



GEOSTATISTICAL ASSOCIATION OF AUSTRALASIA

NEWSLETTER NO. 11

MARCH 2000

PRESIDENTS ADDRESS

The Sunday afternoon/evening GAA function held at the Scout premises at Pelican Point was attended by a number of members and their families. Although the river was still closed due to the algal bloom, there was more than enough food, wine and cricket for entertainment. Thanks to all the Committee members for the organisation, and to James and Tim for the cleanup.

The GAA will shortly be publishing the edited proceedings from the Beyond Ordinary Kriging Conference, held in 1998-9. Copies can be ordered from the Committee for \$50 each. Postage and handling extra.

The AGM will be held in April, 2000. Inside this issue is a nomination form for potential Committee members. This is your opportunity to throw in some new ideas, or perhaps sign up as a committee member.

John Henstridge, President, 1999-2000.

MEETING DETAILS

The Annual General Meeting of the Geostatistical Society will be held on
April 17th, 2000,

at

BFP Consultants Board Room,
Level 2, Eastpoint Plaza, 233 Adelaide Terrace

Drinks at 5:30, meeting commences 6pm.

Due to security considerations, all visitors must arrive prior to 6 pm.

The closest public carpark is at the Sheraton in Hill Street.

Inside This Issue

Unfolding 1	3
Unfolding 2	4
Nomination form	7

GAA MEMBERSHIP

There are 4 types of membership:

- ◆ Ordinary Member
- ◆ Associate Member
- ◆ Student Member
- ◆ Corporate Member

Only ordinary members have full voting rights.

Corporate membership is by invitation of the Executive Committee.

The current makeup of the Society is: 7 honorary life members, 106 ordinary members, 7 associate members, and 2 student members.

Membership forms are available by post or email, contact GAA Secretary, P.O. Box 1719, West Perth WA 6872, email bateleu@omen.com.au

Membership fees are:

- \$35 member
- \$15 associate
- \$5 student



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Geology Blunders

- ◆ Geology is worked on the principle that the key to the present is in the past
- ◆ The boundary between two types of rocks are bedding places
- ◆ Bedding planes form when sediment is deposited and compressed - i.e. in an iniquitous manner
- ◆ Biozone - the very upper part of the continental crust on which we live, e.g. Dartmoor
- ◆ course and fire grained sandstone ...
- ◆ ... resulting from erosion, deposition, past depositional and bionic structures
- ◆ the coarsening upwards ... is also indicative of two floral marine environments
- ◆ shale and Maidstone
- ◆ The Devonian period is missing from the whole area and was probably a time of land.
- ◆ a meterorite .. would have to be 10 km in diameter and produce a crater 150 km in diameter
- ◆ The sandstone is boarded to the northeast
- ◆ Laterite occurs in topical environments

STATISTICS AND THE MEDIA

The chances of the baby's chromosomes being defective were 250 to 1, which sounds reasonable odds. Except that all odds are, in reality, 50-50: it may happen and it may not
The Times Magazine

Due to deforestation, the rainfall in the Peruvian rainforest is now 120% less than 25 years ago
Michael Palin

The study was carried out in 2 stages. Stage 1 of the data collection was completed in September 1993, and is based around a survey of 224 managers in the East and West Midlands of the UK. Men and women were equally represented in proportion to their numbers in management, and more so in the case of women.
Sociological Research Online

Although actual suicides account for only 2 percent of deaths of males, and 1 percent of deaths of females, they figure far more significantly among premature deaths
Journal of the Royal Statistical Society

In the study, men who began taking light exercise in their sixties reduced their chances of dying by about 45% compared with those who stayed inactive
Liverpool Echo

Of those aged more than 60 living alone, 34% are women and only 15% are men
Canberra Times

Can you tell us in how many countries the Jerry Springer Show has been syndicated? Is the answer (a) over 30, or (b) over 40? Call us on 0891.....
Challenge TV broadcast

Women born in the 1960s are twice as likely as their mothers never to have children
Good Weekend

70% of what we die from is the foods we eat
The Times



The Editors, GAA Newsletter

Re: Questions posed on Unfolding, December 1999 News Letter

I have recently been involved in an "unfolding" (unrolling) approach to grade estimation for an iron ore deposit. The deposit is contained within the Marra Mamba Iron formation and the original stratigraphy is folded into asymmetric, non-cylindrical open to tight folds. Many of the issues mentioned by Dean O'Keefe were encountered during resource estimation and examined in some detail with the following results:

- ◆ unfolding using the stratigraphy (bedding planes) as a control surface reduced the need to sub-domain the deposit into a multiplicity of search orientation domains;
- ◆ as a consequence of unfolding and the reduction in the number of domains, an increased number of samples were available for variography and interpolation in any one domain;
- ◆ the global tonnage and grade estimate for the deposit was not significantly different when either an unfolded modelling approach, or a conventional multiple search domains modelling technique was used. However, on a local scale (section to section) grade distributions using an unfolded data set are generally more consistent across sections than in a multiple search domain model. This smoother, more consistent interpolation of grades is considered to be a direct result of utilising more balanced sample numbers across the whole zone, in contrast to previous models, where the number of available samples can be restricted by sub-domains to those from only two drill holes;
- ◆ variography within the unfolded system showed some improvements, but not as marked an improvement as expected.

In applying the unfolding technique assumptions had to be made about the mineralisation and fold style, and in particular the issue of cartesian distances (across the fold) as against geological distances (around the fold). Dean mentions translation of all results to a defined plane, which in a simple open fold may be sufficient and unlikely to significantly distort the spatial relationships between samples. In dealing with the folded Marra Mamba Iron Formation units we used computer aided unfolding (DATAMINE's UNFOLD process) which allowed us to unroll and re-position samples separated by their true geological distances. However, even though we had achieved a spatial distribution of samples into a plane parallel to original bedding, several additional issues arose:

- ◆ it is essential to know your geology and the genesis of the mineralisation. In other words, part of the failure in not producing a marked improvement in variography may be due to the fact that bedding alone does not control the distribution of iron mineralisation. Mineralisation is complex and has distribution patterns related to both pre-folding and post folding events;
- ◆ the folding mechanism is important, as any departure from simple cylindrical folding to folding accompanied by shear (stretching) will complicate the spatial re-positioning of samples;
- ◆ The process of unfolding re-arranges samples in a new coordinate system and it is extremely important to differentiate this from a reconstruction of the pre-folding geology. This feature often makes it difficult explain the technique to others;
- ◆ The preparation of data for unfolding can be time consuming and complex. This factor may prompt the question as to whether the amount of effort justifies the improvement in results, never mind the additional cost;

There are a small number of published papers on unfolding case histories and a considerable number of unpublished company reports. A detailed review of various unfolding processes and their influence on variography was undertaken by Simon Ingram in a Ph.D. thesis titled *Mineral Resource Estimation using a Computerised Unfolding Technique at Zinkgruvan Mine, Sweden* (University of Wales, 1997).

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The Editors, GAA Newsletter

Re: Questions posed on Unfolding, December 1999 News Letter

Mother Nature rarely provides us with orebodies with true planar geometry. Non-planar orebodies are the general rather than the exceptional case and examples include:

- ◆ Layered stratiform base and precious metal sulphide deposits,
- ◆ Shear hosted gold deposits in deformed geological terrains;
- ◆ Stratiform iron ore deposits
- ◆ Sinuous channel iron deposits such as Yandicoogina
- ◆ Concentrically zoned porphyries.

Better resource estimates will obviously be obtained if the continuity of grades can be honoured as part of the estimation process. In the past, limitations of computer hardware and software resulted in the practice of dividing deposits into contiguous structural domains for resource estimation. For example, base metal grades within a simple anticlinal structure might be estimated by dividing the data and block model into a domain for each limb of the anticline. This type of approach results in several problems:

- ◆ The data set for variography is split into subsets, potentially making the variogram less stable;
- ◆ Grade estimates in the blocks close to a domain boundary (in this example the fold hinge) are biased towards one or other limb;
- ◆ At domain boundaries, there may be illogical discontinuities in grades;
- ◆ As curvature of the fold limbs increases the cartesian distances between data points become an inappropriate representation of the spatial relationships between the data.

These problems can be reduced by increasing the number of domains, so that the curvature in each domain is minimised, and by the use of overlapping data sets and careful search strategies. However, the basic problems remain and increasing the number and complexity of domains quickly increases the workload.

Intuitively we might expect that optimum results would be achieved if data points could be related to one another using a non-cartesian coordinate system that honoured the geological structure. This type of coordinate system can be produced by several different methods. The selection of the method depends on the objectives of the study and the complexity of the geological structure. As the curvature of the orebody becomes more extreme, issues such as geological shortening and estimation of block grades rather than point grades become increasingly important.

For deposits that are not highly deformed a simple approach of translating data points by projection relative to a reference plane can be applied. A pathway or folded surface that follows the median or central points of each zone or domain can be interpreted. This pathway can then be modelled in 3D to create an unfolding surface about which both the data sets, the variography and the block model can be considered to be unfolded for the purpose of grade interpolation. The unfolding method enables the interpreted spatial relationships between geological samples to be correctly represented. For example, by unfolding using a median surface all the sample points that are equidistant from that surface become related for the purpose of estimating grades into blocks that are also equidistant from that surface.

Unfolding data in this way can often lead to much improved variogram structure. Using the same method for grade interpolation, with the variograms of the unfolded data, will lead to improved estimates. The connectivity of high grade and low grade zones between drill holes can be better honoured, producing resource models that have patterns of grade distribution much closer to the expectation of the geologist. These improvements typically outweigh the minor distortions of sample to sample distance that the method incorporates.

The variograms of the unfolded data are only applicable within the unfolded coordinate system. They should not be used as input to kriging in a cartesian coordinate system.

Ian Lipton, Mining & Resource Technology., Level 3, Kirin Centre, Mount Pleasant, WA. itl@mrtconsulting.com.au



The GAA recognises that many members and peers are unemployed, or underemployed. The following is a list of Internet based employment consultants, found at <http://jobs.ninemsn.com.au/indexframe.asp> which may be of interest

AAA Group of Specialists

A leader in specialist niche permanent and contract/temporary recruitment for accounting, banking, training & office support.

Abraxas Technologies

First class global IT Recruitment

Adex Resource Consultants

Management consulting firm

Affinity Contracting & Search

Placing People First

Align Industrial Consulting

For permanent & contract engineering, drafting & production staff.

Andrews Partners

Meeting the demands of the world's most dynamic industry

Aston Manam

...Your future in employment opportunities

AUSLINK

The Auslink Consulting Group brings "the best people together Australia wide"

Bevan Turner Group

Work with clients, and thus recruit across a broad range of disciplines.

Bushell & Cornish

Bushell & Cornish Pty. Ltd is a specialist recruitment consultancy

Candle Australia

At Candle, we pride ourselves in offering you a quality placement service and more job opportunities than any other agency in Australia.

Career People

Head and shoulders above the rest...

Carter and Stone

At Carter & Stone, we pride ourselves on providing a highly personalised service. That way we all win.

Chandler & Macleod

Chandler & Macleod are Australia's leading corporate organisational consultants.

Chess Consulting Group

Chess Consulting Group was established to recruit high calibre personnel for the computer and high technology industries.

Command Technical

Command Technical is a specialist recruitment service that provides companies with contractual and permanent professional staff.

Computer 2000

We operate on two basic principles, Integrity and Trust...

CPE

CPE is a successful IT recruitment agency based in Western Australia.

CSP Recruitment

CSP Recruitment is the newest addition to Client Server Professionals' diverse and successful group

Data #3 Limited

Data#3 is one of Australia's largest and fastest growing providers of 'end-to-end' IT solutions.

David Chorley & Associates

Provide a fresh new highly specialised approach concentrating exclusively on financial and executive recruitment both locally and internationally.

Drake International

Drake is your answer...

Eagle Recruitment

Our team helps candidates find positions in both local and international niche markets.

eTemp*eJobs

Recruitment and Selection Specialists

ETM Placements

ETM Placements is the employment service of the Association of Professional Engineers, Scientists and Managers, Australia.

Forum Consulting Pty Ltd

Computer placement company

IGraeme V Jones & Associates

People Delivering the Future

Hallis

Hallis offers a wide range of solutions-based temporary and permanent recruitment consultancy services.

**I.T. Resources Group**

Providing service excellence to contractors and career seekers.

IPA Group

The IPA Group offers a number of different recruitment service options.

Kelly Services

are a company of specialists bringing solutions to Australasia's leading organisations.

KPMG Management Consulting

Our focus is providing quality solutions to our clients and candidates.

Lyncroft Consulting Group

Total Recruitment Solution in the provision of Executive Recruitment Services

Mack Recruitment

Mack Recruitment provides a range of Human Resource Services across all industry sectors in South Australia.

Management Recruiters Australia

We provide general business Recruitment Services for both contract and permanent requirements.

Morgan Consulting Group

Solutions for Human Resources

Network Recruitment Services

Specialising in the placement and competency profiling of permanent and temporary staff.

Nicolai Absolute Consulting

IT and General Recruitment Firm

Oxford Recruitment Pty Ltd

Oxford Recruitment Pty Ltd specialise in engineering construction recruitment

Pivotal Recruitment

The PIVOTAL business operation includes both temporary and permanent recruitment services, across a range of industry sectors and job categories.

Quay Appointments

Our personal best is placing the best personnel.

Recruitment Options

Treating people as we would like to be treated

Recruitment Solutions

Providers of temporary and permanent recruitment services from support to executive level.

Richard Shaw & Associates Pty Ltd

Richard Shaw & Associates (RSA) is a personalised Management and Recruitment Consultancy

Robert Walters Associates

Robert Walters is a team-orientated company with a global presence.

RSA - Recruitment Services Australia

RSA is a specialist recruitment consultancy that provides top quality candidates for IT and Engineering positions.

Rusher Rogers Recruiting

Working in partnership with clients to recruit highly valued personnel.

SACS Consulting Group

Permanent and contract executive recruitment specialists.

Spring Search & Selection

Spring Search & Selection offers a personalised executive recruitment service.

Staff Search Consulting

Are you ready for a change of pace? Looking for that light at the end of that tunnel? End the search...

Strategic Recruitment Services

Strategic Recruitment Services is committed to achieving the highest standards of personnel recruitment, providing comprehensive recruitment solutions.

Waite Group

Providing effective Human Resource solutions to Australian business and industry.

Westaff

Aiming to be the best providers of temporary and permanent personnel in Australasia, supplying high quality staff services at good value.



GAA COMMITTEE NOMINATION FORM

2000-2001

**The following positions are open for nomination for the GAA Committee:
Vice-President, Treasurer, Secretary, and Ordinary Member (5 positions)**

Nominations are open to any paid up member of the GAA. All nominations must be received by 5 pm, Friday, April 14th, 2000, either by post (P.O. Box 1719, West Perth) or by email to the Secretary, (bateleur@omen.net.au), or by fax to the Secretary (08-9433 4924).

Nominations without signatures of the nominee or proposers will not be accepted.

Nominations may also be taken from the floor at the AGM, but the nominee must be present to accept nomination. Nominations will only be accepted where no written nominees have been received.

Nominee

Name: _____

Signature _____

Position Nominated:

Proposed

Name : _____

Signature _____

Secunder

Name _____

Signature _____



GAA ANNUAL GENERAL MEETING
APRIL 17TH, 2000
BFP CONSULTANTS BOARDROOM
LEVEL 2, EASTPOINT PLAZA, 233 ADELAIDE
TERRACE

MINUTES OF THE 1999 ANNUAL GENERAL MEETING:

A total of 35 GAA members attended the AGM held at the Celtic Club, West Perth on April 22nd, 1999.

The meeting was opened by the President, Louis Voortman. He introduced the incoming President, John Henstridge and gave a presentation on the activities of the Society during 1998-9.

The Treasurer's report showed that:

- ◆ Bank Balance on 20 April 1999 (before incurring any AGM linked expenditure) was A\$ 2834.44
- ◆ Petty Cash balance on 20 April 1999 was A\$ 127.00
- ◆ Total Balance of Accounts and Petty Cash was A\$ 2961.44

A new committee was elected with the following personnel:

- ◆ Treasurer Sjoerd Duim
- ◆ Secretary Stella Searston
- ◆ Committee Lyn Bloom, Mark Murphy, Brian Davis, John Vann.

The election of the Vice President for 1999-2000 was deferred due to the absence of the nominee.

The evening concluded with a presentation by Mark Murphy on the Anaconda nickel project.

During the year, Ian Lipton, Steve Hyland and Mike Humphreys were co-opted to the Committee.

AGENDA FOR THE 2000 ANNUAL GENERAL MEETING:

1. Outgoing President's Address
2. Incoming President's Address
3. Treasurer's Report
4. Election of 2000-2001 Committee
5. General Business
6. Guest Speaker (to be advised)

DRINKS AT 5:30 PM, MEETING COMMENCES AT 6 PM.

All visitors must be in the building by 6 pm due to security considerations. The closest public