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VIEWS

Some Elements of Exploration Success or How to Shave the Odds

What makes for success in exploration can be looked at from two broad perspectives, the *organizational*, and the *individual*. I will deal primarily with the broad factors and the *philosophy* needed to guide the exploration organization to economic success—to discovery. I will not deal particularly with the scientific factors and discipline needed to turn the individual scientist into an *ore finder*, a subject that bears importantly on exploration success, as this topic is beyond the scope of this discussion (Muessig, SEG Newsletter, April 1992).

EXPLORATION

- DISCOVERY/ACQUISITION
- NOT SCIENCE
- A BUSINESS
- CREATES CAPITAL

Exploration is a combination of activities that in my view should include the acquisition of undeveloped properties that contain known but undeveloped resources. *Exploration is not a science*. The goal of science is not specific; it is an open-ended search for knowledge and understanding. By contrast, the goal of exploration is specific: the discovery or acquisition of a mineral deposit, by whatever means. The way it got there is

Siegfried Muessig Sig served as a WW II B-29 pilot/flight engineer. He joined the U.S. Geological Survey in 1951, and published the seminal bulletin on the Republic gold district, as well as papers on borate mineralogy and geology. He organized and managed the U.S. Borax exploration department from 1959. In 1966 he joined Getty Oil, where he organized, staffed, and managed the new minerals division until it was sold and disbanded in 1984 by Texaco. He actively participated in or discovered the Escondida and Zaldivar Cu deposits, Chile (50%); Jabiluka U deposit, Australia (35%); Mercur Au deposit, Utah (100%); and Casa Grande Cu deposit, Arizona (50%). He also revitalized the Petrotomics U mine, Wyoming (100%) and tripled production; initiated Tidal Diamonds marine mine, Namibia (33%); and discovered other substantial uranium, and Cu, Zn, and Pb deposits (100%). Sig organized and operated Crystal Exploration diamond program in a J.V. with Ashton Mining and Dow Chemical, and consulted internationally until 2007.

really of no great concern in the search for ore; *finding a “look-alike” is*. This is an important distinction and this philosophical concept *should pervade the organization and guide its operations*. It follows, for example, that if a drill hole will test a prospect, without further geologic work or understanding, the hole should be drilled; if it is negative, the prospect should be dropped.

Exploration is a business. It utilizes the knowledge of science and the resources of people, money, and time to achieve economic return. It is to a mining company what research is to the drug, chemical, and other technologically based companies; without it such companies fade away.

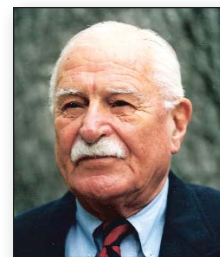
Successful exploration creates new capital and can yield the highest return of any of the business functions in a company. It takes ideas and judicious decisions and converts them into new wealth.

WHY EXPLORATION

- REPLACE RESERVES
- EXPAND THE BUSINESS
- CREATE OPPORTUNITIES

To preserve its life, a company obviously needs to replace any known reserves and convert resources to reserves. Reserves can sometimes be bought, but good ones only at a premium, and so exploration is really a better option. The company needs to expand the business, and advance its industry position; otherwise shareholders will leave, productive employees will flee, and the company will stagnate. Most importantly, a strong exploration presence makes the company a “player”; it creates business opportunities for acquisitions and joint ventures, for example, that would not be there if it were not active in the field.

So, how do you shave the odds in a high-risk business? In its simplest elements, the organizational strategy for successful exploration boils down to *what, where, and how*. However, I want to strongly re-emphasize that the overall *philosophy* that prevails is the most important ingredient of organizational success.



SIEGFRIED MUESSIG
(SEG 1957 SF)
SEG President, 1978

COMPANY STRATEGY

- THE RIGHT COMMODITIES
- IN THE RIGHT PLACES
- WITH THE RIGHT APPROACH

Commodities with *large base demand* form the backbone of our industrial society. Although a number of the strategic metals, for example, are glamorous, they have relatively small total demand. The need for *growth* is obvious and with business becoming increasingly international and the demand increasing to raise the average person to a higher standard of living, generally the best growth lies in the basic commodities. A *broad market*—many uses—gives protection against substitution. *High discovery potential* is an aspect commonly overlooked when commodities are being selected. Here I refer to those found widely distributed and commonly in many different well-known geologic environments. Lastly, commodities that require a lot of *custom processing* to produce a whole range of special products and *technical service* at the marketing end usually are a tough business, and therefore will generally not support a robust exploration effort, especially for a junior company.

Where best to look? Or, where do we expect to get the highest discovery potential and lowest risk? In a word, *in the shadow of the head frame*. More broadly, the lowest risk is within or close to the identified mineral districts and *mineral trends*. This obvious principle reflects the fact that ore-forming processes tend to occur as multiple events and therefore produce multiple deposits in favorable geologic settings (Fig. 1).

DEPOSITS TO LOOK FOR

- LARGE SIZE, SIMPLE GEOMETRY
- EXPECTED HIGH GRADE
- MANY WELL-UNDERSTOOD EXAMPLES
- SIMPLE METALLURGY

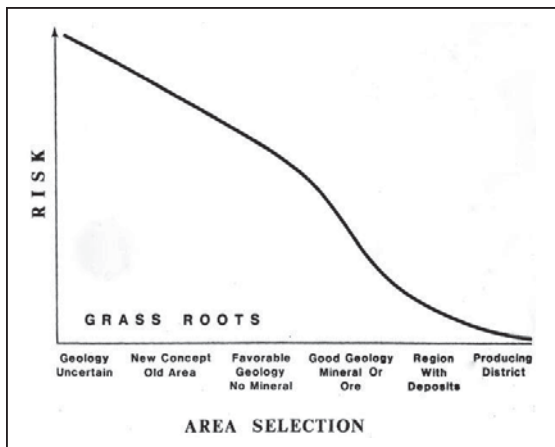


FIGURE 1 illustrates the obvious: the closer to ore, the lower the risk. Much has been written about doing grass-roots exploration where land is cheap and a discovery might give the organization an advantage in a new district; however, until a company is comfortable with its exploration business and has some discovery, I'd say, keep your drill rigs near the head frames. I would add further, that in my view, it pays to concentrate effort in a few areas. This allows the group to progressively build on its own work, that of others, and build associations that could lead to new ventures in the area. This is much preferable to over reacting to submittals and ending up with projects all over the map.

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- SPECIFIC EXPLORATION/ DEVELOPMENT SKILLS NOT NEEDED
- IN LOWER HALF OF COST SPECTRUM

The *large size and simple geometry* of stratiform deposits and porphyry deposits, say, make them easier to find than vein deposits or complexly folded ones. District habits and styles may suggest places where deposits, if found, are of *higher grade*, may have simpler metallurgy, and may have *lower costs*, than elsewhere. Two types of models, the *genetic* and the *descriptive*, have been developed and their use has improved the odds for discovery; when looking for ore, therefore, *go for the observed—the “look alike”—forget the theory* (Fig. 1).

THE JOINT VENTURE

- INCREASES EXPOSURE
- SHORTENS LEAD TIME TO DISCOVERY
- SPREADS RISK
- SPREADS CONTACTS
- REDUCES CAPITAL EXPOSURE
- GAINS EXPERTISE IN NEW AREA

A joint venture increases “exposure” and thereby can shorten the time to discovery and spreads the risk (Fig. 2). Joint ventures increase exposure to new ideas and contacts in the business and,

in development, reduce capital expense. Gaining new skills through a partner is many times quicker and cheaper than building them up yourself.

Let us now take a look at some desirable characteristics of the *practitioners* of the business.

THE LEADER – CATALYST FOR DISCOVERY

- HAS A TRACK RECORD
- IS ELITIST
- INTENSE, FOCUSED, DECISIVE
- ENTREPRENEURIAL

The successful explorationist has a highly personalized leadership style. He has been involved in several discoveries, and is demanding, impatient, and has a sense of urgency about the business. He does not just accept responsibility, he usurps it. And what kind of organization does he run?

THE ORGANIZATION

- INFORMAL, BUT PRIDEFUL
- COMMUNICATIVE, FLEXIBLE
- LEAN MULTIFUNCTIONAL STAFF
- AUTHORITIES PUSHED LOW
- HAS A NEGOTIATED CHARTER

This organization is lean and multi-functional and also considers itself *elitist*. It is an organization in which, where possible, *authorities* are pushed to the level at which the data and information needed to make decisions lie. Most importantly, it operates under a concise written *charter*, negotiated with executive management, which gives it a mandate to operate under clear authorities and guidelines and to perform with a minimum of unwarranted interference.

EXECUTIVE MANAGEMENT

- SETS CLEAR OBJECTIVES
- ENSURES CONTINUITY, PERSISTENCE
- IMPARTS SENSE OF PURPOSE
- COMFORTABLE WITH THE RISKS
- FAMILIAR AND INVOLVED

The successful exploration group operates in an environment where exploration is a

well-recognized and accepted part of the corporate culture. It is a culture occupied with successful ventures, which are few, and not preoccupied with the failures, which are many. Exploration sits at the same table as the other major functional units of the company.

Given the unpredictability of discovery, the only real measure of success, it is important to periodically judge *performance* of the exploration effort. Two scales need to be used: *long-term* and *short-term*. The long-term measure can be truly quantitative and financial, since we would expect to have one or more discoveries to measure, whereas in the short-term, lacking discovery, we can only judge performance subjectively, and is therefore more difficult.

MEASURING PERFORMANCE – LONG-TERM

- COST PER UNIT DISCOVERED – THE “FINDING COST”
- PRESENT VALUE OF DISCOVERIES VS P.V. OF EXPLORATION COSTS
- IMPACT ON COMPANY
- AT LEAST 5-YEAR PERIOD

Assuming that there are discoveries, there is success to measure, and the criteria used are pretty straight forward. Each discovery should have a calculated “finding cost,” presented in terms of the cost per unit of the commodities discovered, the Present Value (P.V.) of the discovery, and the P.V. of the exploration costs to find it. The time scale of 5

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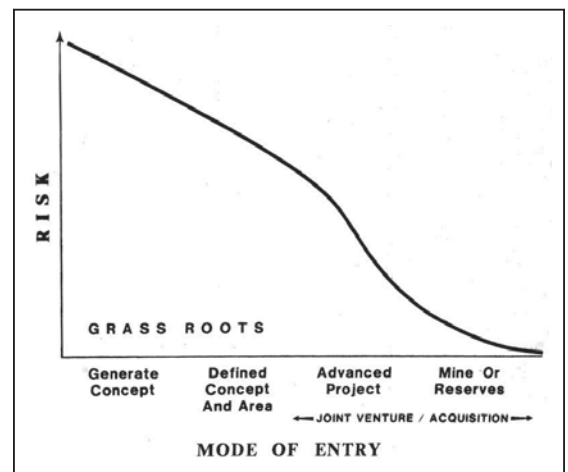


FIGURE 2 shows the broad aspects of how the organization can select and get into target areas and equates the mode of entry with risk. The diagram is obvious in its relationships, but let me make a strong recommendation about the acquisition of reserves or a mine: if it has no “romance” – exploration potential – don’t do it.


 VIEWS (Continued)

years is minimal, especially if there have been changes in management directions, in which case more time is needed to judge. The size and value of the discovery will determine the *financial impact* on the company and can be an important factor in judging the exploration effort. But always remember that even the best groups have dry spells.

SHORT-TERM PERFORMANCE MEASURES

- QUALITY OF THE STAFF
- PROJECT TURNOVER
- % OF PROJECTS DRILLED (THE "DEFINITIVE TEST")
- PROJECTS WITH ORE HOLES

The successful staff has a broad range of experience, a love of the profession, takes part in professional activities, and shows no 8-to-5 tendencies. The group can be judged by the way it turns over projects: they do not drag on and on. This staff aims for the "definitive test" as early as possible so as to keep or drop projects quickly, thus being able to concentrate on projects with highest potential. This group concentrates on projects where there are *ore holes*.

Finally, given a dedicated staff and adequate support, the single most important characteristic of the successful exploration group is that it *drills lots of holes*.

IQ gets you there, but.... NQ finds it.

EPILOGUE

The above discussion assumes that the exploration group operates effectively in a corporate environment in which it is not hobbled by a heavy bureaucracy. Unfortunately, this is generally not the case. As organizations grow, rules, regulations, and cumbersome operation procedures tend to multiply and increasingly hamper the relatively free, but disciplined, open operating environment needed by the exploration group. (This is distinctly different from the environment that fosters an engineering group, for example.)

At Getty Oil the activities of the operating groups were governed by written, concisely worded policies and procedures that allowed them to function relatively unburdened by bureaucracy. Each operating group had a brief written **Charter**, periodically negotiated with executive management. Each charter assigned specific functions within specific geographic areas, thereby obviating the frequent need to "go upstairs" to clear up uncertainty.

Further, there was a detailed **Schedule of Authorities** for officers and managers, covering different types of actions, involving, for example, expenditures, personnel, agreements, and the many other types of activities and transactions needed to function. Prominent in the language was the term "discretion",

within well described limits or actions, of approved programs and budgets. Additionally, it was well known that we were expected to test our authorities. Final annual approvals of programs and budgets were achieved by intimate across-the-table discussions between executive management and managers, followed by detailed written approvals for each program. The procedures were designed to promote and give operating freedom and foster entrepreneurship.

As well, other simple policies promoted the same aims. For example, whenever a manager left the office for more than a day, a "delegation authority" letter was issued. There was no lapse in the operation due to the lapse of authority, a lapse common in many organizations. Further, when a request went "upstairs", there was an unwritten rule that the recipient was to respond *within the week*. Also, *everybody* answered their own phones.

The policies, written and understood, created a culture that nourished operations that were free of all but the bare minimum of bureaucracy needed to guide complex corporate operations. Getty Mining's outstanding success in the 18 short years of our existence was catalyzed by our being a member of Getty Oil, a remarkable company. 