the information you need to make an objective initial decision on the fastest growing mode of business travel today: the company airplane.

It's the Beechcraft Business Flying Kit and it's free. All you have to do is send for it.

But be prepared for a few surprises when your kit arrives. To begin with, you won't be getting just another pretty piece of sales literature.

Instead, you'll receive a straightforward, easy-to-read businessman's kit designed for one purpose: To help you make a realistic initial evaluation of what a business airplane can do for your company. In terms of time savings, fuel savings, and overall cost efficiency.

And you'll get up-front answers to the real questions you have about a company airplane. How do you determine the need for one? What financing plans are available? How do you select the right size aircraft?

The kit even helps you determine the net capital cost to your company of owning a business airplane, like the Beechcraft Super King Air shown here.

The Beechcraft Business Flying Kit. After you've read it, you'll have a good idea as to whether or not a business airplane is right for your company now.

Send for it.

Get the kit that will inform you, excite you, and challenge your every thought on business travel. Write on your company letterhead to: Beech Aircraft Corporation, Dept. A, Wichita, Kansas 67201. Ask for our free Beechcraft Business Flying Kit, and please mention if you're a pilot.

Member of General Aviation Manufacturers Association

The jetprop Beechcraft Super King Air. The world's best selling turbine powered corporate aircraft. It can carry 8 to 15 people in unquestionable elegance at nearly half the speed of sound.

Know any friends who want to learn to fly? Tell them about the General Aviation Manufacturers Association Take Off Sweepstakes. They could win a $50,000 airplane just for earning their private pilot license. Have them call TOLL FREE, 24 hours a day, any day and ask for the BEECH "TAKEOFF" operator: USA 800-447-4700 (in Illinois, 800-322-4400); Canada 800-261-6362 (Toronto, 445-2231).


Moonroof optional.
This is the new 1979 Lincoln Versailles.
This is the new 1979 Lincoln Versailles.
Vinyl roof optional.
This is the new 1979 Lincoln Versailles.
The pride of owning a Lincoln distilled to a 110-inch wheelbase. Your choice of custom roof designs makes the new Versailles a most personal luxury car.
LINCOLN VERSAILLES
LINCOLN-MERCURY DIVISION
Ford

Get the sharpest picture in Zenith history.
Our new Tri-Focus picture tube has three focusing actions—two more than ordinary tubes.

Get rich, real color. Automatically.
Our exclusive Color Sentry automatically corrects the color thirty times a second.

Get the TV designed to be the most reliable Zenith ever.
Our Triple-Plus chassis is all new. It's 100% modular, with far fewer component interconnections. And it runs cooler at critical points.

THIS IS A BREAKTHROUGH. THIS IS THE BEST ZENITH EVER.

SYSTEM 3

ZENITH®
The quality goes in before the name goes on.®

Shown the Purcell, SK3527P. Pecan color with front and base of simulated wood and select hardwood solids framing the top. Simulated TV picture.

Four of the 400 things you can do without flash.

All four pictures taken with Kodacolor 400 film, without flash.

1/500 @ f/2.0. Stop a speeding snowball in mid-air.

1/30 @ f/2.8. Capture the subtlety of twilight.

1/60 @ f/2.8. Use the natural light that comes in through a window.

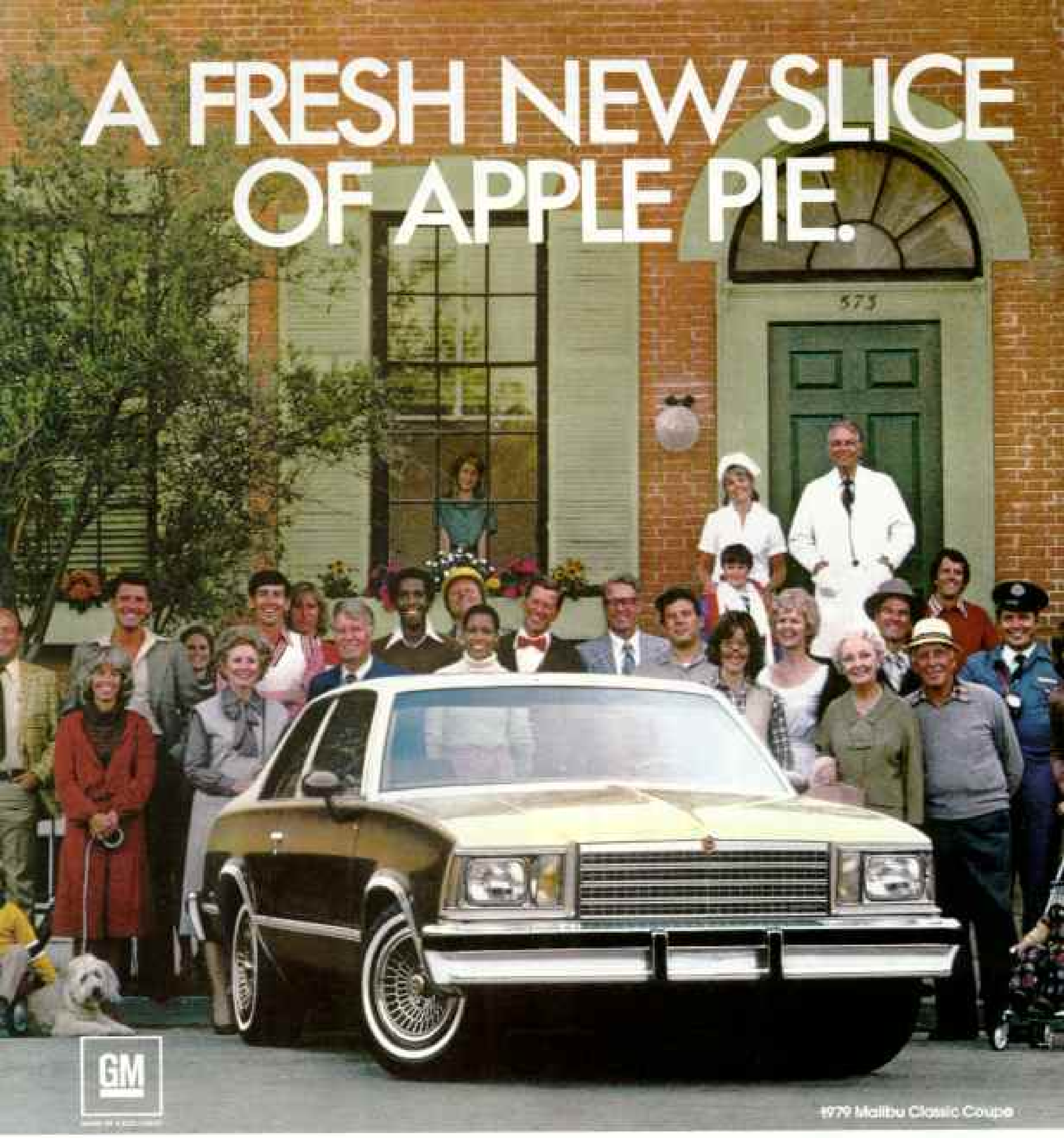
1/30 @ f/2.0. Take advantage of lamp light for a dramatic effect.

With Kodak's family of 400-speed 35 mm films, you can stop action in low-light conditions as well as take indoor and outdoor pictures without flash. And your pictures look natural, because you are using available light instead of altering the light.

For clear, sharp color prints, use Kodacolor 400 film; new Ektachrome 400 film for eye-stopping color slides; and Kodak Tri-X pan film for dramatic black-and-white shots. Just remember to add a Kodak 400-speed film to your 35 mm camera—and you've got what it takes.

Kodak 400-speed films.
You've got what it takes.

A FRESH NEW SLICE OF APPLE PIE.



America is really getting behind our crisp mid-size Malibu. What's the attraction?

The looks. The size. The room. The value. The name. In short, the car.

The right size: Quick and maneuverable.

You're going to love the way Malibu moves through tight city traffic with agility.

Yet out on the open road, Malibu's Full Coil suspension with front stabilizer bar helps give it an impressive ride.

The right room: More head, leg, trunk room.

Today's Malibu has more head and leg room than the '77 Malibu it replaced.

And the trunk is surprisingly large for a car of such trim dimensions: 16.6 cubic feet of usable luggage capacity.

The right ingredients: Body by Fisher and more.

The doors, the hood and the deck lid all feature strong, double-panel construction.

You get fiberglass-belted radial ply tires, a Delco Freedom battery that never needs refilling, High Energy Ignition, full-time flow-through ventilation, and more.

Talk to your Chevy dealer about buying or leasing a new Malibu.

You're going to eat it up.

'79 CHEVY MALIBU

Chevrolet

How to liven up the day after the holiday, too!

It's the day after.
You open the fridge and all that's left are the leftovers. This is your chance to pile up all your favorite holiday tastes into one giant super-sandwich. Now...if you can just find one chilled bottle of Coke somewhere between the carton of eggs and the last of the turkey, you've got it made.

Coke adds life...
Trade-marks

Treasures from the tomb reveal Chan Chan's past

Carbon-impregnated black ceramic vessel bears witness to an ancient kingdom as rich as a pharaoh's. Chan Chan, pre-Columbian capital of Chimor on the coastal desert of northern Peru, has yielded treasures for 500 years. Conquering Incas looted it in the 15th century. Conquistadores mined it for gold artifacts. Pedro Pizarro found a doorway slabbed with silver. *Huaqueros*—grave robbers—have been tunneling into the ruins ever since. A maze of mud-brick walls enclosed nine spacious compounds. These served successive monarchs as palaces in life, as shrines in death. Huge adobe platforms honeycombed with chambers entombed kings, hoards of treasure, and human skeletons "stacked like cordwood"—bones of young women. They were apparently sacrificed to tend royal needs in the afterlife. Threatened by squatters, Chan Chan might have remained an enigma had not archeologists sponsored by the Society completely mapped and extensively excavated the city, puzzling out its past. Digging for facts rewards readers every month in the pages of NATIONAL GEOGRAPHIC.

Is time running out for the mighty condor?

Profile from the past, the Andean condor has changed little since prehistoric times. Beady red eyes, hooked beak, and white ruff mark the female. The paler-eyed male wears a crinkled crest. Giants among birds that fly, condors soar on wings spanning as much as ten feet. Leaping from cliffs, condors ride updrafts to three-mile altitudes, attaining speeds of 35 miles an hour. Wings flap sparingly, mainly for takeoffs and landings. Andean condors haunt coasts and mountains from Colombia to Tierra del Fuego, feeding mostly on carrion. Once plentiful, their numbers decrease as humans encroach on their wild domain.

Hunters bag them for trophies. Guardians, hired to protect guano birds on Peru's offshore islands, wantonly slaughter condors on the mainland. One village ceremony also takes a grisly toll. A captive bird is swung from arched poles, and Cashapampa's fist-swinging horsemen pummel it to death. A man bites its tongue out, then others tear the creature apart for talismans. The rite, now meaningless, apparently began with the Spanish, who symbolized destruction of the Inca's pagan culture by killing condors. Their cousins, the few surviving California condors, cling to dwindling mountain retreats. Readers keep tabs on these and other endangered species by regularly turning to the pages of NATIONAL GEOGRAPHIC.

"THE NEW POTSCRUBBER III IS THE BEST DISHWASHER GE HAS EVER MADE. WHO COULD ASK FOR ANYTHING MORE?"

– Debbie Reynolds

IT WASHES DISHES CLEANER.

The Potscrubber III dishwasher features the new exclusive Multi-Orbit™ Wash Arm, engineered so that it directs a constantly changing pattern of water up through the

dishes. This arm, combined with a Power Shower on top and a Power Tower in the middle, gives you 3-level washing action to get your dishes and glasses cleaner than ever before.

And the special Power Scrub® Cycle, while it may not do everything (such as remove burned-on soils), is designed to remove heavy dried-on and baked-on foods from pots and casseroles.

IT SAVES WATER AND SAVES ENERGY.

Almost 80% of all the energy used in a dishwasher is in the hot water it consumes.

The new Potscrubber III dishwasher has been specially designed to use less hot water. In fact, your family could save hundreds of gallons a year.

You can also save energy by letting the dishes dry naturally, simply by pressing the Energy Saver button. And you can cut down on the number of washings you do because the new Super Racks hold more dishes.

AND IT RUNS QUIETLY, TOO.

Our PermaTuf™ tub is not only tough (it won't chip, crack, peel or rust in normal use), but it's actually an effective sound-dampening material as well.

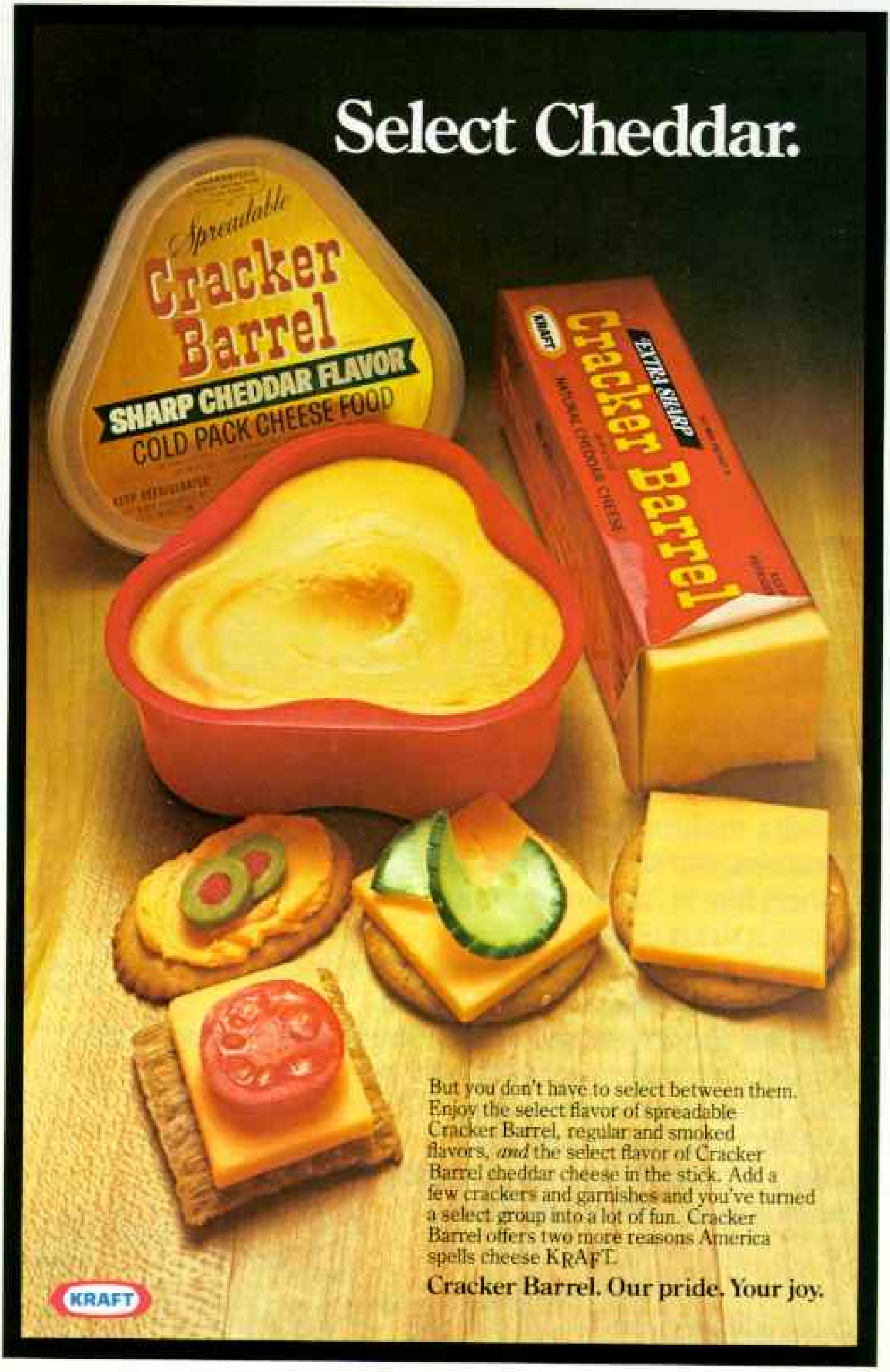
And we didn't stop there. We even surrounded the PermaTuf tub with a blanket of sound insulation.

The Potscrubber III dishwasher from General Electric. Who could ask for anything more?

THE APPLIANCES AMERICA COMES HOME TO.

GENERAL ELECTRIC

Select Cheddar.



But you don't have to select between them. Enjoy the select flavor of spreadable Cracker Barrel, regular and smoked flavors, *and* the select flavor of Cracker Barrel cheddar cheese in the stick. Add a few crackers and garnishes and you've turned a select group into a lot of fun. Cracker Barrel offers two more reasons America spells cheese KRAFT.

Cracker Barrel. Our pride. Your joy.

KRAFT

Delta is an air line run by professionals. Like Dot Turnipseed, Ticket Sales Agent.

She has spent most of her 10 years with Delta making telephone reservations. But she loves meeting customers face to face in her job at a downtown ticket office.

Tycoons, tots, globe-trotters and first-timers. She has a warm welcome for everyone.

And Dot doesn't just sell tickets. She finds an earlier flight, a lower fare, an easier connection for her customers. Because when it comes to people,

Dot couldn't care more. And that goes for all 31,000 Delta professionals.

Delta is ready when you are.®

This is Delta's Wide-Ride® L-1011 TriStar. The "living room" cabins are 8 feet high, almost 19 feet wide.

WELCOME HOME DIPLOMAT.

LET THE FOLKS BACK HOME SEE THAT YOU'VE REALLY ARRIVED, WHEN YOU ARRIVE IN A NEW MID-SIZE DODGE DIPLOMAT.

Going home. And you want to show the folks you've done all right for yourself. So you arrive in style. In a new Dodge Diplomat wagon.

First thing the clan's bound to notice is how good looking your new Diplomat is. Dual rectangular headlamps. A simulated wood-grain exterior. Even an optional luggage rack and air deflector.

Then they'll probably want to get inside for a closer look. Mom may be a bit surprised to find a wagon that's available with real leather seating. And your sister will undoubtedly be surprised that her big brother was smart enough to order the optional AM/FM stereo with Search Tune.

Now dad is more likely to be impressed by Diplomat's practical aspects. Like the fact that it can be bought or leased at such a reasonable price. Or the fact that its standard 225 six-cylinder one-barrel engine works with a four-speed manual transmission for great mileage.

28 MPG HWY/18 MPG CITY*

Once all the oohing and ahhing has died down, everyone can help you unload. And since you've got over 72 cubic feet of cargo space with the rear seat down, you've probably brought along a few big boxes with ribbons on top. After all, it's a special occasion, you and your new Dodge Diplomat are home again.

Dodge Diplomat

*EPA estimates. Your mileage may vary depending on your driving habits, the condition of your car, and its equipment. California estimates are lower and automatic transmission is required.