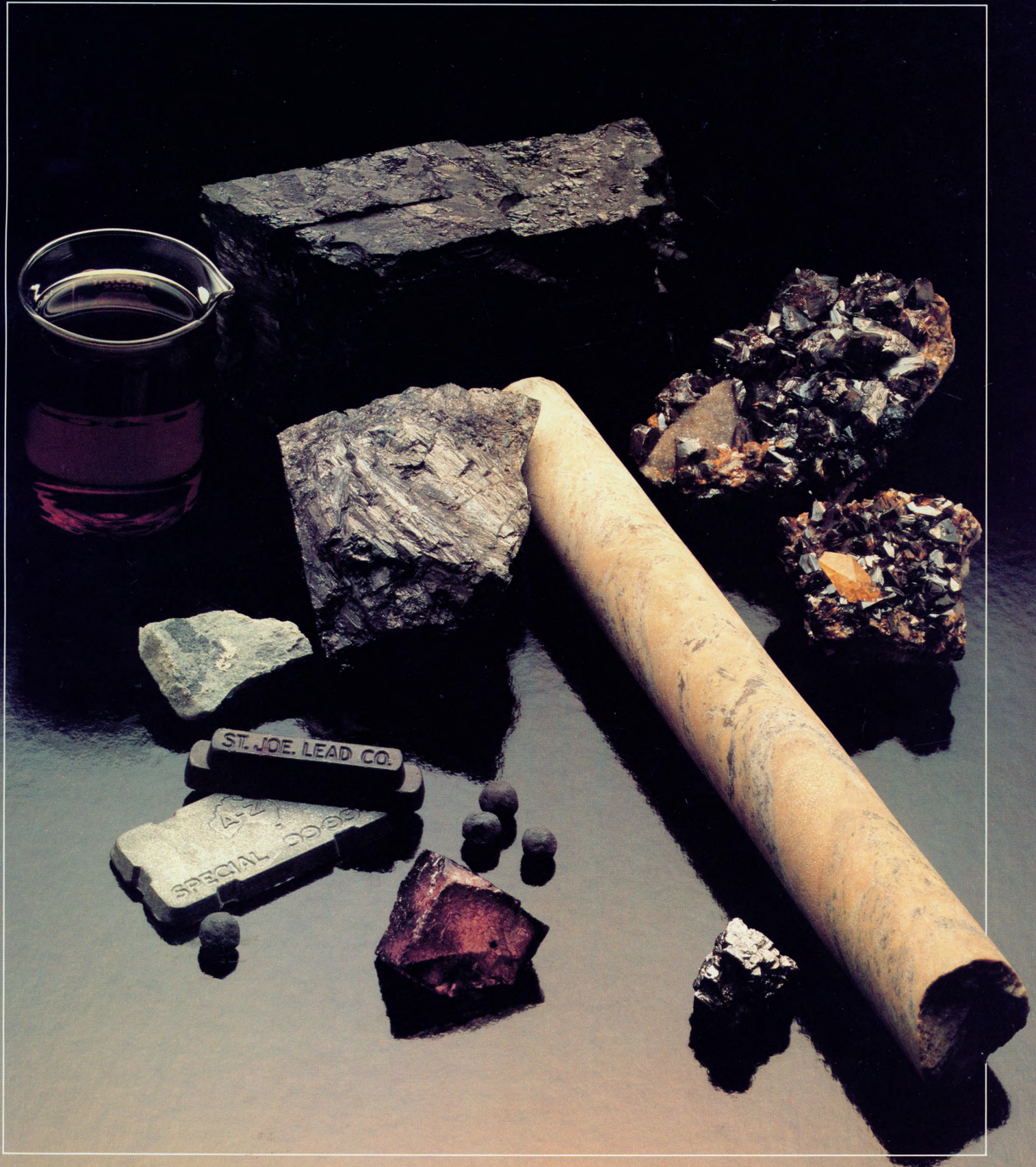


FLUOR

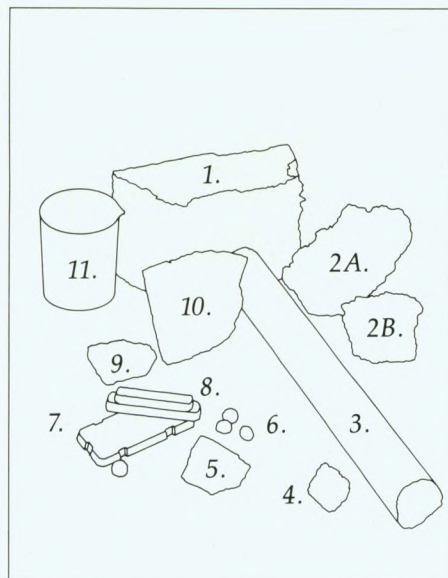
Magazine 1981 Number 3





FLUOR

Magazine
Volume XXXVIII Number 3



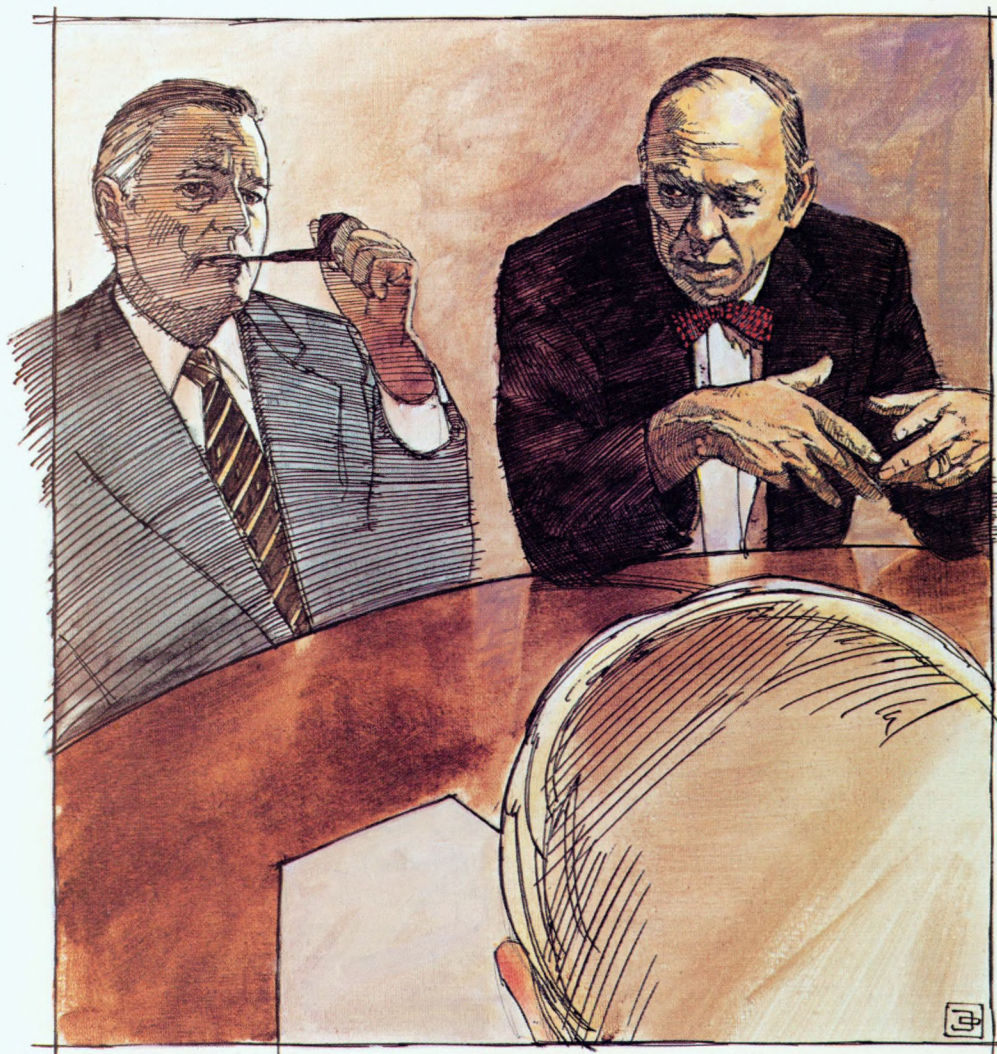
Cover: A limited sampling from St. Joe's kaleidoscope of resources includes:
1. Coal. 2A. Sphalerite crystals. Sphalerite is zinc sulfide ore. 2B. Sphalerite crystals with calcite crystal. 3. Core samples give clues to what lies below the earth's surface. 4. Galena is lead sulfide ore. 5. Fluorite crystal. Fluorite is used in steel manufacturing. 6. Iron pellets. 7./8. Miniature "slab" of zinc and "pig" of lead. 9. Silver ore with naturally-occurring native silver. 10. Enargite from which copper is produced with arsenic as a by-product. 11. Oil.

Frontispiece: The St. Joe collection of mining paintings spans the 19th and early 20th centuries. It is international in scope with an emphasis on American artists and topography. This painting, titled Copper Mining, Butte, Montana, was painted by Frank Earle Schoonover in 1906.

- | | |
|---|--|
| <p>4 Why St. Joe?</p> <hr/> <p>7 Lead, Zinc and the Early Days</p> <hr/> <p>10 Anatomy of a Mineral</p> <hr/> <p>12 Minerals and the Marketplace</p> <hr/> <p>13 This Is St. Joe</p> <hr/> <p>14 Oil and Gas</p> <hr/> <p>16 Coal</p> <hr/> <p>17 A Capital Idea</p> <hr/> <p>20 Domestic Metals</p> <hr/> <p>22 Energy Research Corporation</p> <hr/> <p>24 California Gold</p> <hr/> <p>26 St. Joe International Corporation</p> <hr/> <p>27 Exploration</p> <hr/> <p>28 El Indio—Against the Elements</p> <hr/> <p>30 St. Joe's Special Team</p> | <p>Fluor and St. Joe Minerals Corporation have joined forces. The two chairmen discuss what led to the merger and where the new company is headed.</p> <hr/> <p>A business started as an investment deal more than 100 years ago blossomed into one of the most lucrative lead-and-zinc operations in the United States.</p> <hr/> <p>A brief description of what minerals are, and how they are formed.</p> <hr/> <p>Certain minerals are prone to commodity market whims, others aren't. It was this cyclicity that helped St. Joe's board of directors make the decision to diversify.</p> <hr/> <p>St. Joe is a diversified natural-resource company at work around the world.</p> <hr/> <p>St. Joe has domestic and international oil and gas holdings, which will contribute to and stabilize Fluor's earnings.</p> <hr/> <p>St. Joe's coal subsidiary provides an opportunity to participate in the growing steam-and-metallurgical coal market.</p> <hr/> <p>By building its own transshipment terminals, St. Joe's coal division is getting a leg up on its competitors.</p> <hr/> <p>Though St. Joe has diversified in the last 10 years, hard-rock mining remains a company mainstay.</p> <hr/> <p>The third largest electrochemical research facility in the U.S. is actively exploring new ways to generate and store energy.</p> <hr/> <p>Gold has always intrigued mankind. St. Joe is redeveloping some interesting properties in the northern part of the state.</p> <hr/> <p>Development of a rich orebody in Argentina marked St. Joe's entry into the international minerals market.</p> <hr/> <p>St. Joe's superb exploration team reduces the odds in the risky search for minerals.</p> <hr/> <p>The spare Chilean Andes provide the backdrop for an unusual mining project.</p> <hr/> <p>This close-knit management group oversees St. Joe's diverse worldwide activities.</p> |
|---|--|

MO
622
Sa2js

Why St. Joe?



John Duncan and Bob Fluor

Earlier this year, in a fit of takeover fever, a subsidiary of The Seagram Company of Canada Ltd. went after St. Joe Minerals Corporation. St. Joe rejected the bid. Why, and what does it mean?

It's official. At a special meeting held on August 3, stockholders of both Fluor and St. Joe Minerals corporations voted overwhelmingly in favor of a merger to complete the acquisition of St. Joe by Fluor Corporation.

It was the first in a series of similar multi-billion-dollar amalgamations to be consummated within the natural-resources industry this year.

At a total of more than \$2 billion, paid in cash and stock, the deal is Fluor's largest expenditure to date.

Why St. Joe? A number of reasons, not the least of which was timing. On March 11 this year, a wholly owned subsidiary of The Seagram Company Ltd. of Canada approached St. Joe and offered \$45 a share for all its outstanding stock.

Denouncing the offer as grossly inadequate, St. Joe's board of directors rejected the bid and urged its shareholders to follow suit.

St. Joe's board then authorized management to take whatever steps necessary to protect the interests of the company and its shareholders.

On March 9, at a Fluor board of directors meeting, it had been decided that a natural-resource company would be the next logical step in Fluor's diversification program.

Two weeks later, Chairman J. Robert Fluor received a call from St. Joe's investment adviser inviting Fluor to join a consortium being formed to buy a minority share in St. Joe. Fluor decided to acquire the company alone.

On March 31, Bob Fluor and St. Joe Chairman John C. Duncan announced that a preliminary merger agreement had been entered into: Fluor would acquire 45 percent of St. Joe's stock for \$60 a share and, upon approval by shareholders of both

companies, it would be followed by a tax-free merger.

Now approved, 55 percent of St. Joe's stockholders receive 1.2 shares of Fluor common stock for each share of St. Joe stock.

The following interview with J. Robert Fluor and John C. Duncan was conducted shortly after the initial agreement was announced.

Q: Why did Seagram approach St. Joe, and why was the offer rejected?

Duncan: Seagram wanted back into the natural-resource business. It had sold its U.S.-based petroleum company, had money to spend, and knew we had good prospects and a strong management team.

The bid was rejected because it was too low. Our stock had been valued in excess of \$60 per share, and Seagram offered only \$45.

Q: What were the criteria on which the St. Joe acquisition was made?

Fluor: Fluor's diversification program actually began in 1963 when we purchased our first oil and gas property. But it wasn't until our March board meeting that we decided to emphasize natural resources in our diversification program. Simultaneously, the Seagram/St. Joe acquisition battle was in progress.

Shortly after we arrived at our decision, Smith Barney called and suggested we join the consortium to purchase St. Joe.

While we didn't know everything about the company, we did know it was into oil and gas, coal—areas Fluor is strongly committed to. We requested more information and, based on what we saw, decided to go ahead. In

short, it met the criteria we had established. The only thing we didn't anticipate was a company of that size.

Q: In reference to size, how will the combined companies operate? Will there be any major changes?

Fluor: No. There will be no need. Both companies have strong similarities—a good cash flow, growth pattern and management philosophy.

Q: How would you describe that management philosophy?

Fluor: Decentralization. Responsibility is given to each entity and it essentially runs its own operation—with support from the home office.

Duncan: St. Joe operates the same way. This approach affords each group the ability to think on its own, to make decisions and to act on them.

There are, however, some fundamental differences between the two companies. Fluor Corporation is a service business. It is highly administrative, people oriented. It sells project management, engineering, construction supervision.

St. Joe is first of all into exploration: hard rock and oil and gas. However, this requires large amounts of capital to develop new projects, and the combined cash flow of Fluor and St. Joe can be put to good use in developing these new projects.

Q: How will shareholders be affected?

Fluor: In the long run, there's no doubt that the company will be strengthened. Fluor now has a much stronger base—not just in assets, but in management as well.

In the short term, there will be a certain amount of dilution. That's to be expected in a deal like this. That is also expected to be temporary.

Management's foremost responsibility to shareholders is to anticipate how the company must be positioned for the future. That view cannot be limited to a seven-month, or even a 17-month period.

In the early 1970s, we began preparing Fluor for the management of super-projects as well as the engineering and construction of synfuels plants. As a result, the company has booked several super-projects slated to continue through this decade.

In 1977, we acquired Daniel International Corporation in response to a growing trend in open-shop labor construction.

Last year, we signed an information exchange agreement with Genentech, a leading biotechnology company. Discoveries through bio-engineering could profoundly affect the way we engineer and construct future chemical, petrochemical and pharmaceutical plants. Basically, we try to stay on top of developing trends and technologies.

Duncan: While Fluor was positioning itself for the future, St. Joe was, too. We looked at the energy situation in 1971–72 and decided to diversify into oil and gas, both domestic and foreign.

At about the same time, we acquired the A. T. Massey Coal Company, a domestic coal-mining and exporting company that was expanding its operations.

When the oil embargo hit, the price of coal broke the sound barrier. Massey paid for itself in the first year. Practically everything we made was

plowed back into the business. We now operate 25 coal-mining operations and 16 coal-preparation plants. We also continue to broker coal. We have good long-term contracts and relatively low capital investment in our mines.

We also have a unique position in the industry in that we have reserves of high-quality steam coal, as well as metallurgical coal. We are in the process of building export terminals with the capability of blending coal to match clients' needs.

El Indio, our Chilean gold, silver and copper property, contains exceptionally high-grade ore. We are looking at other areas as well—tungsten, cobalt, titanium, magnesium and more.

Q: Could Fluor have accomplished the same investment strategy by investing smaller chunks of money over a longer period of time?

Fluor: I think the answer is obviously yes, but whether we could have achieved the same profit potential is highly questionable.

Q: Will the merger affect the interaction between existing Fluor entities?

Fluor: There will, of course, be a certain amount of coordinating with reference to Fluor Oil and Gas, and Fluor Mining & Metals.

I do not anticipate any competitive posture with St. Joe's activities. They do not compete today. They operate in different markets and different areas of the country. I don't see that as a problem.

Q: What would you say are each company's strengths?

Fluor: Well, I feel that our ability to plan, execute and manage numerous major projects worldwide has to be a major strength.

Duncan: Our greatest area of expertise is the ability to bring projects in—to find the property, arrange for the financing and put the whole package together.

Our principal aim in our hard-rock minerals business is to find and develop low-cost orebodies. The decision to develop an orebody is based on several criteria, including the extent and grade of the ore, location of the find and the politics of the host country.

Q: How might the two companies complement each other?

Fluor: The combined companies have at least eight areas that have been significantly reinforced.

First, the merger provides more diversified sources of revenues, earnings and assets.

Second, both companies are strong cash generators. This will facilitate expansion and allow us to investigate opportunities not available before.

Third has to do with flexible spending programs. Those areas, like oil and gas development, that are receiving the largest capital allotment may be delayed if there are more effective uses of cash flow.

Fourth, both companies are hedged against the effects of inflation.

Fluor's engineering and construction work is funded in advance and is done on a cost-plus basis with appropriate escalation clauses. St. Joe's diverse natural-resource holdings, in

turn, should increase in value over the long term and will track inflation.

Fifth, our combined track record is positive. In the past decade, Fluor's revenues and earnings have increased at a compound annual rate of about 25 percent. In the same period, St. Joe's increased at about 14 percent annually.

Sixth, both Fluor and St. Joe have traditionally maintained conservative capital structures. Growth has been financed through a heavy reliance on retained earnings rather than outside borrowings.

Seventh, the combined company has a strong competitive position in many of its key businesses. Fluor in engineering and construction management, drilling and distribution services, and St. Joe in mining and minerals.

Eighth, both Fluor and St. Joe have seasoned and highly effective management teams. It is our firm belief that a high degree of compatibility already exists between these formerly separate managements, and this compatibility will assuredly grow stronger in the years ahead.

These are some of the primary strengths of the new company.

Q: If today were January 1, 1990, how would you describe Fluor Corporation?

Duncan: As a major natural-resource and premier engineering/construction firm. Fluor and St. Joe together will continue to generate a substantial cash flow. This capital will be invested in opportunities that offer the best return on investment for the shareholders, and I happen to believe those opportunities will be in the development of natural-resource projects in which St. Joe excels.

LEAD ZINC

and the Early Days

*St. Joseph Lead Company
was formed in 1864 for
"manufacturing, mining,
mechanical and chemical
purposes." A combination of
expertise and tenacity carried
the domestic mining company
through some very tough times.*

Throughout history, writers have referred to the smelting of a malleable, bluish-gray metal element—lead.

This serviceable metal was used for everything from water pipes in ancient Pompeii to sling-ejected projectiles on the battlefields of Greece.

Today, besides its continued use in the manufacture of pipe, solder, cable sheaths and radioactive shields, lead is the major component of electric storage batteries. In the United States, batteries consume some 60 percent of domestic lead production.

Lead mining and smelting began in the U.S. in the 1700s when numerous French expeditions were dispatched to find new sources of the versatile metal. What they discovered was a very rich corridor of lead-bearing ore located in Southeastern Missouri. This geological formation later became known as the *Lead Belt*.

Those early mines were merely open pits with few, if any, smelters



located nearby. The miners would simply take their accumulated cache to a convenient point where it was sold to a smelting operation.

In those days, smelting techniques were very crude. Lead was processed in log furnaces, which were holes in the ground covered by a smooth coating of clay.

Over the top of the hole, men placed two or three large logs and set smaller logs and sticks on top. They then scattered the crude mineral over this pyre.

When the fire had roasted and oxidized the lead, the resultant molten metal trickled into the cavity below. They repeated the process until the hole was filled with impure lead; then they pulled the slug and cut it into convenient-sized pieces to sell.

Time passed and technology improved. It wasn't long before the Lead Belt was drawing much attention. Lead demand grew.

But there was a problem: how to transport product from the mines to the major population centers?

In 1809, after a concentrated search, a group of lead producers picked a site alongside the Mississippi River that afforded easy river shipment. Roads were built and a town sprang up—a town they named Herculaneum.

The district grew and, by 1819, Herculaneum became the county seat. By 1834, however, larger towns were built along the river and the legal administrators moved west.

Herculaneum began to lose impor-

tance as a river port for the shipping of lead. It might have become another ghost town except for the founding of a new company.

St. Joseph Lead Company was established on March 25, 1864, with a capital stock of \$1 million and some acreage at Bonne Terre, Missouri.

Production was slow to take off, and the company's early annual reports complained of drought, flood, Confederate Army raids and deadly winters. In 1865, the year's entire lead production totalled 240 tons.

In 1887, a commercial overland haulage road was constructed making it possible to move smelting furnaces and supplies to the Mississippi at reasonable prices.

Just two miles south of old Herculanum, St. Joseph purchased 540 acres of prime river-front property. Here they built a new lead smelter.

Within a few years, Herculanum had become a major lead-smelting center. More roasting furnaces and

blast furnaces were added as lead demand continued to grow.

The company, under President J. Wyman Jones, brought the diamond drill to the Lead Belt, which revolutionized the industry. After some exploratory drilling, St. Joseph workers discovered that the ore deposits extended down much farther than originally thought.

By 1874, five shafts were in operation and St. Joseph Lead Company was producing in excess of 130 tons of lead per month.

The introduction of the diamond drill and underground-mining techniques enabled the company eventually to become the largest domestic lead producer.

The company prospered. After the turn of the century, St. Joseph acquired a number of other properties in the Lead Belt.

By the mid-1920s, a network of more than 250 miles of narrow-gauge track was running under the towns of

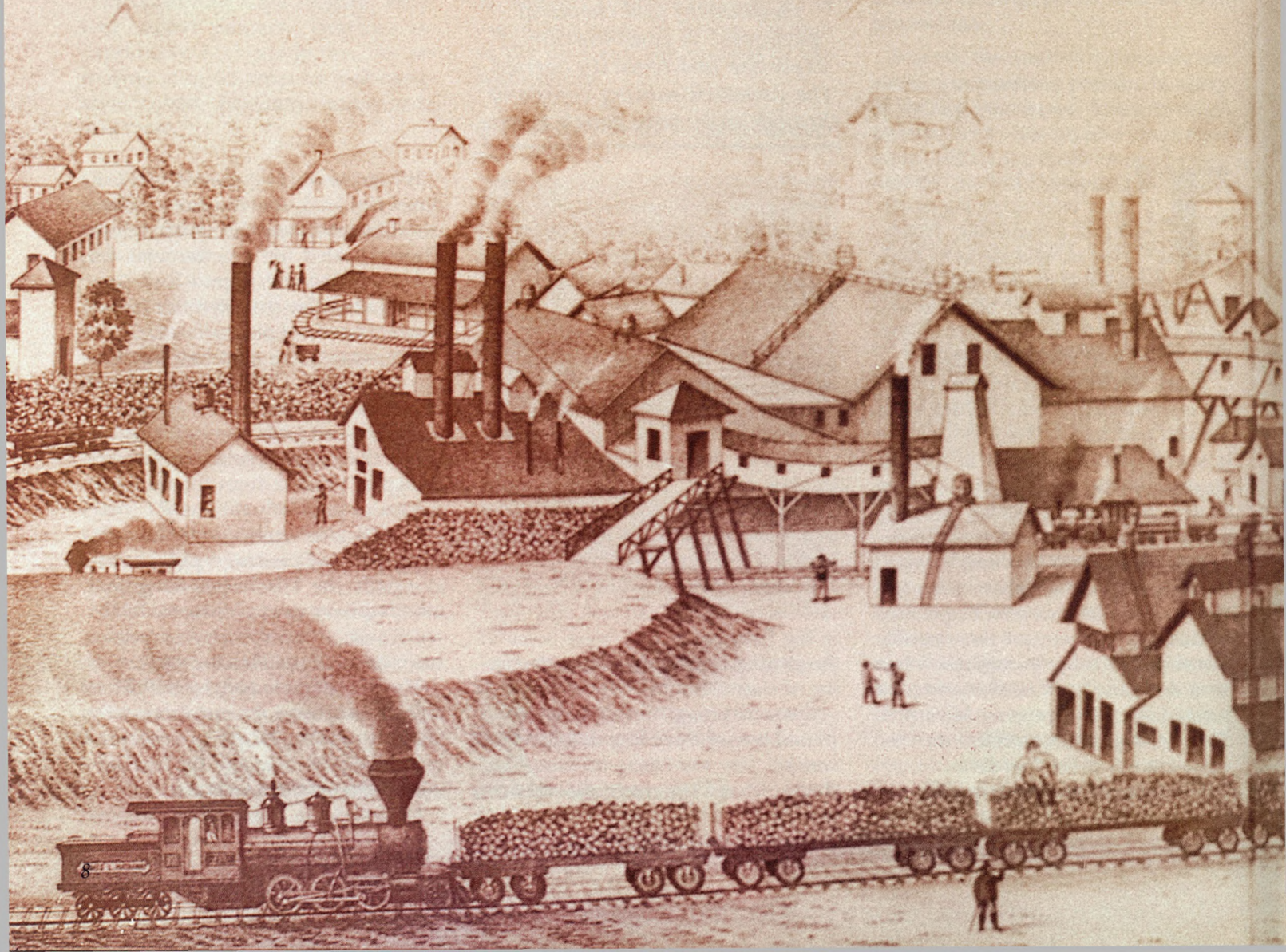
Flat River, Leadwood, Desloge, Rivermines and Elvins. This sub-surface transport system consolidated the company's mines, which increased overall efficiency.

After almost 100 years of continuous mining, the ore showed signs of depletion. Mine and smelter capacity dropped off.

The introduction of the diamond drill and underground-mining techniques enabled the company eventually to become the largest domestic lead producer.

In 1926, St. Joseph entered the zinc market by purchasing the Edwards and Balmat properties in upstate New York. The company built a smelter nearby and began producing zinc oxide and then zinc metal.

Like many other industries, the Depression affected the lead and zinc



markets, too. The company borrowed \$10 million to stay afloat, and even provided garden plots so employees could grow food.

With the advent of World War II, the market exploded. St. Joseph had more than 3,000 employees working in the Lead Belt by the end of 1945.

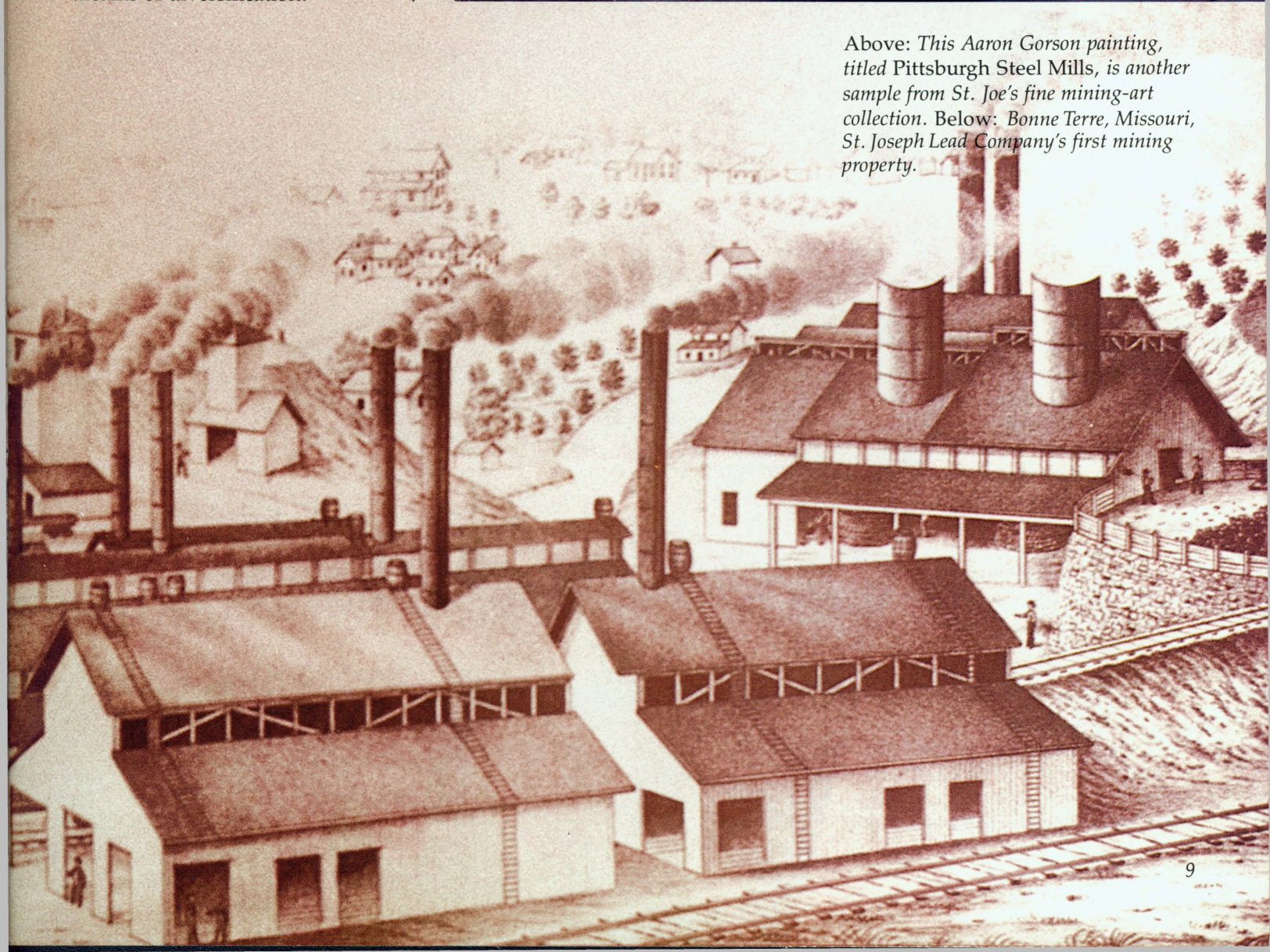
In 1953, St. Joseph discovered new deposits about 50 miles west of the old Lead Belt and opened up new operations. The area became known as the *New Lead Belt*.

In the late 1960s, the company completed a multi-million-dollar expansion and modernization of the Herculaneum plant. By then, St. Joseph had become the nation's largest producer of domestic lead and zinc and had moved into the iron market.

First lead, then zinc and iron. What next? It wasn't long before that question was answered. Revenues generated from St. Joseph's low-cost lead and zinc operations were soon to fuel dreams of diversification.



Above: This Aaron Gorson painting, titled *Pittsburgh Steel Mills*, is another sample from St. Joe's fine mining-art collection. Below: *Bonne Terre, Missouri*, St. Joseph Lead Company's first mining property.



Anatomy of a Mineral

What are minerals? How are they formed? Why do they occur where they do?



Silver nitrate under polarized light.

min'ér-al (*noun*) any naturally-occurring, homogeneous inorganic substance having definite chemical composition and characteristic crystalline structure, color, and hardness.

More than 3,000 separate mineral species are known to exist in the world. Of these, only about 20 are commonly found on the earth's crust. Rarely do useful minerals occur in sufficient concentrations to make commercial mining operations worthwhile.

Rocks are made of an aggregate of one or more minerals. A very few rocks are made up of a single mineral; most, however, contain many.

Those concentrations of minerals that contain commercial amounts of metals such as lead, zinc and copper are called *ores*. The surrounding, or matrix, material—of no commercial value—is called host rock and consists of a variety of different rocks, including clay, shale and granite. It commonly occurs that one ore deposit contains more than one metal, as is the case at St. Joe's El Indio mine in

Chile, where gold, silver and copper occur together.

But how are minerals formed, and why do they occur in certain areas?

Many mineral deposits were formed when molten rock, or *magma*, bubbled from the earth's interior and cooled. When magma forces itself into surrounding areas and cools before reaching the surface, it is called *igneous intrusion*. These super-heated intrusions change the makeup of surrounding rocks, particularly those in direct contact, by literally cooking them. When magma reaches the earth's surface, it is called a *volcanic rock* or *lava flow*.

During the cooling stage of magma, mineral-rich solutions of liquids and gases are forced, under great pressure and temperature, into the surrounding rocks.

As these solutions and gases cool, they sometimes migrate into small cracks in the matrix and create *veins*.

Rocks are made of an aggregate of one or more minerals. A very few rocks are made up of a single mineral; most, however, contain many.

These veins are normally not very thick, but can run for considerable distances and penetrate to great depths. Others may be narrow and of limited lateral and vertical extent.

Deposits formed by the intrusion of aqueous (liquid) solutions are known as *hydrothermal*, while gaseous deposits are called *pneumatolytic*.

A *pyrometasmatic* deposit occurs when gaseous and/or aqueous fluids replace some of the original rock.

Sometimes mineral-rich solutions affect the whole rock they penetrate; otherwise they may replace only certain rock compounds, or fill open spaces found in the rocks.

When the former happens, large deposits are formed such as the Copper Belt of Zambia. When the latter occurs, we get ore deposits such as the Lead-Zinc Belt in Missouri.

Hydrothermal solutions will some-

times reach the earth's surface as hot springs, depositing cinnabar, a mercury ore.

Rocks that are on or near the surface of the earth are subjected to weathering. Useful mineral elements such as copper are often leached down and re-deposited at water table levels by downward percolation of ground water.

In this manner, valuable deposits of copper have been concentrated from relatively low-grade ores. Such is the case of the very large copper deposits in the Southwestern United States and those found in Chile and Peru.

As rocks are broken down, erosion carries particles away via streams and rivers. Minerals that are heavy and not easily changed can be concentrated in workable quantities forming *placer* deposits.

These deposits occur near streams and beaches. Gold from placer deposits led to the California gold rush of 1849. Most of the world's tin—from Malaysia and Indonesia—is dredged from placer deposits, as are some diamonds mined in Africa and Brazil.

An ore deposit, then, is a natural occurrence of some element or mineral that has been concentrated over long periods of time.

Placer-mining technology has made giant strides in recent times and deposits that were once thought uneconomical to mine can now be profitably worked.

For example, new, lighter alloys and steels enable more efficient dredges to be manufactured. These dredges have longer booms, but because they are substantially lighter, they can dig much deeper (without tipping over) than was previously possible. This permits the mining of a greater amount of ore, which in turn reduces mining costs.

Economic concentrations of minerals are non-renewable natural resources. Once the ore deposit is mined out, it will not regenerate. Thus, geologists are continuously looking for new ore deposits to replace those that become exhausted.

The business of mining concerns itself with locating the rare, commercially viable, non-renewable ore deposits—not an easy task. ♣

Minerals and the Marketplace

In spite of all the complicated mechanisms of modern economics, the minerals industry is often caught in a classic supply/demand configuration.

Along with the fortunate position of being an incubator for wealth, basic resources—such as metals—also experience periodic fluctuations in price. Although these may vary depending upon the specific commodity, over the decades the historic waves persist.

Because of these cycles—particularly in lead and zinc—St. Joe's board of directors decided to diversify into other, counter-cyclical areas in order to mitigate radical shifts in demand.

A good example of the nature of metals is the recent behavior of gold and silver values. News of these precious metals has moved from small type on the newspaper commodity page to front-page attention.

January 1980 is memorable because a combination of geopolitical events and massive speculation drove the price of gold and silver to an all-time high—\$860 and \$50 per ounce, respectively. Since then, their prices have dropped substantially.

Currently, there is considerable interest in strategic metals, which include chromium, titanium, cobalt, columbium and tantalum.

These, and other metals that industry depends upon, frequently come from unreliable sources.

Events in foreign countries sometimes threaten supplies. Newspapers carry stories about shortages and rapidly increasing prices.

Not nearly as glamorous as precious or certain strategic metals, base metals have a luster all their own.

Metals such as lead, zinc, iron and

nickel may be caught in the current home-construction and automotive slump, yet have a bright future once these doldrums are weathered.

Storage batteries used in automobiles represent the largest single market for lead. Long-term prospects will improve with the development of lead/acid battery-powered cars.

The market for zinc should improve somewhat as domestic steel manufacturers continue to modernize and upgrade their plants.

Galvanizing, die-casting and production of brass are zinc's main applications. More than 90 percent of total zinc applied in protective coating goes for structural-steel roofing, siding, guttering and reinforcing bars.

Until the economic tide turns, only the most efficient, low-cost metal producers will turn a profit.

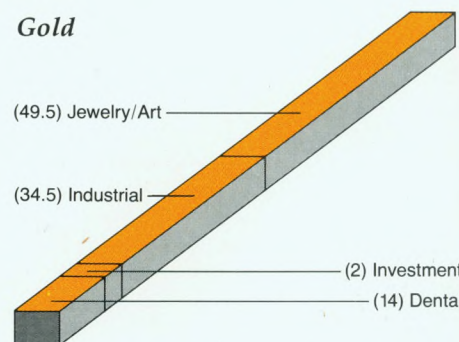
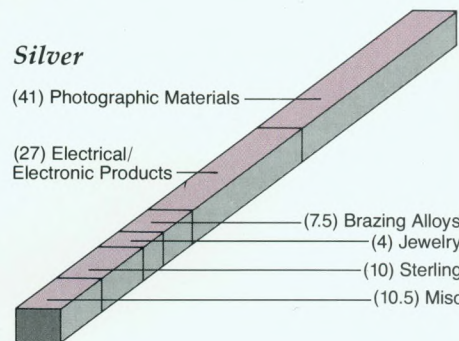
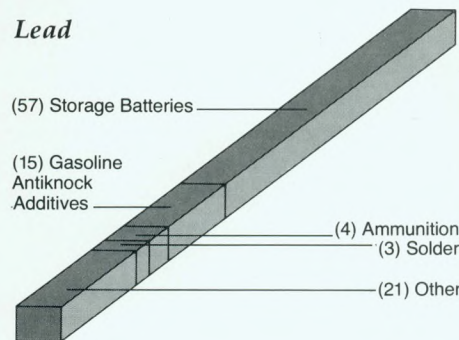
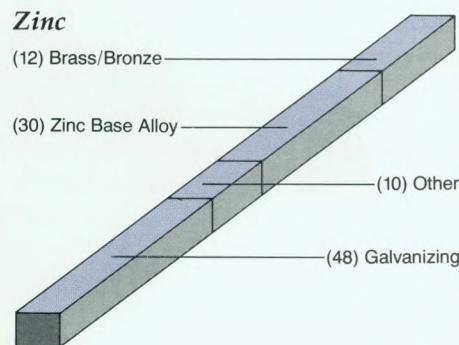
St. Joe, which has one of the lowest cost lead operations in the world, is among the nation's most efficient zinc producers. It also operates a profitable underground iron-ore mine near Sullivan, Missouri, the only one in the United States.

The metals market is subject to innovation. For example, exceptionally high-grade pellets, such as those produced by St. Joe, are the preferred material for the production of direct reduced iron (DRI). DRI is a technically superior substitute for scrap iron and is used in a growing number of electric steel furnaces.

Coal, which isn't considered a hard-rock metal, has increased in market price since 1973, with steam coal—used as utility boiler feed—moving from \$9 to around \$35 per ton. Metallurgical coal has increased in price from \$18 to about \$50 per ton. ♣

As commodities, minerals are prone to the whims and fancies of various world markets. What causes this cyclicality, and what lies ahead?

U.S. Industrial Consumption by End Use (% of Total)



This Is St. Joe

The close of the 1960s brought change to St. Joseph Lead Company, a philosophical change that ushered in a decade of diversification.

In 1970, St. Joseph was a profitable, well-respected metals company. Its sales at the time topped \$160 million. However, the company's board of directors recognized the need to diversify in order to protect St. Joseph from the industry's cyclical trends. The move would also offer new avenues for growth. The company's name was changed to *St. Joe Minerals Corporation* to herald this new attitude and to reflect its broader range of activities.

"After evaluating the energy situation in 1971-72," said St. Joe Chairman John C. Duncan, "we decided to move into oil and gas. Our first acquisition was CanDel Oil Ltd., of Canada.

"When we purchased it in 1972, we paid \$47 million. When we sold it this year, we received \$460 million. What we thought was a good investment at the time turned out to be nothing short of *remarkable*."

The association with CanDel resulted in a number of international oil

Revenues from St. Joe's low-cost lead-and-zinc properties fueled the fire of adventure. Today, St. Joe Minerals Corporation is a diversified natural-resource company with projects dotting the globe.

and gas ventures. St. Joe Petroleum Corporation currently has oil and gas reserves in Europe, and holds exploration interests in several other countries.

"While we were moving into oil and gas, we were looking at the coal industry as well. We started calling on various coal companies late in 1972. We then located A. T. Massey and negotiated a deal. In 1974, we bought the company."

Next, St. Joe looked to the domestic oil and gas market. In 1977, the company acquired Coquina Oil Corpora-

tion. Coquina's domestic holdings include reserves in a number of states.

Diversification costs money—lots of it. "Earlier this year, before the merger, we had examined our five-year plan," said St. Joe Vice Chairman Philip Walsh. "The figures indicated that there would be a tremendous cash build-up towards the end of that period. We knew we had to put that money to work."

"In the past few years we've been investing on the average of about \$200 million annually. In the next five years we plan to step up our activity in coal and precious metals, as well as oil and gas."

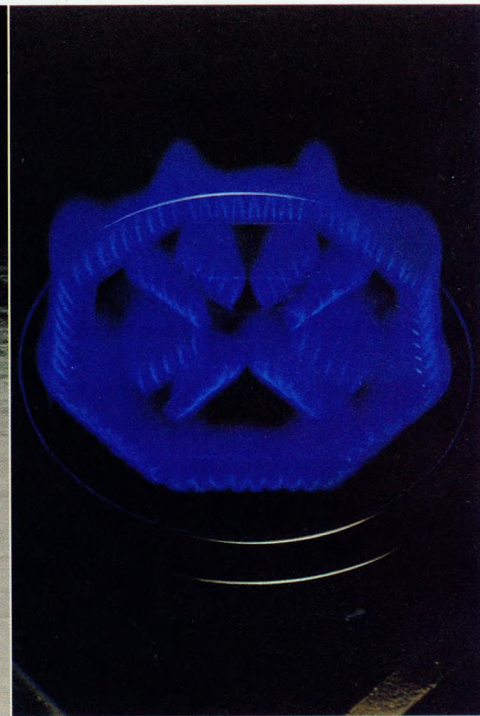
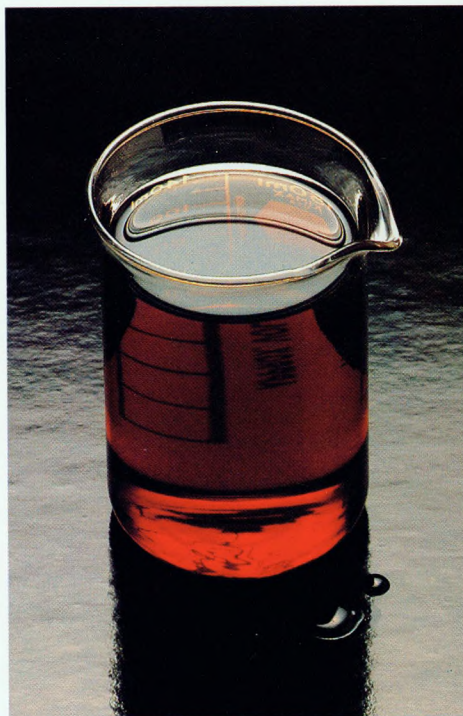
St. Joe's operating philosophy is akin to Fluor's in that it has a strong central management to which a number of autonomous groups report.

"We've put together a very strong, aggressive management network," said Duncan. "They have the ability and opportunity to make their own decisions."

The combined financial strengths and operating philosophies of Fluor and St. Joe open a world of opportunity as yet unexplored. ♣

Oil and Gas

Two operating units, Coquina and St. Joe Petroleum, bring new oil and gas holdings to Fluor, thus providing a strong earnings base for the future.



One of St. Joe's highest priorities since its diversification program began was to enter the primary energy market—to provide non-cyclical earnings for the company.

That goal has now been reached on two fronts. One is the coal business of A. T. Massey, and the other is oil and gas.

Two subsidiaries, St. Joe Petroleum Corporation and Coquina Oil Corporation, handle St. Joe's oil and gas business. St. Joe Petroleum operates internationally, while Coquina is St. Joe's domestic oil and gas enterprise.

St. Joe President Jim Broadhead outlined two major elements of the company's activities in this area.

"To build a strong reserve position, we gear exploration investments toward established, productive regions domestically, and politically stable foreign properties. Secondly, we increase reserves and production through internal growth, and by acquiring productive properties and/or other oil and gas operations."

Headquartered in Houston, St. Joe Petroleum has several very promising ventures currently under way. Heading the list is the Buchan Field, located in the United Kingdom sector of the North Sea in which St. Joe Petroleum has a 13 percent interest.

Current estimates call for a minimum of 48 million barrels of oil to be produced from the Buchan Field during its produc-

tive life with the bulk of these reserves to be extracted within the next four years.

Onshore, not far from London, St. Joe Petroleum holds interests ranging from 13 to 17 percent in 1.3 million acres. One license, the Humbly Grove No. 1 well, has discovered hydrocarbons.

"We found oil after drilling an exploratory well in 1980," Broadhead said.

"Though early production rates have been modest, it confirms our belief in the potential of the acreage."

St. Joe Petroleum operates internationally, while Coquina is St. Joe's domestic oil and gas enterprise.

Domestic opportunity for oil and gas production has been greatly increased due to the energy shortage of the last decade.

St. Joe Petroleum also owns leasehold interests in other international concessions.

Domestic opportunity for oil and gas production has been greatly increased due to the energy shortage of the last decade.

"United States demand has stimulated deregulation and price increases," added Broadhead. "While costs of exploration

and development have risen accordingly, there is still great profit potential."

Coquina, with headquarters in Midland, Texas, operates four exploration offices in the U.S. in major centers of activity. This network enables the company to quickly evaluate new opportunities.

"In the last several years our emphasis has been on acquiring leasehold interests in the United States," Broadhead said.

During the first seven months of 1981, Coquina's revenues and reserves increased 49 percent and six percent, respectively.

"Our strategy is to establish a strong acreage position. This enables the company to farm out some development and drilling costs, and to operate joint ventures with other oil and gas companies.

"Oil and gas should add significant earnings, on an increasing basis, over the coming years."

Harsh weather conditions are a way of life at the North Sea's Buchan Field, where St. Joe Petroleum has a 13 percent interest.





Coal

"St. Joe acquired A. T. Massey Coal Company in January 1974 with the belief that coal, especially high-quality, low-sulfur coal, would play an important role in satisfying the world's future energy requirements," said Jim Broadhead, St. Joe's president, who oversees the company's coal operations. "Our position has been strengthened by events since that time."

Massey Coal Company operates more than 25 mining complexes, and 16 state-of-the-art preparation plants. All are located in the Appalachian Mountains—in West Virginia, Kentucky and Tennessee—with the exception of two facilities in Colorado.

Production from these mines and plants amounted to 14.1 million tons in 1980. Massey's brokers purchased an additional 8.3 million tons from independent producers for resale to domestic and foreign customers.

"We have broadened Massey's position in the coal market by building quality reserves, which now total more than 900 million tons. The company's production has increased from 6.7 million tons in 1973, the year before we purchased Massey, to the 14.1 million last year," said Broadhead.

In October 1980, St. Joe entered into a 50-50 joint venture with Scallop

Steam-and-metallurgical coal is an energy source given new life by world events. St. Joe, through its 50-percent owned A. T. Massey Coal Company, is well positioned to address and serve this growing market.

Coal Corporation, a member of the Royal Dutch/Shell Group.

In addition to their existing coal business, Scallop contributed \$680 million to the venture, consisting of \$100 million in cash and \$580 million in interest-bearing installments.

St. Joe contributed its coal assets, excluding approximately \$220 million in cash.

"The advantages of this partnership are many," explained Broadhead. "The infusion of capital from Scallop allows St. Joe to invest in other aspects of its business.

"Short-term profitability has in-

creased due to interest income on Scallop's contribution. Most importantly, the money made available for coal investments will enable Massey to increase production beyond the 20-million-ton capacity we had planned by 1984. Because of Scallop's well developed international marketing network, Massey's already strong position in the growing export market will be enhanced."

The world coal market revolves around two types of bituminous coal: metallurgical and steam grade. Metallurgical coal is used primarily to make coke for use in the manufacture of steel, while steam coal, for the most part, is used by utility companies as fuel for power plants.

"In 1977, about 38 percent of Massey's output was sold as metallurgical coal," Broadhead added. "By 1980, that percentage was reduced to 25 percent. Of the approximately 84 percent of Massey's anticipated 1981 production, which is already committed under long-term contracts, 88 percent is steam coal and 12 percent is metallurgical coal."

Domestic utilities, under long-term contracts containing price escalation provisions, absorb much of Massey's steam-coal production.

The export market for steam coal is growing rapidly, particularly in Japan

(continued page 18)

A Capital Idea

St. Joe's coal division is acting now to fill the needs of a growing list of steam-and-metallurgical coal customers.



Picture, if you will, the coal export terminal of the not-too-distant future.

There, coal from 12 mountainous stockpiles is blended by computer-controlled conveyors to meet individual customers' specifications.

Powerful diesel locomotives ease 100-car coal trains into the giant oceanside facility. Each 10,000-ton load is emptied as the train rolls slowly down the track.

At dockside, coal cascades from large overhead conveyors into waiting ocean-going vessels.

By 1985, such a terminal, with the capacity to handle 12.1 million tons of coal a year, will be in full operation.

At that time, the A. T. Massey Coal Company will have completed construction of its new coal-export terminal.

Coal producers like Massey are getting into the export-terminal business for some very good reasons.

The most apparent incentive is to end the massive delay of shipments caused by inadequate export terminals. It is estimated that last year alone foreign utilities paid more than \$1 million in demurrage, or waiting charges, as foreign vessels lay at anchor in the Virginia coal port of Hampton Roads.

Another incentive for owning and operating such facilities is to build credibility with potential customers. A coal producer-owned terminal offers greater

Coal is loaded for transport to Japan from Massey Coal Company's Davant, Louisiana, terminal.

reliability as far as getting coal to the buyer on time and according to specifications.

Producers with their own terminals will also see mining efficiency increase. "It means less congestion at the mines," said St. Joe's Jim Broadhead, "because we can transport and store coal as soon as it's produced."

Why has coal from the United States become increasingly attractive to a growing number of nations?

Rising ocean-freight rates from Australia to Europe have given U.S. coal producers a new competitive edge.

"In addition to the United States being a relatively cheap source," said Broadhead, "coal-consuming countries are looking about for other sources of supply. The political unrest in Poland and the labor situation in Australia, traditional suppliers of export coal, have helped to strengthen the demand for American coal."

(continued next page)

Left: Rail lines converge where coal cars await shipment to points unknown.



Japan is on its way to becoming an important U.S. coal customer. But Western Europe, particularly Italy, France, Spain, Denmark, Germany and the Netherlands, is still the major importer of U.S. coal. Also, markets are developing in Brazil, Romania, Turkey, Israel, Korea and Taiwan.

As an example of this demand, Massey exported more than nine million tons of coal in 1980—an increase of 49 percent over the previous year.

"In addition to the United States being a relatively cheap coal source, consuming countries are looking for other sources of supply. The political unrest in Poland and the labor situation in Australia, traditional suppliers of export coal, have helped to strengthen the demand for American coal."

Industry-wide, there was much to encourage coal producers to begin developing coal-exporting capacity.

In 1978, some 310,000 tons of steam coal were exported by the U.S.; by 1980, exports had increased to 16 million tons.

Even more encouraging are industry projections pointing to steam coal exports of 40-to-50 million tons in 1985.

Metallurgical coal, while not sharing the dramatic demand growth of steam coal, has always been a large export commodity. From 1970 to 1980, annual U.S. exports of metallurgical coal increased from 47 million to 56.8 million tons.

And what are projections for world demand beyond 1985 for U.S. coal?

"That is anybody's guess," added Broadhead. "It will depend upon environmental considerations, nuclear-power capacity and oil availability and pricing."

Within the industry, however, predictions point to seam-and-metallurgical coal exports doubling by 1990 and tripling by the year 2,000.

For various reasons, the railroads are reluctant to commit the millions of dollars needed to modernize their export terminals. Thus, some coal producers are either planning, or are actually beginning, development of their own terminals.

Despite predictions that the coal producers may overbuild terminal capacity, Broadhead is confident that the Newport News facility will be profitable.

"There's a lot of talk throughout the industry about export-terminal expansion. However, remote mine locations and high capital costs may cause some producers to think twice about the investment. We feel that many of those talked-about plans are concepts that just won't materialize."

and Western Europe. Much of the export coal sold by Massey is purchased from independent producers, and the company is implementing steps, including the construction of new port terminals, to expand its capacity to participate in the export market.

Massey has invested heavily to expand its coal production capacity during the past five years and anticipates continuing investment for new mine development, replacement of facilities and construction of new preparation plants.

The largest ongoing project in Massey's development program is a steam-coal mine and preparation plant in Mingo County, West Virginia.

Known as the Marrowbone Development Company complex, it began operating in 1979 and is expected to reach an annual production rate of four million tons by 1984.

The nation's inadequate and aging port system restricts growth in export and domestic coastal shipments, and these congested ports also increase shipping costs. St. Joe is seeking to help remedy the situation.

"One of the most exciting projects currently under way is our investment in port facilities," explained Broadhead. "We have purchased Pier number nine and 65 surrounding acres in Newport News, Virginia, and

Appalachian Region

Total reserves = 930,132,000 tons
St. Joe's share = 465,066,000 tons
Approximately 30% metallurgical.



will construct a coal terminal with a 12-million-ton annual capacity.

"We have also acquired a terminal facility in Charleston, South Carolina, and are evaluating construction of a transshipment terminal there. A number of other such projects are also under consideration."

The nation's inadequate and aging port system restricts growth in export and domestic coastal shipments, and these congested ports also increase shipping costs. St. Joe is seeking to help remedy the situation.

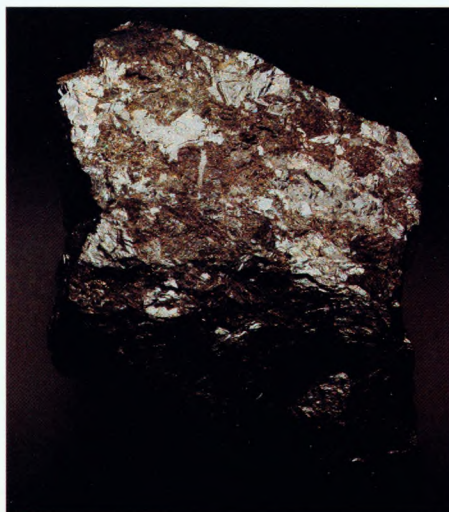
The terminal in Newport News will be the only major port in the area that has facilities for coal blending. "There are many grades of coal, and customers have different specifications as to sulfur content, ash and Btu's per ton," Broadhead stated.

"Present blending methods are time-consuming and inefficient. The Newport News terminal will streamline this process and give us a leg up on our competition.

"With innovative ideas like these, coupled with the increasingly strong coal markets, the outlook for Massey is very bright."



Upper left and above: Preparation and handling operations play an important role in today's evolving coal industry.



Domestic Metals

In the decade of the '70s, St. Joe transformed from a lead and zinc mining and manufacturing company with sales of \$161 million and profits of \$26 million in 1970 to a diversified minerals company producing coal, oil, gas and precious metals. Sales of \$1.3 billion and profits of \$117 million were generated in 1980.

St. Joe's dramatic growth, while well planned and executed, did not come without a few growing pains. "St. Joe had grown so much between 1970 and 1975 that our top management, in overseeing the new acquisitions, found less time for running the day-to-day operations of our core businesses," said John Wright, executive vice president and division head in charge of Domestic Metals headquartered in Clayton, Missouri. "Our decentralization in 1977 allowed us to return to a more hands-on style of management, allowing attention to details which could no longer be effectively handled from an office a thousand miles away."

There are four sections in Wright's Domestic Metals group.

The lead business, conducted through St. Joe Lead Company, is the largest integrated lead producer in the United States. It operates four mine and mill complexes in Southeast-

*In the last 117 years,
St. Joe became one of the top
U.S. lead-and-zinc producers.
While the company has
diversified extensively in this
decade, hard-rock mining
remains a vital, and profitable,
company function.*

ern Missouri, as well as the nation's largest lead smelter located in Herculaneum, Missouri.

St. Joe Resources Company conducts zinc mining operations at Balmat, New York, and zinc smelting at Monaca, Pennsylvania.

The third division, the Pea Ridge Iron Ore Company, has an iron mine and pelletizing plant not far from Sullivan, Missouri.

The research and development division is located at the Monaca, Pennsylvania, site. "We handle two types of research," explained Wright. "The first is product research relating to the three product lines we are involved in: lead, zinc and iron ore. We have a technical service center whose basic goal is to find new uses for these

products, and to make them environmentally safe.

"The second is basically process, or extractive metallurgy, research; we continually monitor our existing processes in an effort to upgrade them."

St. Joe's lead-mining operations cover a 26-mile segment of a lead-bearing geological area in Missouri known as the *New Lead Belt*.

The ores extracted from these mines vary in grade and production costs, yet all turn a profit. Nearly all the lead-concentrates from the four mills, which have a total capacity of 20,000 tons of ore per day, are smelted at St. Joe's Herculaneum plant.

The zinc market has been depressed because of the domestic automobile recession, but Wright sees a reversal in that trend. "I'm a believer that zinc is going to come into its own very soon. The base feed material is very scarce worldwide, which is forcing prices up. Another positive sign is that domestic steel mills are modernizing. We believe zinc demand will increase by virtue of the growth in the use of galvanized steel, the largest consumer of zinc metal in the U.S."

The reduction in automobile sales has affected the price of lead due to its use in automobile batteries. Wright sees positive signs that this cyclical industry will also soon be on the

Upstate New York

Proven = 4.2 million tons—average 9.7% zinc.

Probable = 7.0 million tons—average 11.2% zinc.

Missouri

Approximately 62.2 million tons proven with average grade of approximately 5.22% lead.

Actual ore reserves substantially greater.

Pea Ridge, Missouri

102 million tons of ore averaging 56% magnetic iron.

upswing. "The development of the electric car, with its use of an improved battery, is encouraging as well."

In 1980, St. Joe defined new probable reserves of 2.6 million tons of ore containing 16 percent zinc in what is known as the Pierrepont Orebody, located approximately 28 miles from the Balmat, New York, mine and mill. The development of this high-grade ore should significantly reduce St. Joe's cost per ton of metal produced. The Pierrepont mine will begin to feed 500 tons per day to the Balmat mill in 1982.

January 1979 saw the formation of the Pea Ridge Iron Ore Company for the purpose of resuming operations at the Pea Ridge underground mine and pelletizing plant.

From 1964 to 1977, the iron-ore property operated as a joint venture between St. Joe and the Bethlehem Steel Corporation. When the plant reopened in February 1979, it did so with a substantially smaller work force. "We've gone from well over 1,000 people when we shut down in 1977 to a crew of 306. Yet we are producing about the same as we did prior to shutdown. It's small, but very profitable," said Wright.

Iron ore produced at the Pea Ridge mine is suitable for the production of direct-reduced iron, used in place of

(continued page 23)



Use of the hydraulic jumbo drill has helped St. Joe become one of the most efficient and productive lead producers in the world.

Energy Research Corporation (ERC), headquartered in Danbury, Connecticut, is an 80-percent-owned subsidiary of St. Joe Minerals Corporation.

ERC is the third largest electrochemical research and development group in the United States.

Fuel cell development and nickel-oxide-zinc battery research are the two major projects ERC currently has under way.

"The fuel-cell is one of the most efficient energy devices in existence," said Bernie Baker, president of ERC. "Through electrochemical reactions, it provides silent, pollution-free electric power from a number of sources, including natural gas, oil-or-coal-derived synthetic fuels, as well as renewable (biogas or alcohol) fuels."

Similar to a continuously fueled battery, the fuel-cell produces direct-current electricity in a device containing few movable parts. Its only by-products are water, carbon dioxide and heat.

The ERC's fuel-cell program is divided into three categories according to size and application.

Small, portable units, one to 20 kilowatts; intermediate size Total Energy Systems for small commercial buildings or apartment complexes, 100-500 kw; and full-service electric utility systems greater than one megawatt.

Fuel-cells can be up to 300 percent more energy efficient than comparably-powered generators and internal-combustion engines. Since there are few moving parts, greater dependability and lower maintenance are achieved.

Two advanced fuel-cell systems are currently under development.

One is designed for use with coal-derived fuels in large power plants. Known as the molten-carbonate fuel-cell

(MCFC), it has a greater efficiency than present fuel-cells and its waste heat can be used more effectively.

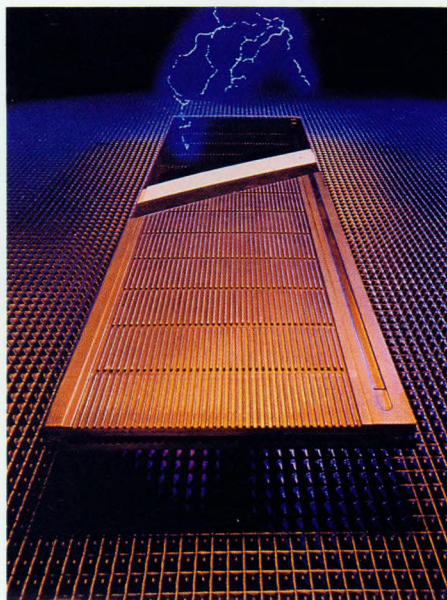
The trifluoromethanesulfonic acid (TFMSA) fuel-cell is ERC's most advanced system. It operates at high densities and low temperatures making it ideally suited to vehicle propulsion.

According to current estimates, passenger cars with TFMSA fuel-cells could obtain mileage equivalents of 80- to 90-miles per gallon of gasoline.

"MCFC and TFMSA fuel-cells are technologies of the future. Nonetheless, they point out the potential of fuel-cell growth and the effects the fuel-cell may have in obtaining domestic energy self-sufficiency," added Baker.

ERC's second field of concentration is

Energy Research Corporation



Energy-producing and storage devices are subjects of study at the Energy Research Corporation. This St. Joe subsidiary is the third-largest electrochemical research-and-development group in the United States.

the research, development and manufacture of alkaline rechargeable batteries.

Using an ERC-patented, low-cost, plastic-bonded electrode process, ERC is developing nickel-zinc, silver-zinc and nickel-cadmium batteries. They are custom-developed for specific applications.

The electric-vehicle market is the major target for development of the nickel-zinc battery.

In 1979, ERC demonstrated its first nickel-zinc-powered electric vehicle for highway use. The second generation vehicle, the NiVolt-powered Bradley GT, was unveiled in March 1980.

Other applications of the nickel-zinc battery include power tools, golf carts and military products.

ERC has been developing the nickel-cadmium battery since 1972. Concentrating on lightweight, non-sintered electrodes, the firm has developed a 50 percent greater energy density than other nickel-cadmium systems.

A lamp system for miner's caps is currently being developed by ERC using nickel-cadmium technology. ERC technicians have achieved output greater than conventional devices in addition to reducing weight by approximately one-half—a critical factor in mining equipment.

Very large nickel-cadmium systems are also being developed at ERC for use in underwater exploration.

ERC's silver-zinc battery systems are used by the U.S. Navy in several of their submersible crafts. Known for its high-power density, silver-zinc is a rechargeable system.

"ERC's research in the areas of fuel-cells and alkaline battery systems is part of a vanguard movement in America to reduce energy-import dependency," Baker concluded.

high-quality steel scrap in a growing number of electric-arc steel surfaces being constructed in the U.S.

Another advantage St. Joe has is the location of Pea Ridge. "Our competition in the north can ship about eight months of the year because they rely on waterways which ice up," stressed Wright. "We ship year-round and can thus help customers minimize their iron ore pellet inventories."

Wright outlined four objectives for his operating groups: "First is to keep St. Joe involved in using our strength in metals, mines, smelting and marketing. We want to expand into other metals and are especially intrigued by magnesium, titanium, cobalt and others known as *strategic* metals.

"Second is the development of our existing businesses, which have traditionally been called *mature*. We will protect and make sure these grow.

"The third goal we have relates to our stock in trade—people. Morale is important. Our concept is that if you run a safe operation you will have good morale; if you have good morale, you have high productivity; if you have high productivity, you will be profitable.

"We want to expand into other metals and are especially intrigued by magnesium, titanium, cobalt and others known as strategic metals."

"Our fourth goal is to continue to use the ingenuity of our people by creating challenges. That, in my mind, is the most important of all." ♣



Above: A mountain of iron ore pellets amass at St. Joe's Pea Ridge pelletizing plant. Left: Smelting separates the pure metal from extraneous substances.



California Gold

Gold—the cry that sent otherwise reasonable people into a state of frenzy. Many sold their possessions and trekked untold miles in search of the precious metal.

In California, gold was first discovered in 1848 on John Sutter's ranch in the Sacramento Valley.

The raucous band of adventurers, called the *Forty-Niners*, who answered the cry helped establish a mystique about the Golden State that still exists.

The gold that attracted so much attention has its source in the gold-quartz-veined Mesozoic and Paleozoic rocks that comprise the bedrock complex of the western Sierra Nevada mountain range. One famous 120-mile-long belt of this auriferous bedrock was called the *Mother Lode*.

The gold these settlers panned from the streams was termed *placer gold*, and had been formed some 200 million years ago. Then, during the Cenozoic period between 10-50 million years ago, the gold was slowly eroded by westerly-flowing rivers and deposited in the riverbed sediment. Parts of the ancient rivers were subsequently buried by volcanic material.

While many people flocked to California hoping to strike it rich, few actually did. Gold that was easy to find

Perhaps more than any other substance, gold has captured man's imagination and desire.

It has been the hallmark of wealth through the ages, and remains the backbone of many a nation's currency standard.

was uncommon, and mining methods were primitive at best.

In the century following the rush of 1849, California produced well over one-third of the nation's gold—more than 103 trillion ounces valued at over \$3 trillion.

Placer-gold deposits were mined on a large scale from the 1850s until 1884 when a court order prohibited miners from discharging tailings into the river systems, which effectively curtailed hydraulic mining.

Hydraulic mining had been practiced extensively and the unrestricted tailings discharge had choked rivers and flooded farmlands. However, through the 1950s, '60s and '70s, California remained one of the top gold producers in the country.

In anticipation of improved technology and higher gold prices, St. Joe decided to take advantage of the still untapped gold reserves in California.

In 1973, as part of its overall diversification program, St. Joe formed Placer Service Corporation (PSC) from a contingent of placer engineering and mining personnel who had previously run placer-mining interests for W.R. Grace & Company in South America.

PSC still renders advisory services to those South American operations, now nationalized, and also evaluates, develops and operates new placer properties supported by St. Joe.

PSC currently has two projects in California, the Yuba and San Juan properties, that promise to produce gold, profitably, on a continuing basis.

Gold dredging was developed in California and New Zealand in the middle 1800s, but only became viable around the turn of the century. The Yuba Gold Fields have been mined continuously since 1906. In that time, more than one billion cubic yards of material have been removed.

The Yuba project is a joint venture with Yuba Goldfields, Inc., in which PSC has a two-thirds and managing interest. The property covers 2,000 acres of the Yuba Valley, including an area called The Deep Reserve identi-

fied in the 1950s. Improved gold prices and technological improvements have made the mining of these reserves profitable.

Two dredges that remained on the site are being redesigned and re-equipped to dig to greater depths than previously possible and to incorporate improved gold-recovery circuits.

The first dredge is now starting operation and will soon be producing 20,000 to 25,000 ounces of gold annually. "We expect the second dredge to be operational in the latter half of 1982 with production capability equal to the first dredge," said Bill Breeding, president of PSC.

Breeding estimates that even at an annual production rate of 50,000 ounces, there will be sufficient reserves to operate both dredges for at least seven years in uncontested areas, and a recent court decision

awarding Yuba mineral rights to an adjacent area promises to approximately double that life.

Hydraulic mining had been practiced extensively, and the unrestricted tailings discharge had choked rivers and flooded farmlands. However, through the 1950s, '60s and '70s, California remained one of the top gold producers in the country.

In the Sierra Nevada foothills 30 miles east of the Yuba property, PSC is evaluating 2,200 acres under lease from the San Juan Gold Company. This project still requires submission of a use permit application for approval of state and local authorities.

The application includes environmental impact studies and a reclamation plan.

"Today, our methods return excavated material to the site from which it was mined and rehabilitate the land surface to a state equal or superior to that prior to mining," added Breeding. Close attention is paid to noise limitation and other environmental factors.

The United States Geological Survey has estimated that the San Juan property could be one of the largest concentrations of placer gold in the United States.

The annual rate from both projects may reach 75,000 to 100,000 ounces of gold annually by 1984.

More than 130 years after the gold rush, St. Joe Minerals is proving there's still pay dirt in the golden hills of California. ♣



Northern California

Yuba—12 years production (at least)
40-50,000 ounces per year.

Above: Placer Services' rehabilitated dredge can dig to a depth of 140 feet below the water's surface, making it the deepest-digging gold dredge in the free world. Upper left: Because of its detrimental effects on the environment, hydraulic mining was eventually banned.

St. Joe International Corporation

The discovery of a rich lead-zinc-silver orebody on a mountainside in Argentina marked St. Joe's entry into the international minerals markets.

St. Joe's diversification into the world of international minerals actually began in the late 1930s when the company acquired and developed the Aguilar lead-zinc-silver mine in Argentina. This property is still turning a consistent profit for St. Joe.

Today, St. Joe International Corporation, one of St. Joe's operating units, monitors activities in Chile, Argentina, Peru and Australia.

The group's main objective is to provide new raw material sources and international market opportunities for the company.

The group's strategy is based on three key elements: investing in countries with stable political climates that welcome outside investment; avoiding excessive investment in any one country; and selecting projects that offer attractive rates of return and new operating advantages.

St. Joe's reorganization in the early 1970s opened a new era of discovery for the company.

"In 1971, Jack Duncan instituted aggressive exploration and development programs," said Roy Wheelock, president, St. Joe International Corporation. "This resulted in a mush-

rooming of international activities and opportunities.

"Forming the division (four years ago) made sense from an organizational standpoint in that we are responsible, financially and operationally, for mining operations and developments outside the United States."

When investigating a new property, management pays close attention to the political stability of that particular country. "There are a variety of ways by which we make our political assessment," Wheelock said. "We make contacts through diplomatic channels, and confer with other companies that have a working knowledge in that country."

St. Joe International supports the company's extensive mineral exploration program outside the U.S. The proper evaluation of a property is contingent upon the extent and value of the orebody.

"We work closely with the exploration team, securing their evaluation as early as possible in order to program the engineering feasibility and financing of the project," Wheelock added.

"We make our judgments based on the political climate, amount of capital risk involved and how long that risk

El Indio (Chile)

3.1 million tons of ore averaging .39 ounces of gold, 4.63 ounces of silver and 3.6% copper. Sufficient for seven years of mill production.

47,419 metric tons of ore averaging 11.48 ounces of gold, 4.57 ounces of silver and 2.6% copper. Sufficient for two years.

Aguilar (Argentina)

Proven and probable—6.6 million metric tons with average grade of 7.6% zinc, 6.2% lead and 4.2 ounces of silver per metric ton.

Additional reserves exist.

Pachon (Argentina)

780 million metric tons of ore averaging .59% copper and .016% molybdenum. Upper part of deposit contains about 161 million metric tons of secondarily enriched ore averaging 1% copper.

Woodlawn (Australia)

Proven and probable—4.4 million metric tons averaging 1.7% copper, 4.8% lead, 13.6% zinc and 2.4 troy ounces of silver per metric ton; and 2.1 million metric tons of copper ore averaging 1.9% copper, .2% lead, .6% zinc and .3 ounces of silver per metric ton.

will be outstanding."

One prime concern of the international group is to be mindful of problems that arise when investing too heavily in one country.

"We recognize that operating overseas brings added risks," said Wheelock. "In order to offset those risks, we will enter into joint ventures with other companies that have experience which may be relevant to the particular country or technology. We prefer working with companies that we feel are compatible and have similar objectives and complementary technology."

Along with expanding its overseas activities, St. Joe International decided to extend its marketing capabilities and provide such services to other units of St. Joe. In 1980, St. Joe International Trading Corporation was established to provide the company with a trading subsidiary designed to complement and support its commodities marketing operation.

The trading company concentrated initially on the copper market involving domestic producers and consumers, the Commodities Metal Exchange, the London Metal Exchange, domestic brokers as well as St. Joe's International units.

In addition to dealing in copper metal and raw materials, the trading group conducts *hedging* for St. Joe units. "Hedging assures or guarantees a specific price by selling the metal content of the company's

***St. Joe International
decided to extend
its marketing capabilities
to other units of St. Joe.***

production on one of the exchanges for future delivery," said Wheelock.

"The company plans to expand trading into other commodities and to develop new business opportunities based on commodities from St. Joe operating units, and from those that Fluor may have throughout its worldwide activities."

All of the company's operating divisions work closely together in order to monitor the market, both domestically and internationally. And all have one thing in common—to turn opportunity into reality for St. Joe. ♣

Exploration

Finding it.

That statement sums up the necessary first objective of any St. Joe project.

Along with the preferred minerals—lead, zinc, copper, gold, silver and uranium—oil, gas and coal have landed on St. Joe's most-wanted list.

A small, but very capable exploration staff headed by vice president Thomas N. Walthier, implements St. Joe's exploration strategy.

"We search for selected resources in a limited number of politically stable countries," said Walthier.

"The sine qua non for a mining or oil operation is a special mineral or hydrocarbon concentration buried in the earth's crust, formed by geologic processes acting over perhaps billions of years. Man had absolutely nothing to do with its formation and cannot change where it occurs in nature.

"Orebodies and oil fields are well concealed and most difficult to find. Even with the best of modern equipment and knowledgeable personnel, there is no such thing as a sure bet.

"The best techniques and the most experienced judgments merely say you have a better chance of success if you drill here rather than there. This better chance in hard minerals still has the betting odds (when looking at any single prospect) of several hundred to one against our being successful at that site," added Walthier.

"Perseverance and continuity of effort are essential to make the big discovery. Actually, the odds of success run in favor of the qualified group continuing the search for an extended period of time."

St. Joe has an active exploration program, though its expenditures don't approach the exploration budgets of larger companies. This has prompted people to ask Walthier why St. Joe has had such outstanding success in locating and acquiring the many productive properties it has.

"There's really only one way. We have to have the best minds. I try to pick key

people very carefully and they are instructed to choose their key people just as carefully.

"We don't rush out when there's a vacancy and hire the first person who walks by. We screen applicants very closely and don't mind taking the time to make the best possible choice."

The exploration division of St. Joe is comprised of 97 technical people; all are experts in geologic and geophysical technology, but more than that, they also have to appreciate and be knowledgeable of the legal, political and financial aspects involved in exploration and subsequent mining.

"I think the key to good exploration is a sympathetic management," added Walthier. "They come up with the financial and management support. It is also extremely important that there be a close and cooperative relationship between the exploration group and the operating group to ensure a successful transition from exploration to production. St. Joe is extremely fortunate to have top-management support for exploration, and it also enjoys good coordination between the finders and the mine operators.

"As difficult and risky as exploration may be, let's face it, there would be no operating mines anywhere if people hadn't gone out first and found them."

Right: Core samples reveal subsurface mineralization.



El Indio— Against the Elements



Above: Workers supervise the loading of direct-shipping ore from St. Joe's El Indio Mine. Opposite: The switchback road that angles toward the El Indio site.

The El Indio copper-gold-silver mine lies at the end of a twisting, 114-mile switchback road that takes the traveler from sea level to an elevation of 13,000 feet in the Chilean Andes. The deposit is located inland from the city of La Serena about 300 miles north of Santiago.

Heading toward the project site, the traveler passes from rich agricultural country into the narrow valleys of the recent Andean geological upthrust. Climbing onward through seemingly endless 180-degree turns, the vehicle noticeably loses efficiency.

The new mountains are barren, with slopes that angle at a sharp 35 degrees. Out of these slopes the road is cut. The region appears so desolate that one thinks only a National Geographic Society scientist could find something other than lichen, moss and insects. Here, high in the Andes, Fluor Mining & Metals is building a compact processing plant for Compañia Minera El Indio, an 80-percent-owned subsidiary of St. Joe.

This flotation plant will produce copper-gold-silver concentrates and, using the carbon-in-pulp adsorption-desorption process, turn them into a gold-silver bullion called doré.

It is fundamental to mining economics to have the process plant located near the orebody. This is necessary to remove the waste rock and concentrate the mineral for subsequent shipping.

Because it has some unusually high-grade gold veins, El Indio is the exception which proves this rule. Selective mining produces a high-grade ore which can be shipped directly to smelters. Proven and probable direct-shipping ore reserves are currently estimated at 49,200 metric tons

averaging 11.1 troy ounces of gold, 4.6 troy ounces of silver and 2.6 percent copper per metric ton.

In 1981-82, ore containing an estimated 200,000 troy ounces of gold may be shipped each year. This remarkable quantity of direct-shipping ore is a testament to the value of the El Indio deposit.

At El Indio, where milling ore was stockpiled until the processing plant was completed in August, milling-ore reserves are estimated at 3.1 million metric tons averaging .39 troy ounces of gold, 4.63 troy ounces of silver and 3.5 percent copper per metric ton. Additional reserves are likely to exist at the mine.

For the newcomer, the lack of oxygen can cause a certain amount of physical discomfort until the body adapts to the altitude.

St. Joe has explored and placed claims over an extensive area north and south of El Indio. In separate agreements with other companies—notably Preussag, AG, of Germany; Standard Oil of California; Antarchile S. A. and other Chilean partners—St. Joe is investigating those areas recognized as having potential.

In this region, at an elevation of 13,000 feet and more, there is little oxygen to breathe. Both men and machine must strain to perform. Large turbochargers and blowers are necessary to operate the internal-combustion engines which drive the construction machinery.

For the newcomer, the lack of oxygen can cause a certain amount of physical discomfort until the body adapts to the altitude.

On a desolate, wind-swept mountain in the Chilean Andes, Fluor and St. Joe toil side-by-side to develop an unusual copper-gold-silver property.



Still, the logistics of delivering materials via the hazardous road tax even the most experienced mountain veteran. The combined Fluor/St. Joe crews are old hands at this, since both companies have built mine complexes in every conceivable climate and location.

High-velocity winds whip through the narrow valley where the mine and plant are located.

In this region, each season has its own surprise: the snows of winter bring a threat of avalanche, spring's thaw means mud slides and summer occasions rock falls.

Due to the constant cold, concrete must be heated for proper curing. Grout used to seal large pipe is covered with tents to prevent the dry winds from evaporating moisture from the mixture. Pack mules, an improbable but sure-footed form of transportation, carried materials to the transmission tower sites located in isolated areas.

Tough Chileno crews, under the watchful eye of their Capatazes (foremen), wear brightly-colored knit caps under their hardhats and layers of clothing beneath their foul-weather gear to keep out the intense cold.

The cold continues year around. Winter is especially bitter because the high valley walls shadow work areas and savage gusts of wind drive the chill factor down. One construction superintendent working on *The Mountain*, as it is called, remarked that in 18 months on the job, he "can't remember a day when the ground didn't freeze."

In spite of the natural adversity, isolated site and difficult logistics, the project nears completion—a tribute to the tenacity and ingenuity of the Fluor/St. Joe team.

St. Joe's Special Team

St. Joe's management team has been called one of the most dynamic and entrepreneurial in the mining industry. This close-knit group manages and directs the company's diverse worldwide exploration and development programs.

John Duncan

When asked about the evolution of his successful career, John Duncan is quick to respond, "It's quite simple really." He graduated with a degree in international relations and American history from Yale University in 1942. He then served as a captain of Field Artillery in the China-Burma-India theatre of operations during World War II.

He joined W. R. Grace & Co. in 1946. From 1948-55, he and his family lived in Peru where he directed Grace's huge sugar business. He was promoted to group executive of the company's Latin American operations in 1960; to executive vice president and director in 1967. He was also president and director of two of Grace's mining affiliates.

John Duncan joined St. Joe in 1970 as senior vice president and director. In May 1971, he was elected president, and the following year was named chief executive officer. In May 1977, he was elected chairman.

During their years in South America, the Duncans cultivated a keen interest in Latin American contemporary and colonial art. His wife, Barbara, who has donated one such art collection to the University of Texas, regularly lectures on the subject.

Among his numerous outside activities, he is a director of Westvaco Corporation, Irving Bank Corporation and Irving Trust Company, the American Mining Congress, BF Goodrich Company and the American Institute for Labor Development.

He is also chairman of the board of trustees of the Council of the Americas, trustee of the Hampton Institute, chairman of Accion International, a member of the Council on Foreign Relations and is a member of many trade associations pertaining to the mining industry.

Philip Walsh

Philip Walsh is a negotiator, and a good one. In his 35 years in business, he's had plenty of practice. Like John Duncan, Walsh spent many years working in South America for

W. R. Grace & Co.

His father was in the mining business in Colombia and the experience influenced him, for he graduated from Yale University in 1943 with a geology degree.

After graduation, Walsh served as an officer of Field Artillery and saw service in the Third Army in France and Germany. During this time, he received both the Purple Heart and Silver Star.

After the war, he polished up his Spanish and went to work for Grace. During his early years with the company, he lived in Peru where for 11 years he managed Grace's textile interests. He was later transferred to New York to become chief operating officer of Grace's Latin American Group.

His ability to negotiate complicated and sometimes difficult contracts earned Walsh a respected reputation. His subsequent positions and responsibilities with Cerro Corporation and Newmont Mining Corporation involved extensive negotiation in Chile and Peru, as well as general duties in the United States.

Phil Walsh joined St. Joe Minerals Corporation as vice chairman in 1980.

James Broadhead

Jim Broadhead's career has followed what can only be referred to as the *fast track*. Since he obtained his bachelor of mechanical engineering degree from Cornell University in 1958, he hasn't stopped moving.

After graduation, Broadhead worked as an engineer for Ingersoll Rand. Within 15 months, he decided to pursue his interest in law and enrolled in Columbia Law School.

While obtaining his law degree, Broadhead was an editor of the Columbia Law Review and was an International Fellow. Upon graduation, he joined the New York City law firm of Debevoise, Plimpton, Lyons & Gates.

In 1968, he joined St. Joe as assistant corporate secretary. Two years later he was promoted to secretary, and then to general counsel.

During that time, his duties entailed more than monitoring the company's legal affairs. From 1973-74, Broadhead was chairman of the Ener-

gy Research Corporation as well.

In 1974, while still acting as corporate secretary, he was promoted to vice president of St. Joe Petroleum. Two years later he became vice president, Development, and by May of the next year he was named president of St. Joe Zinc Company.

Broadhead's list of promotions didn't stop there. In 1980, he became executive vice president of St. Joe Minerals and was elected to the company's board of directors. In April 1981, he was promoted to president.

As president of St. Joe Minerals Corporation, he is responsible for St. Joe's domestic and international coal and oil-and-gas operations, as well as the company's legal, administrative and certain financial functions.

John Wright

John Wright's enthusiasm is contagious, especially when it comes to his work. A New Yorker born and bred, he joined International Paper Company out of high school, attending C. W. Post College at night. He obtained a bachelor of science degree in 1966, and was one semester into the master of finance program when he was drafted into the Army.

After two years' duty, he resumed

his career and returned to school. When he learned that C. W. Post had discontinued the master's program, he enrolled at Adelphi University. In 1970, he obtained his master's degree.

During his 10 years with International Paper, Wright held a number of positions, including: salesman, sales manager and then director of Marketing for Latin America. In 1971, he joined St. Joe Mineral's sales force.

Wright moved up quickly. In the 10 years with St. Joe, he has been a sales representative; assistant sales manager; manager of special products, sales manager; director of corporate development, vice president, Sales; then vice president, Lead.

Presently he is executive vice president of St. Joe Minerals Corporation and president of St. Joe Lead Company.

Roy Wheelock

To say that Roy Wheelock is at home in South America would be an understatement. He has spent a good portion of his life living and working there.

He was born and reared in Brazil where his father was an educational missionary teaching agriculture. When it came time for college, he moved to the United States to enroll

at Iowa State University. He received his bachelor of science in mining engineering and went on to earn his master of science degree from the University of Missouri, Rolla, in 1952.

While working on his master's degree, he was employed by Eagle-Picher Mining and Milling Company as assistant to the general superintendent of Mines.

He then joined C. Tenant, Sons & Co., of New York. He was sent to Bolivia for one year where he acted as a mining equipment consultant and raw materials purchasing agent. Transferred to New York, he became a marketing commodity specialist for two years.

From 1956-60, Wheelock was on the staff of the Engineers Joint Council (a national federation of engineering societies). In 1960, he was named executive director, a position he held until 1964.

In 1965, he joined St. Joe as director, Raw Materials Purchases. Subsequent positions held included assistant to the president, and then assistant vice president, Domestic Mining Operations. In 1971, he became vice president of St. Joe Minerals Corporation and seven years later, was named president of St. Joe International Corporation. ♡

From left: John Wright, Philip Walsh, John Duncan, Roy Wheelock and James Broadhead.



Published three times a year by Corporate Communications, Fluor Corporation
3333 Michelson Drive, Irvine, California 92730

Jack Gardner, Manager Editor: Pat Rolfe Assistant Editor: Rick Maslin Design: Hinsche & Assoc.
Printed in the USA by George Rice & Sons, Lithographers