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VIEWS I

Grassroots Exploration: Between a Major Rock and a Junior Hard Place



RICHARD H. SILLITOE†
(SEG 1976 F)

Peak metal—the time when demand for certain metals exceeds supply, irrespective of how much is spent on exploration and recycling (e.g., Sverdrup et al., 2009)—is nigh according to a growing number of its adherents, but mainly from outside the mining industry. Nonetheless, it is being increasingly remarked that the number of discoveries of major metal deposits appears to be dwindling and the cost per discovery rising (e.g., Dummett, 2000; Horn, 2002; Hall, 2010). Many mining professionals, however, subscribe to the view that metal supply will continue to meet society's growing demands for the foreseeable future, notwithstanding the enormous projected requirements of the large urbanizing and industrializing nations, specifically China and India (e.g., Crowson, 2008). This view, however, would appear to take for granted that abundant but currently subeconomic resources will eventually be exploited and that grassroots (early-stage, greenfields) exploration, by which many new metal provinces, belts, and

districts are traditionally discovered, can be sustained at something approaching historical levels. Grassroots exploration has made major contributions to the global metal inventory (Table 1) and, arguably, remains a prerequisite if we are to satisfy long-term metal demands.

DECLINING GRASSROOTS ACTIVITY

It is becoming abundantly clear, however, that there is a progressive decrease in the proportion of exploration funds being devoted to grassroots activities, irrespective of the position in the economic cycle and, hence, total annual exploration expenditures. Currently, less than one-third of exploration expenditure, both by the world's largest companies and industry wide, including the junior sector, is assigned to grassroots work (Metals Economics Group, 2010; PriceWaterhouseCoopers, 2010). Furthermore, the grassroots proportion of worldwide exploration budgets dropped from 53 to 32 percent between 1996 and 2009, with 41 percent of this latter year's total being raised and spent by the junior sector (Metals Economics Group, 2010); however, this percentage is considered an overestimate because it includes activities that would not be classified here as grassroots. Major and mid-tier companies that still advocate long-term grassroots exploration and have been successful at it (e.g., AngloGold Ashanti in Colombia; Lodder et al., 2010) are becoming a rarity nowadays.

The decrease in the share of exploration expenditure assigned to grassroots activities may be attributed to a variety of causes, some of which tend to be fundamentally different for the major and junior sectors. Nevertheless, the reduced expectation of discovery in grassroots environments seems to be a common deterrent. In their present guise, many major companies are becoming dysfunctional grassroots

explorers, although their near-mine (brownfields) exploration efforts have recently been rewarded with a number of outstanding discoveries, perhaps most notably in the porphyry copper belts of northern and central Chile. The majors' appetite for exploration in frontier and emerging provinces, where much grassroots work needs to be focused, is diminishing because of increased adversity to both the demonstrated and perceived financial, political, social, and personal risks involved. The growing influence of Chinese capital on the Australian, African, and South American mining scenes seems likely to reduce even further the amount of grassroots work conducted there. Clearly, the opportunity for continued brownfields success in any mining district is finite, and the widely touted concept of junior companies being able to supply the grassroots pipeline is, at best, questionable. Furthermore, while acquisition of resources via mergers or takeovers may be an economically attractive option for some in the major and mid-tier sectors, it adds essentially nothing to global metal inventories as well as seriously reducing total exploration expenditure.

The junior explorers are under constant pressure from their investors, particularly the hedge funds as well as most brokers and mining analysts, to provide quick, even instant exploration success, which normally translates into potentially ore-grade drill intercepts and resource statements. The lead times involved in grassroots work, typically no less than five years, are simply too long for the attention spans of most investors. A drainage or soil geochemical anomaly generated as part of an inspired grassroots program is of minimal interest to the market, and will certainly do little for a company's stock price. Therefore, much junior exploration effort tends to be devoted

Richard Sillitoe graduated from the University of London, England, where he went on to obtain a Ph.D. degree in 1968. After working for the Instituto de Investigaciones Geológicas (Geological Survey of Chile) and then returning to the Royal School of Mines at the University of London as a Shell postdoctoral research fellow, he has operated for the last 38 years as an independent consultant to more than 500 mining companies, international agencies, and foreign governments. He has worked on a wide variety of precious-, base-, and lithophile-metal deposits and prospects in 90 countries worldwide, but focuses primarily on the epithermal gold and porphyry copper environments. His specialty is deposit modeling using field observations and drill core. Published research has earned him awards in Europe, Australia, and North America, including the Silver Medal of the Society of Economic Geologists, of which he was President in 1999–2000.

†27 West Hill Park, Highgate Village, London N6 6ND, England; e-mail, acu@compuserve.com

TABLE 1. Examples of Preeminent Grassroots Exploration Discoveries

Deposit, location	Deposit type	Discoverer, year	Leading to eventual definition of:	Discovery description
Serra dos Carajás, Brazil	Banded Fe formation	United States Steel, 1967	Carajás (world's largest) Fe district	Machamar et al. (1991)
Panguna, Papua New Guinea	Porphyry Cu-Au	CRA Exploration, 1964	Southwest Pacific porphyry Cu-Au province	Knight et al. (1973)
Kambalda, Western Australia	Magmatic Ni	Western Mining, 1966	Western Australia Ni province	Woodall and Travis (1970)
Carlin, Nevada	Sediment-hosted Au	Newmont, 1962	Carlin and other Nevada Au trends	Coope (1991)
Rabbit Lake, Saskatchewan, Canada	Unconformity-related U	Gulf Minerals Canada, 1968	Athabasca Basin (world's largest) U province	Reeves and Beck (1982)
Olympic Dam, South Australia	Fe oxide-Cu-Au-U	Western Mining, 1975	Olympic IOCG trend	Haynes (2006)

essence as a contractor, but typically must have a demonstrated track record of discovery or, at the very least, a convincing story! Majors could also make parts of their grassroots land holdings available to judiciously selected junior explorers. Obviously, whatever the business arrangement, the junior company must retain a meaningful participation in any discovery and, if it is a listed company, continue to conduct lower risk exploration elsewhere in order to placate the market. More integrated business relationships between major and junior companies are clearly advantageous, as discussed recently in these columns (Hall, 2010).

A strong case also can be made for majors to create and carry out their own grassroots programs without junior company involvement. For example, the formation of consortiums might be considered, which would result in the pooling of capital, expertise, and influence in order to reduce or at least apportion the perceived risk (and, hopefully, the bureaucracy) of carrying out grassroots work in prospective regions (e.g., Horn, 2002). A spectacularly successful arrangement of this type between Utah International and Getty Oil Company resulted in discovery of the Escondida porphyry copper deposit in Chile (Lowell, 1991). Indeed, many major mines today are owned and operated by two or more companies (e.g., Antamina, Peru), so why not simply create the company associations at the outset? This approach is prevalent in the oil industry, primarily as a means of risk mitigation. Another attractive possibility might be for majors to create autonomous exploration subsidiaries that could theoretically have more freedom to conduct grassroots exploration. Such subsidiaries could be wholly owned by the parent, mirroring Bear Creek Mining's highly successful role in Kennecott during the 1950s to 1970s, or partly owned by two or more majors and with or without outside investor participation. Today, the creation of exploration subsidiaries seems to be out of favor, although EMSA's function as the Chilean exploration arm of Codelco is a notable and successful exception. While it is accepted that an exploration subsidiary would have to operate under most of the same corporate constraints as the parent company(ies), at least these constraints

to long-known prospects, many of them either handed on by the majors or simply recycled, where promotional drilling results are more readily achievable. As a result, it is estimated that perhaps only 10 to 20 percent of worldwide junior budgets are actually spent on true grassroots activities.

The widely discussed reduction in field time by explorationists over the last two decades, particularly in the major companies but also in many juniors as well, has also undoubtedly had a negative impact on grassroots exploration, in which fieldwork is the all-important component. Most of us know why ever more time is being spent in the office: the burgeoning bureaucracy created by the increased need to document and verify issues related to human resources, social responsibility, environmental stewardship, and health and safety; the proliferation of technical reporting requirements; and the all-pervasive obsession with computerized data manipulation and communications. In many companies, excessive amounts of time are spent on indiscriminately collecting and collating masses of geologic, geochemical, and, particularly, geophysical data and not enough time spent on critically thinking about what is really important (the data-rich, knowledge-poor environment; Thompson, 2009). A further problem militating against effective grassroots exploration is the continued failure of many majors (and also some juniors, for that matter) to properly value the cumulative experience of their geologic teams; this was shown yet again by the knee-jerk dis-

missals from several exploration divisions during the 2008–2009 financial crisis. The resulting savings were token, at the expense of a massive loss of corporate memory and future exploration effectiveness, not to mention image.

SOME POSSIBLE REMEDIES

If long-term metal supply is to be assured, the major, mid-tier, and junior sectors need to expand and refocus their grassroots exploration efforts, a change which implies the need for greater implementation of innovative business approaches and associations. Clearly, the current industry structure and mindset are not, and never will be, conducive to effective grassroots work.

A spectrum of business relationships already exists between major and mid-tier companies and their junior counterparts, and could be readily redirected to stimulate grassroots programs. A major may seek out a junior partner holding an attractive grassroots land position, the latter without the inclination and/or funding to carry out the necessary technical work. The major may supply the funding and/or take a minority equity stake in the junior; and the major, the junior, or both in collaboration may conduct the program. The converse is also eminently feasible: the junior with an unexplored grassroots land position or simply a novel metallogenic concept that requires testing may approach a suitable and potentially interested major for funding. In this case, the junior carries out a mutually agreed-upon technical program, in

might be tailored more explicitly to exploration than to mining, processing, and marketing, leading to correspondingly greater operational freedom and flexibility. Transfer of seasoned geoscientific staff, generally accepted as being the most effective explorationists (e.g., Thompson and Kirwin, 2010), from the parent to the subsidiary could result in their being liberated from at least some of the time-consuming paper-pushing, thereby enabling them to focus much more on technical matters.

It is unrealistic to imagine that the current structure of the world's stock markets can be altered to facilitate improved exploration practices, so junior companies intent on grassroots work need to devise alternative corporate strategies. Clearly, the best but probably the most difficult strategy is to seek venture-capital funding from nonlisted companies, high-net-worth individuals, or private syndicates, thereby gaining independence from the dictates of the market. The well-endowed sovereign wealth funds and perhaps even private equity funds might also conceivably play a role here if they can be persuaded that grassroots exploration accrues value. The prospective financiers obviously need to understand the exploration process and be fully conversant with the inherent risks and long lead times likely to be involved in grassroots discovery. This stipulation implies, of course, that the major mining companies themselves would be the ideal source of such funding. Therefore, perhaps they need to seriously consider grub-staking small (two- or three-person) groups of creative individuals with proven track records of discovery, in essence corporate venturing, rather than spending a large budgetary share on bureaucracy. Alternatively, a major could create some sort of formal partnership with one or more recognized but independent explorationists, the implant entrepreneurship advocated by Johnson (2010). A fine recent example of grassroots exploration success by a nonlisted explorer, Ivanhoe Nickel & Platinum, is provided by the Kamo a discovery in the Central African Copperbelt of the DRC (Broughton and Rogers, 2010).

Over and above the juniors that associate themselves in some way with major or mid-tier companies, as discussed above, an extremely small minority of listed juniors gain investor support for business models focused on grassroots exploration of frontier terranes (e.g., James Bay lowlands, northern Ontario; Afar, Ethiopia and Djibouti). Perhaps a

concerted effort to educate institutional and private investors of the need for and potential benefits of grassroots exploration should be considered, with emphasis being placed on the end product: discovery of a completely new metal province or district and the substantial profits that would inevitably ensue. The education process might be facilitated if junior consortiums were formed for the specific purpose of undertaking high-profile grassroots projects.

If renewed expansion of grassroots activity can be achieved using one or more of the above corporate means, the exploration community must make its own significant contributions by adopting a more grassroots-oriented mentality. Specifically, explorationists need to think much more about ore deposit models and global metallogeny. Questions they need to pose might include the following: Which ore deposit type(s) could be present in that underexplored region?; Could some of the world's apparently unmineralized terranes in fact contain unsuspected ore deposit types?; and, perhaps most difficult of all, Could this combination of geologic factors suggest the existence of a previously undocumented ore deposit type?

CONCLUSIONS

Grassroots exploration is the lifeblood of discovery; without it, future metal supply, even taking account of changes in technology, may not manage to keep pace with the demands imposed by worldwide population growth and economic development. The remedies considered here require major, mid-tier, and junior companies as well as suitably talented individuals to devise innovative means of collaborating on grassroots exploration as well as the provision of more generous funding to make this possible. The suggestions are not new and seem unlikely to be the panacea but, in combination, they might begin to redress the decline in the grassroots component of exploration. While accepting that mining, like any other industry, is principally designed to create wealth for its investors, albeit in an increasingly sustainable fashion, it should not be forgotten that we also have an obligation to provide adequate metal inventories for future generations. This fact should also not be forgotten by state, provincial, and federal governments worldwide as resource nationalism in the form of increased, commonly excessive

imposts is once again on the political ascendancy (Ernst & Young, 2010).

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