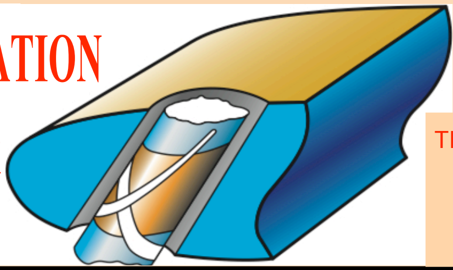
MINING 2009

DATA GAP WORKSHOP REGISTRATION

Please complete this form and remit together with your payment to the address at the bottom of the page. A separate form must be completed for each delegate (photocopies are acceptable). Registrations will not be processed without full payment.

LAING EXPLORATION

The Laing Toolbox



THE DATA GAP; DESTROYER & MAKER OF OREBODIES: JUST WHEN YOU THOUGHT YOU WERE JORC TABLE 1 COMPLIANT .... Don't destroy a viable deposit, & don't mine one that doesn't exist

CONTACT INFORMATION

Title / First Name: ______________________ Surname: ______________________

Job Title: ______________________

Organisation: ______________________

Address: ______________________

City / State / Postcode: ______________________ Country: ______________________

Telephone: ______________________ Facsimile: ______________________

Email: ______________________

A TAX INVOICE AND CONFIRMATION OF ATTENDANCE WILL BE FAXED TO YOU. ABN: 86 083 623 358

CONFERENCE REGISTRATION

☐ Data Gap Workshop — $825 (inclusive of GST)

Prefered date (tick one, or both boxes if you are flexible): Tues 27 October ☐ Sat 31 October ☐

PAYMENT OPTIONS

Payment must be received within seven (7) days of verbal reservation. Please return this application to PO Box 1153, Subiaco WA 6904, Australia or alternatively fax to (61 8) 9381 9222. ***If paying by cheque, please make payable to Mining 2000 Pty Ltd.***

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Authorisation of this form is a binding contract – including non-arrivals to the event. Please refer to the cancellation policy below.

Name: ______________________

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CANCELLATION POLICY

Cancellation Policy: All cancellations must be made in writing to Vertical Events. No refunds will be made after 9 October, 2009. All refunds prior to 9 October, 2009 will incur an administration charge.

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VERTICALEVENTS

THE DATA GAP - DESTROYER AND MAKER OF OREBODIES:
JUST WHEN YOU THOUGHT YOU WERE JORC TABLE 1 COMPLIANT....

Don't destroy a viable deposit, and don't mine one that doesn't exist

This special Mining 2009 Workshop is the international premiere of this subject critical to resource modelling. Principal Consultant Dr Bill Laing sponsored two new clauses in the current JORC Code Table 1, which recognise the Data Gap for the first time in our international regulatory environment. The Data Gap has been a core component of the Laing Toolbox corporate training since 2007, in a consulting portfolio of 113 ore deposits including 28 greenstone, 30 non-greenstone gold, 15 IOCG, 11 massive sulphide, 10 epithermal, and 13 Cu+Au deposits. Bill Laing is a Competent Person in all. The Workshop comprehensively documents the complex manifestations of the Data Gap, in all deposit types separately, and how to recognise its commonly camouflaged complexity including simple tests for financial analysts. The Workshop then documents the remediation of the Data Gap, drilling design, and resuscitation of deposits infected by a serious Data Gap in previous testing.

The Workshop comprises:

- Lectures on the Data Gap
- Lectures on Architectural Templates, as the foundation of Data Gap remediation
- Case studies (including several world-class deposits)
- Discussion sessions
- Exercises I(including delegates privately analysing their own prospect cases)
- Delegates' case studies (identified or fully anonymous) analysed publicly by the presenter
- Colour Manual

TARGET AUDIENCE:

- All geologists in exploration prospect testing, resource drillouts, drillout design & resource modelling
- All Competent Persons in all ore deposit types

DATES: 1 day Workshop, bracketing Mining 2009: Tuesday 27th & Saturday 31st October 2009

VENUE: Hilton Hotel - the Mining 2009 Convention venue

ENQUIRIES: Dr Bill Laing 07 4789 1401 or 0439 891 452 or http://www.laingex.com/datagap.htm

The importance of appropriate *spatial density* of sampling (drilling) of mineralised structures in a resource has been understood for decades. It has been addressed comprehensively in regulatory codes, particularly Australia's JORC Code, over this period. The gap in spatial sampling in a widely-spaced drilling array might be termed the *spatial data gap*. **However there is an analogous data gap, in the *direction* of sampling with respect to the mineralised structures. This is termed the *vector data gap*, or the *data gap (DG)* for simplicity.**

Drill a deposit one way, and you will get one stereonet distribution. Drill it another way, and you will get a different stereonet distribution (Figure 1). You will also get a different CV, a different resource model, a different search direction, a different grade, and a different tonnage. The result from the first drilling array might be a bankable resource, from the second a “walk away”. The first array might be JORC Table 1 compliant, the second non-compliant. *But it’s the same deposit, and most significantly, both arrays may appear appropriate to testing the deposit.* The reason? **The Data Gap: the structures which are “missing” from our view, from the stereonet, and from our resource statistics, because of the angular relationships between the drillhole and the mineralised structure(s). The DG is a Pandora's Box of issues. The DG is not simply the angle between the drillhole and a set of veins**. All deposits, except genuinely thin-vein deposits and sheeted vein deposits without any shoots, are infected by a significant to major to asset-terminating DG. This is because most ore deposits possess 2D or 3D stockworks and/or multiple mineralised structures, and many deposits contain mineralised structures systematically oblique to the drilled planar lode. Particularly DG-infectious are open hole programs with no structural information, and parallel 1D arrays of drillholes. Even drilling normal to the lode still delivers a terminal DG in some deposits. Other lode deposits have a terminal DG for the mine-making shoots within the lode. *STOP PRESS*: A current paper (Harrison, Mining Technology) asserts that for dipping targets vertical holes are more detection-effective than angled holes. The implications for DG are substantial.

The DG is inherently covert and self-camouflaging. The DG is a classic case of "you don't know what you don't know". Many geometric and operational aspects of the DG are counter-intutive. They require a receptive mind and a commitment to the reality of drill testing rather than the "rules" of long convention.

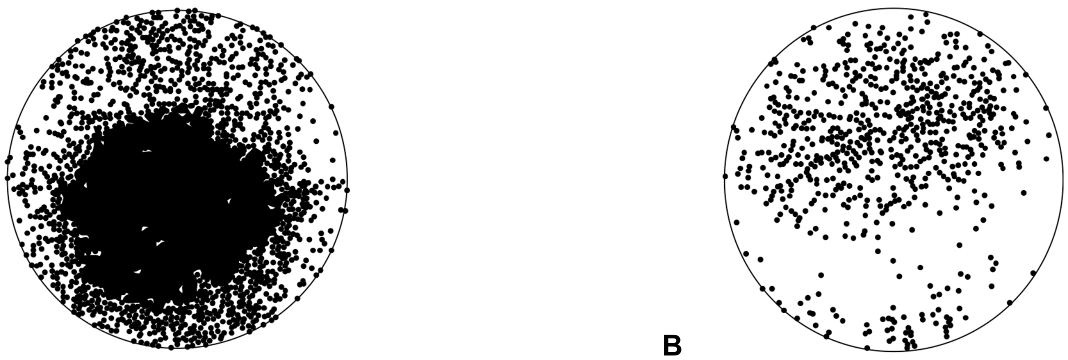
Different deposit types have inherently different DGs (Figure 2). In some deposit types the DG is large, in some it is small and forgiving. The most common deposit types; orogenic/greenstone belt, IOCG, porphyry, epithermal - have large and potentially terminal DGs. A large deposit size is no inoculation against a terminal DG. A deposit drilled by a 1D array of parallel drillholes - almost the norm in drillouts - is infected by a DG which is retained whether the drillout is 10 or 1000 holes. The DG has been the (often unrecognised) cause of resource or mine termination. A major DG retarded Olympic Dam's resource architecture ond ore genesis by 7 years. Placer Dome's flagship Getchell Nevada deposit drilled out from 6m oz to a provisional 19m oz in 3 months, then proceeded to bankruptcy in 1 week after DG analysis. Melita's flagship Orient Well mine (Yilgarn) after a year's operation was terminated consequent on a 2 hour DG analysis. Other case studies illustrate the complexity and destructiveness of the DG (Figure 1): erroneous resource estimates, erroneous "go/no go" decisions, major unexplained reconciliation problems (positive and negative), mine terminations, and on-going operational issues such as unexpected structures encountered in mining, and unplanned structural orientations leading to poor pit design and pit failure.

The DG is accommodated in the latest (2004) JORC Code, in *principle*, by two Laing-sponsored Table 1 clauses: “Sampling techniques and data”, “Orientation of data in relation to geological structure”:
(1) “Whether the orientation of sampling achieves unbiassed sampling of possible structures and the extent to which this is known, considering the deposit type”;
(2) “If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material”.

The Laing Toolbox provides the *practice* of how to recognise the DG, determine its impact, and remedy it. The remedy includes a suite of drilling design recipes for every deposit type, remediation of the structural database, and how to resuscitate projects infected by a large DG in previous testing - one man's trash is another man's treasure. The DG requires the understanding of all personnel involved in mapping, exploration, drillout and resource modelling, and mine design, and all Competent Persons.

Laing Exploration has the capacity to review off-site the Data Gap of an exploration or resource modelling program, from our office base. Followup site visitation is designed with the client as appropriate. The off-site review is based on the following information:
1. Prospect map showing (a) geology (where known) (b) drillhole paths (c) structural orientation data
2. Drill sections showing assay intercept data
3. Structural orientation data (tabled): (a) dip/strike/plunge/plunge direction, or (b) α/β core angles
4. Assay data (tabled)
5. Photographs of mineralised structures in drillcore; preferably (a) all-of-hole coretray photography, or (b) ad hoc photographs of a representative suite at its representative angles in drillcore.

EXAMPLES OF THE DATA GAP IN OPERATION



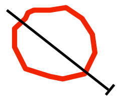
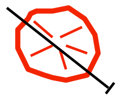
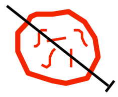
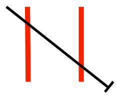
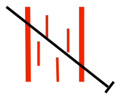
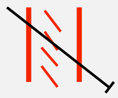
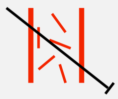
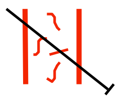
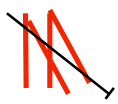
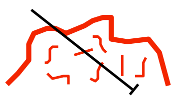
A B

Figure 1 Stereonets illustrating the data gap in a world-class deposit; Prominent Hill Cu+Au deposit.
A Stereonet of all structures in drillholes plunging S (n = 7188)
B Stereonet of all structures in drillholes plunging N (n = 899)

The two stereonets are drilled through the same rock mass and represent the same structural population. Yet their populations are completely different. Neither stereonet is real.

Prominent Hill is a steep-N-dipping tabular body. Had it been drilled via a conventional S-plunging 1-dimensional drilling array, the deposit would have been represented by the structures in Figure 1A and a major data gap would have developed. The Prominent Hill data gap was remediated, by (a) drilling in both S and N directions (b) combining the data from "N" and "S" holes, (c) remediating the "N" and "S" stereonets by normalising them to a similar number of measurements, then (d) drilling a 3rd dimensional set of holes out-of-section and normalising these against the "N" and "S" stereonets. Each drill section was individually remediated for the representativeness of its structural data.

THE FUNDAMENTAL ARCHITECTURE OF ORE DEPOSITS

TYPE	MACRO-MESO		TYPICAL DEPOSIT TYPE	GEOMETRY Plan	DATA GAP
1a	1D	None	Breccia pipe, kimberlite pipe		Small
1b	1D	2D	Fault intersection, fault duplex Dilational jog type 1 (laminated) Magmatic stock, radial stockwork Antiform hinge zone (saddle)		Small
1c	1D	3D	Magmatic stock, overpressured Dilational jog type 2 (brecciated) Carbonate-reef hosted Pb+Zn		Small
2a	2D	None	Concordant massive sulphide (eg Pb+Zn+Ag, Ni) Stratiform replacement deposit (eg Sn)		Negligible
2b	2D	1D Parallel	Fault zone, multiple (splay) faults Shear zone, high strain		Small
3a	2D	1D Oblique	Shear-(fault) + TVA, low strain IOCG deposits		Large (parallel to internal features)
			MOST VULNERABLE		
3b	2D	2D	Shear-(fault) + TVA, moderate strain		Large (parallel to stockwork axis)
3c	2D	3D	Competent fractured host horizon		Small
4	2D	Second 2D macro lode	Intersecting fault/shear zones Intersecting fault & replaced unit (skarn) Intersecting fault & unconformity (eg U)		Small to large (depending on the 2 orientations)
5	3D	3D	Porphyry, overpressured		Negligible

Colour coding:

CONCORDANT: Syngenetic, epigenetic stratiform/stratabound — Base metals

FAULT/SHEAR HOSTED: Greenstone, epithermal, (porphyry), IOCG — Gold(-base metals)

MAGMATIC RELATED: Porphyry, granite-hosted, (epithermal) — Gold -base metals)

OTHER

Figure 2 The inherent data gaps of all hydrothermal ore deposits, based on their fundamental architecture. Simplest architecture at top, most complex at bottom. Deposits most vulnerable to a major data gap are tabular lodes, which are commonly apparently simple. This is a counter-intuitive situation to resource geologists. TVA = tension vein array (in fault/shear zones).