The "Prospector Myth" vs. Systematic Management of Exploration Portfolios: Dealing with the Dilemma

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INTRODUCTION

Figure 1.

The "Prospector Myth" is petroleum explorationists' version of the "Hero Journey". We are informed and inspired by the image (Figure 1) of the courageous lone prospector, who struggles against Mother Nature, financial hardships, skeptical associates, and repeated rejection by investors, before finally succeeding through persistence, faith, and luck, to achieve vindication, wealth and fame. Most of us know personally -- or know of -- one or more such individuals. We call them "wildcatters", "oil finders", "visionaries", or other dramatic names reflecting the respect they are accorded in our industry.

UNCERTAINTY, INTUITION, AND OVER-OPTIMISM

Geoscientists select (or are assigned) basins or trends in which to explore for petroleum. Such endeavors are characterized by daunting uncertainty, which can be reduced (but not eliminated) through costly geotechnology and seasoned judgment. Explorationists must peer through Nature's fuzzy lenses, searching for cryptic clues. They must invest intense physical and intellectual energy, over extended periods, patching together possible portraits of the subsurface, then selling and defending the proposed ventures that arise from their imagination and labor. Because exploration is dominated by subjectivity and uncertainty, it invites the exercise of intuition. And, of course, when geotechnical intuition is rewarded by exploration success, the prospector's ego is affirmed and even extolled. But most exploration projects fail, so most seasoned prospectors have learned to live with repeated failure. It is no wonder that petroleum exploration cherishes the Prospector Myth.

It is also not surprising that most explorationists are over-optimistic about their basins, trends, and prospects. After all, such dedicated prospectors could hardly be expected to be rigorously objective about their prospects! The Prospector Myth is the primary reason why explorationists persistently overestimate the reserve potential of their prospects.

But the process by which oil and gas prospects are translated into economic ventures also contributes to over-optimism. In the early days of petroleum exploration -- the glory days -- many prospectors were indeed individuals, or small firms, and their investors were private, third party investors and

corporations, more or less knowledgeable about petroleum exploration. *Caveat emptor* was the prevailing ethic because the subscribing sponsors were expected to be able to judge the true merit of each deal. So the operative criterion for success was to sell the deal, to get the well drilled. *Have faith -- success will eventuate, given persistence and sufficient trials: one real success will carry a dozen failures.* Unfortunately, the same value system still operates in some offices, even throughout entire companies, even though the professional employees of these publicly owned corporations are "selling their deals" to their own managements (and thus their own stockholders).

TIMES CHANGE

The increasing employment of geoscientists and the rise of large, publicly held corporations after WWII gradually began putting a crimp in the freewheeling presentation of oil and gas prospects. Scientific objectivity, professional ethics, the declining petroleum resource base, and the need for delivery of promised exploration performance, together collided with the Prospector Myth and salesmanship. Even so, influenced by the Prospector Myth, the world petroleum industry wasted a lot of money on exploration in the late 1970's to early 1990's. Shell, Mobil, and Amoco independently reported that exploration for high-risk, high-reserve targets in this period destroyed value, rather than creating it. While we kept looking for elephants, sizes of discoveries were steadily diminishing (Figure 2). We lost credibility with directors; we lost money for stockholders. By the 1990's the industry was becoming global in scope, and needed to become much more efficient.

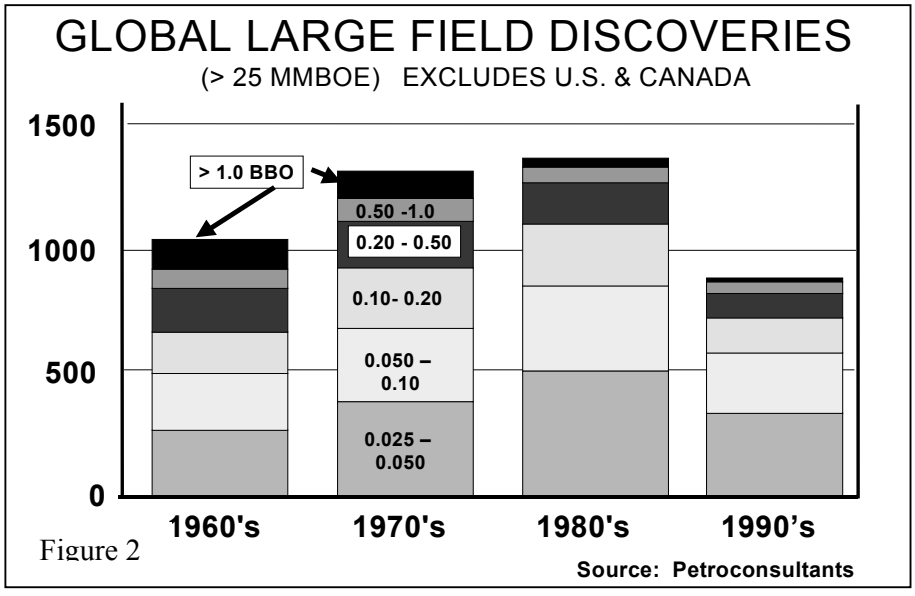

Figure 2

To be sure, improvements in seismic technology improved our success-ratios substantially, But also consistent, objective, technically sound procedures for assessing prospects led to the adoption of systematic prospect risk analysis procedures. The recognition of the lognormal distribution as the prevailing pattern of oil and gas field reserves (Figure 3), together with the development of refined methods of estimating geotechnical uncertainties, began to constrain the optimistic exuberances indulged by intuition and the Prospector Myth.

Today, multidiscipline geotechnical teams, not individual prospectors, carry out most modern petroleum exploration. Most substantial companies consider an inventory of many candidate prospects, from which they select their annual drilling portfolio, comprising only those prospects which together maximize economic value. We try to manage exploration by managing the exploration portfolio. With this concept comes the realization that, if portfolio management is to succeed, each prospect must be assessed consistently and objectively. The inherent uncertainties can be dealt with

via improved geotechnology, and geostatistics. What kills the portfolio is bias, which overvalues some prospects so that the value of the portfolio is not optimized. The stockholder is short changed by the Prospector Myth. Systematic portfolio management is more effective than intuition.

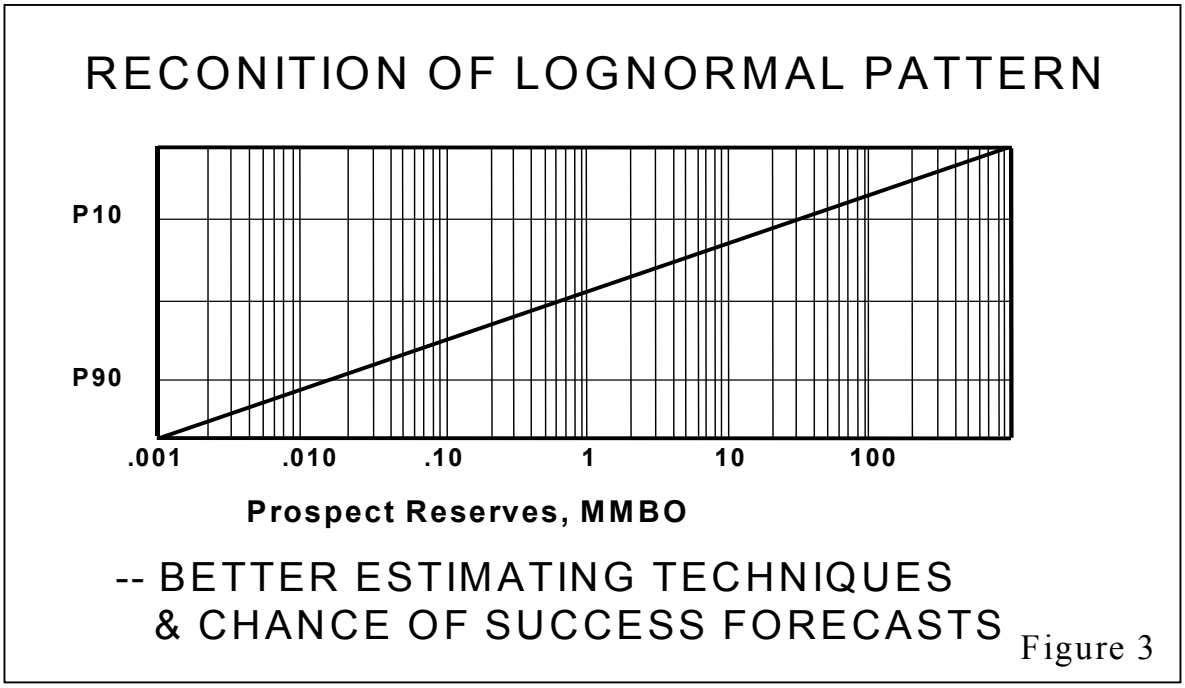

Figure 3

IMPERFECT REMEDIES

Since the 1950's, our industry has tried to reconcile the dilemma in various ways. A common approach -- thankfully now diminishing -- pitted geoscientists against engineers, tacitly accepting (and reinforcing) the proposition that geologists were expected to be over-optimistic, and requiring engineers to be correspondingly over-conservative. Another "remedy" was to artificially inflate economic criteria -- notably the discount rate -- under the mistaken notion that "those prospects which still have positive EMV's under inflated discount rates must be better prospects than those that don't." A third technique was to employ "hidden hurdles" in the higher levels of the decision chain: managers at headquarters routinely cut prospect values by half (or more), based on their observations of past exploration over-optimism.

In response, explorationists became adept at sniffing out such arbitrary screening measures, and devising ingenious ways to generate geotechnical numbers that were adequate to get their prospects drilled. In particular, explorationists in top management exercised their own version of the Prospector Myth, by applying their privileged intuition to the prospect selection process. Since almost no one kept systematic records documenting actual prospect results (compared against geotechnical predictions), everyone in the chain -- prospectors, engineers, local managers, and senior executives -- usually did not have to confront the consequences of systematic bias. The urgency of drilling the next well far outweighed the value of objectively and purposefully assessing our mistakes from the last well. We were too busy drowning to take time to improve our swimming ability.

Instead we put our greater reliance on geotechnology (especially seismic), which often did mitigate the impact of large uncertainties regarding prospect reserves and present value, and discouragingly low chances of prospect economic success.

RESPONSE OF SYSTEMATIC EXPLORATION

Companies began to employ institutionalized systematic procedures for continuous improvement, which required objective comparison of geotechnical predictions vs. actual outcomes. Geoscientists began to learn from their mistakes and to calibrate their predictions. Corporate explorers began to employ a different criterion for success: *adding value* vs. *getting the prospect drilled*. The need for objectivity generated a long-overdue appeal for geotechnical professionalism, as requisite to objectively identifying and selecting those projects which together maximize the value of the portfolio, consistent with the organization's strategies and risk tolerance. Geoscientists could take pride in being professional.

Some prospectors mourn the diminished influence of the Prospector Myth, even though the lognormal distribution still allows them to dream (Figure 4). But increasingly, astute explorers recognize the necessity for heightened exploration efficiency as the global resource base continues to shrink. Systematic risk analysis, professional objectivity, and performance tracking must go hand-in-hand with sophisticated geotechnical methods.

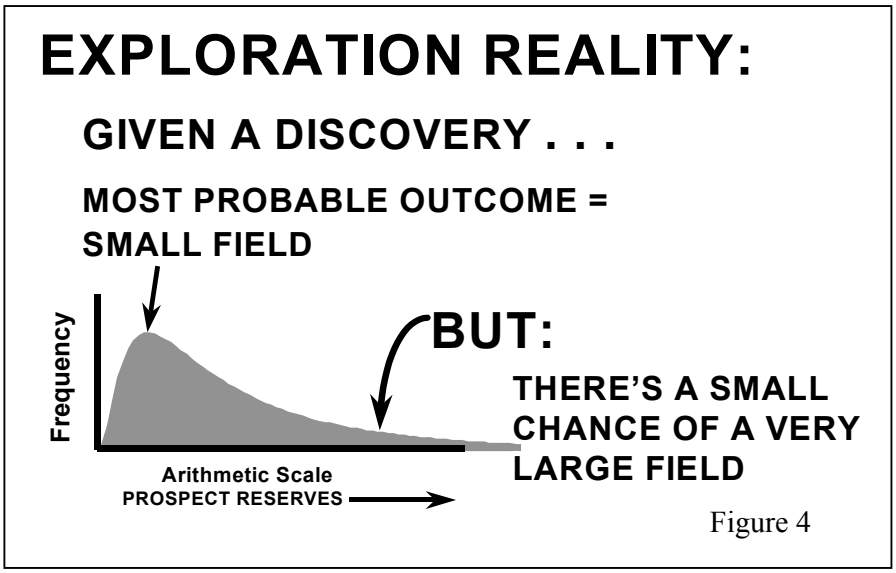

Figure 4

But the Prospector Myth still lingers, and properly so, if it can inspire our courage, persistence, and imagination in petroleum exploration, without biasing portfolio selection. The ongoing challenge is to harness the energy of the Prospector Myth without compromising the scientific integrity and business objectivity now required for successful management of the exploration portfolio.