

## Peter J Brown

**Profile:** An all-round Explorationist with more than 30 years experience in the search for a wide range of resources in a great variety of geological terrains in Africa, Greenland, South America, the Middle East and China, - particularly for precious (both gold & PGE) and base metals. Ph.D. on Ni-Cu deposits of Botswana. Experience ranges from target generation and grass roots exploration in remote areas, through mineral resource estimation, to joint venture agreements and board level considerations. Growing involvement in Feasibility considerations such as metallurgical, geotechnical and hydrogeological investigations and secure data management. Sensitive to working with different cultures and was responsible for Community relations at the Yaoure project in Côte d'Ivoire. Significant experience in training local explorationists.

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**Nationality:** British

### Qualifications:

B.Sc. Dundee University, Scotland, 1972. Honours Degree (Upper Second) in Geology with subsidiary Civil Engineering, Chemistry and Physics.

Ph.D. Southampton University, 1988. The Petrogenesis of the Ni-Cu ore bodies, their host rocks and country rocks at Selebi-Phikwe, eastern Botswana, southern Africa.

### Career Summary:

April 2016 - now	Set up Peter Brown Geological Consultant Limited, consultant for Perseus Mining
August 2011 - March 2016	Cluff Gold / Amara Mining West Africa Group Exploration Manager
June 2009 – July 2011	NunaMinerals, Greenland, Chief Geologist & Acting COO
June 2008–May 2009	Mineral Resources of Madagascar (Jubilee Platinum) Country Manager, Jubilee's Group Geologist in Madagascar, Zambia and South Africa from January 2009
1995 - May 2008	Geological Consultant and Geology & Environmental Science Educator
1993-1995	Bolivar Goldfields, Venezuela VP - Exploration
1992-1993	Gold Fields Venezuela Chief Geologist
1988-1992	Gold Fields Botswana Senior Geologist then Acting Chief Geologist
1987-1988	Keele University Lecturer in Geochemistry
1987	Southampton University Completed Ph.D.
1984-1986	Geophysical Service International. Seismic Interpretation Supervisor in China and Computer Applications Geologist in Saudi Arabia
1980-1983	Southampton University Ph.D. research
1977-1979	Geophysical Service International. Exploration & Field Mapping Geologist in Iran and Wellsite Geologist in Saudi Arabia
1975-1977	Johannesburg Consolidated Investments (JCI), southern Africa Exploration Geologist
1972-1975	Bamangwato Concessions (BotRST), Botswana Exploration Geologist

### Some of Main Achievements:

- Transformed Cluff/Amara's disparate exploration teams in Burkina Faso, Côte d'Ivoire and Sierra Leone – increased performance, motivation, communications and training.
- Saw the potential at Yaoure shortly after joining Amara in August 2011 and delivered a 150% increase in Amara's global gold mineral resources to 10.5 million ounces, including an increase from 0.3 to 7.3 million ounces (24 November 2015) at Amara's Yaoure project in Côte d'Ivoire.
- Significant improvement in Community relations at the Yaoure project when I took over this role in December 13.
- 86,000m drill programme at Yaoure completed in 6 months in 2014 – on budget and on time, 70,000m of core drilling with up to 9 rigs and 16,000m of RC with two rigs.
- A new structural interpretation of the Baomahun BIF-associated gold deposit in Sierra Leone, resulting in potential for further ounces.
- Evaluated NunaMineral's broad portfolio in Greenland and successfully focused exploration on new intrusion-related gold, grassroots copper and IOCCG targets.
- Successfully prepared the Kiwara copper property (Kalumbila – now called Sentinel) in Zambia for sale to First Quantum.
- Built from scratch a successful exploration team for Bolivar Goldfields in Venezuela.
- Carried out initial resource estimate of Tomi gold prospect in Venezuela – 800,000 oz
- Discovered porphyry copper mineralisation in the Taftan region of southeastern Iran
- Structural reinterpretation of the Phikwe nickel-copper ore body in Botswana resulting in a significant increase in mineable resources and length of mine life.

### Career Details:

**April 2016** Set up **Peter Brown Geological Consultants Limited** Initial work for Perseus Mining in Côte d'Ivoire and Sierra Leone. Contributed to new PFS of Yaoure gold project.

#### **August 2011 – April 2016 Cluff Gold / Amara Mining Group Exploration Manager**

One of 5 members of Executive Committee running Amara Mining. Responsible for all aspects of Amara's exploration activities in Africa, particularly in Sierra Leone, Burkina Faso, Côte d'Ivoire, Senegal, Mali and Liberia. Responsible for planning, budgeting and execution of company's exploration programmes for gold, with an annual budget of up to \$26m. Gold projects include shear zone-hosted lode gold deposits in the Birimian of West Africa and BIF-associated deposits in the Archaean of Sierra Leone and Liberia. Regular reports to Board and participation in Board meetings. QP for Amara for stock exchange announcements. Recommendations on potential acquisitions and due diligence. Negotiations on terms of JVs. Supervised both external and internal Mineral Resource Estimates, particularly for the Birimian Yaoure deposit and the Archaean BIF-associated Baomahun deposit. Preparation of NI43-101 reports on Company's resources. Input into PEA and PFS of Yaoure gold project in Côte d'Ivoire, managed the Yaoure ESIA and oversight of metallurgical, geotechnical and hydrogeological investigations. From December 2013, responsible for Community relations at the Yaoure project.

#### **June 2009 – August 2011 NunaMinerals, Greenland Chief Geologist & Acting COO**

Portfolio of projects in the Archaean and Proterozoic of Greenland for Au, Fe, REE, PGE, Cu, diamonds and W (in decreasing order of time spent). Joint ventures with Impala Platinum and NuukFjord Gold, collaboration agreement with Rio Tinto. Responsible for planning, budgeting and execution of company's exploration including drilling and geophysics contracts, supervision of 8 company and consultant geologists, QA/QC of assays, marketing projects, search for and negotiations with potential JV partners, quarterly reports to management and business partners. Project involvement was, in decreasing order: Au, Ni-Cu, REE, PGE, iron, diamonds and tungsten. Gold projects have included shear zone-hosted lode gold, intrusion related gold systems, IOCG and alluvial gold. Member of Executive Board along with CEO and CFO.

#### **June 2008– June 2009 Mineral Resources of Madagascar Country Manager**

Following consultancy in April, management of the exploration of this Jubilee Platinum subsidiary in Madagascar, including a JV with Impala Platinum, for Ni, Cu and PGE in ultramafics of deformed layered intrusions. Supervision of 10 local and 2 expatriate geologists engaged in soil sampling, geophysics and drilling programmes in remote licences. Responsible for design and implementation of exploration programmes including budget preparation and control, drilling and geophysics contractors (mobilisation, quality control and payment), analytical services and compliance with strict environmental legislation.

**November 2008** promoted to new position of **Jubilee Platinum's Group Geologist**

In addition to managing Madagascar operations, also responsible for geological exploration and mineral resource estimation for the Jubilee Platinum group in South Africa (the Tjate PGE resource in the eastern Bushveld and PGE-bearing chromite tailings in the western Bushveld) and Kiwara's Kalumbila Cu, Ni, Co, U prospects in Zambia. Successfully prepared Kiwara-Kalumbila (now the Sentinel deposit) for sale to First Quantum.

**1995 – May 2008 Geological Consultant & Geology-Environmental Science Educator**

Career change necessitated by chronic serious illness of both parents and only sister. Geology and Environmental Science lecturer at Portsmouth, Camborne and Isle of Wight. Consultancies usually arranged for long vacations. Ongoing short consultancies in Botswana, including training of local geologists, and research on Ni-Cu deposits of Botswana, particularly the relationship between (a) the Tati Belt Ni-Cu deposits, including Norilsk's Phoenix and Selkirk ore bodies, and (b) the Limpopo Belt Ni-Cu deposits at Selebi-Phikwe and Dikoloti (Discovery Metals).

Consultancies included:

**May 2008 Water Surveys Botswana** Field mapping of sediments within Karoo basalts, field checking of radiometric interpretation and correlation with drilling in the last year to update structural interpretation of 2007 for the aquifer potential of the Karoo sediments and lavas of the Tuli Basin of Eastern Botswana

**April 2008 Mineral Resources of Madagascar** Evaluation of Jubilee Platinum's Ni-Cu and PGE prospects in Madagascar and planning of 2008 field programme.

**March – June 2007 Water Surveys Botswana** Preparation of new geology map and report on geology, structure and aquifer potential of Karoo sediments and lavas of the Tuli Basin of Eastern Botswana (part of UNESCO's Transboundary Aquifers in Africa project) for the Botswana Ministry of Mineral Resources and Water Affairs using radiometric, aeromagnetic and Landsat imagery.

**January – August 2005 Axmin, Sierra Leone Consultant Project Manager**

Grass roots Archaean greenstone gold exploration, supervision and training of 3 expatriate geologists in remote jungle. Stream sediment and soil sampling, mapping and trenching prior to drilling programme. Planned initial drilling of the Komahun BIF-hosted prospect in the Nimini Hills. Preparation of AIF for Axmin Sierra Leone Ltd for Stock Exchange purposes.

**September – December 2004 Teaching Fellow – Geology, Camborne School of Mines**

**August 2004 BCL Botswana** mapping and structural interpretation to locate extensions to the Archaean Selebi-Phikwe Ni-Cu deposits, plus training of local geologists

**August 2003 Water Surveys Botswana** Management of geophysics programme in search for rural village water supplies in Malawi

**July 2002 Tati Nickel, Botswana** – core logging and structural interpretation to find extensions to Lion Ore's Phoenix and Selkirk Ni-Cu mines in the Archaean Tati greenstone belt. Ongoing research into links between Tati Belt and Limpopo Belt Ni-Cu deposits.

**Retained geological consultant for Water Surveys Botswana.** Most important consultancy was from 1998 to 2000 on the Northeast District Groundwater Resources Investigation for the Botswana Ministry of Mineral Resources and Water Affairs. Preparation of a new geological map of the project area using new radiometric and aeromagnetic data, together with satellite imagery, Botswana Geological Survey mapping, borehole data, mineral exploration records and field checking. Prepared a report on the geology and structure of the Northeast district for the Department of Water Affairs. Expert Geologist status with Botswana Department of Water Affairs.

**1993-1995 Bolivar Goldfields, Venezuela**

**VP – Exploration**

Set up, built and led the successful exploration effort of a new Canadian-Venezuelan company, the most active of the juniors involved then in Venezuelan gold exploration. Supervised 13 geologists working in 16 concessions totalling 60,000 hectares, varying from grass roots to pre-feasibility projects. Prepared and controlled expenditure of annual budget of 6 million dollars. Negotiated drilling contracts and maintained good relations with government departments. Produced a regional structural synthesis and

assessed potential of possible new acquisitions. Implemented systematic soil panning as an exploration tool. Carried out detailed structural study and ore reserve calculations (sections on paper) of Au mineralisation at the Tomi prospect – 800,000 oz - eventually mined by Crystalex.,

**1992-1993 Gold Fields Venezuela** (Gold Fields of South Africa)

**Chief Geologist**

Responsible for the supervision of a new joint venture to prospect for gold and diamonds in Venezuela. Successfully formed a good working relationship with Venezuelan JV partners. Appointed alternate director of Chicanan Resources. Prepared annual budget of 1.5 million dollars and controlled this expenditure. Planned and supervised (5 geologists) all phases of gold exploration programme in saprolitised early Proterozoic greenstones of Guyana shield, including training local exploration staff. Carried out detailed mapping and structural study of Chicanan gold discovery and instigated hydrogeological, metallurgical, geotechnical and environmental investigations for pre-feasibility study. Liaison with government officials. Responsible for choice, quality control and payment of contractors for drilling, excavation and analytical services.

**1988-1992 Gold Fields Botswana** (Gold Fields of SA) **Senior Geologist & Acting Chief Geologist**

In charge of Gold Fields' exploration for precious and base metals and diamonds in Archaean greenstone belts and the Limpopo Belt of NE Botswana. Discovered Tekwane PGE-Ni-Cu deposit. Duties included geological mapping and structural interpretations of the Tati, Vumba and Matsitama greenstone belts and their gold prospects and the planning and supervision of soil geochemistry and D/D core drilling programmes. Responsible for target generation & successful concession applications to the Botswana Government, e.g. in the Damaran terrain of northern Botswana with two targets – Matchless-type stratiform volcanogenic massive sulphides and SEDEX Pb-Zn deposits (now held by Mt Burgess). Subsequent supervision of these new base metal and diamond projects in the Kalahari Desert as Acting Chief Geologist. Following the decision of Gold Fields of South Africa to expand out of their southern African base, selected to be the first international posting.

**1987-1988 Keele University**

**1 year temporary Lectureship in Geochemistry**

**1987 Southampton University**

Completed Ph.D. on Ni-Cu deposits of eastern Botswana

**1984-1986 Geophysical Service International, Bedford, UK**

**January 1986 to December 1986 China**

**Seismic Interpretation Supervisor**

Contracted to the Petroleum Corporation of the Peoples Republic of China (PCPRC) as the Seismic Interpretation Supervisor of a joint Chinese-GSI team evaluating of the geology, structure, and further potential of the Yumen oil field in the western Gobi Desert, Inner Mongolia. Technical responsibility for quality of seismic data collected by GSI field crew and integration with Chinese drilling data. Training of Chinese explorationists.

**March 1984 to January 1986 Saudi Arabia**

**Computer Applications Geologist**

Contracted to the Exploration Department of ARAMCO as a computer applications geologist in their Regional & Special Studies Group. Mainly concerned with regional basin evaluation by the integration of all well log and seismic data. A large element of training of Saudi explorationists was involved.

**1980-1983 Southampton University**

**Ph.D. research**

Postgraduate research into the Ni-Cu deposits of eastern Botswana, particularly Selebi-Phikwe in the Limpopo Belt. Petrological and geochemical study of structurally complex, highly metamorphosed, ore bodies, host rocks and country rocks. Included research into the adjacent Ni-Cu prospects at Dikoloti-Lentswe and the Phoenix and Selkirk deposits in the Tati greenstone belt.

**1977-1979 Geophysical Service International, Bedford, UK**

**January 1979 to December 1979 Saudi Arabia**

**Wellsite Geologist**

Contracted to ARAMCO. Responsible for ensuring that the objectives of deep wildcat boreholes in the Rub'al Khali down to 5000 metres were met. Made decisions concerning casing points, coring intervals, the running and quality of wire-line logs and drill-stem testing of oil reservoirs. Logged drill chips and cores, interpreted wire-line logs and correlated with other wildcat holes. Supervised mud-log geologists.

**March 1977 to December 1978      Iran****Exploration & Field Mapping Geologist**

Mineral reconnaissance, field mapping and photogeology of previously unmapped 7000 sq. km. project area extending from Central Iran to the Pakistan border as one of a team of 10 geologists. Main targets were porphyry coppers and uranium. Discovered porphyry copper mineralisation in the Taftan volcanic region. Training of Iranian geologists.

**1975-1977      Johannesburg Consolidated Investments (JCI), South Africa      Exploration Geologist**

Based mainly in South Africa, but also in Botswana and Zimbabwe. Exploration for base and precious metals, plus coal, uranium, and industrial minerals in a wide variety of geological terrains. Evaluation of the Putsberg Cu-Pb-Zn prospect in the Northwest Cape combining, mapping, photogeology, ground geophysics, and RC percussion and DD core drilling. Reconnaissance in the Limpopo Belt, developing lithogeochemical prospecting techniques for volcanogenic base metal deposits.

**1972-1975      Bamangwato Concessions (BotRST), Botswana****Exploration Geologist**

Exploration for base and precious metals in Archaean greenstone belts and the Limpopo Belt and uranium in Karoo sandstones. Main targets were Cu and Ni using soil geochemistry. Carried out detailed mapping, pitting, trenching, and RC percussion and DD core drilling of soil anomalies, mainly in the Matsitama greenstone belt.

**Other Information:** \* Married (one grown-up son)      \* Health: Good      \* Full clean UK driving licence

\* Computer Literate – usual Office packages plus experience of geological/resource software – GeoSoft-Target, MapInfo- Discover, DataMine and DataShed database, but not a computer expert .

\* Languages: French (quite good spoken, basic reading and writing) – I worked successfully in Madagascar and francophone West Africa; some Spanish.

\* Professional Member IMMM - confers Competent/Qualified Person status for public reporting purposes.

\* Former Official IMM Correspondent for Botswana.

\* Fellow of Geological Society, FGS \* Member, Prospectors & Developers Association of Canada, PDAC

\* Main interest: Trustee and main funds provider – Star Primary School, Jali, Malawi (mainly orphans)

**Referees:**

\* Mr Ole Christiansen, former CEO of NunaMinerals in Greenland. [arfvedsonit@gmail.com](mailto:arfvedsonit@gmail.com)

\* Mr Mario Rossi, GeoSystems International Inc, Florida USA. Geostatistician and co-author with Peter Brown of NI 43-101 compliant Technical Reports on Mineral Resource Estimates at Yaoure, Ivory Coast, email: [mrossi@geosysint.com](mailto:mrossi@geosysint.com)

\* Mr Dennis Thomas, founder of Thomas Mining Associates, Tel: +44(0)7887567999, email: [Thomasmining@aol.com](mailto:Thomasmining@aol.com)

\* Mr Andrew Sarosi, Technical Director, Jubilee Platinum, 6 Queens Road, Plymouth, PL4 7PJ, UK Tel/Fax: +44(0)1752 221937, email: [asarosi@talktalk.net](mailto:asarosi@talktalk.net)

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