



6th SGA-SEG-UNESCO-IUGS Short Course on African Metallogeny

Gold Deposits: from Exploration to Mining

to be held in

Yamoussoukro, Ivory Coast, 28th October – 1st November 2019

organized by

Society for Geology Applied to Mineral Deposits (SGA)

in cooperation with

INP HB, Yamoussoukro

Université Félix Houphouët-Boigny, Abidjan

RH Excellence Afrique, Abidjan

IRD, Toulouse, France

Université Paris Saclay (GEOPS)

Sponsored by



Exploration Drillers in West Africa



LMI-MINERWA

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Alphonse Yao (INP-HB, Yamoussoukro, Côte d'Ivoire)
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Christine Logbo Kossi 'Women in Mining, Abidjan, Côte d'Ivoire)

Introduction

Ivory Coast owns the largest area of gold prospective greenstones (Birimian) in West Africa, but is highly under-explored. However, gold is the largest mineral resource among all natural resources in Ivory Coast with the largest gold mines: Tongon, Bonikro, Ity and Angbovia. Since Ivory Coast is politically stable the past years, and significant technologies advances are achieved, a new gold rush has kickstarted. At present, Ivory Coast is getting one of the most productive countries for gold mining in Africa. Production roughly increased twofold between 2013 and 2015 from 13 t to 23.5 t of Au. More and more companies obtain a license for searching for valuable gold ore deposits in eastern, northern, and southwestern part of the country.

Most of the deposits are orogenic-type gold mineralizations, sediment hosted, and occur as quartz veins or in sheared carbonate sediments (with dioritic sills), carbonate hosted (e.g. Au bearing skarns) and as placer gold.

Innovation in exploration relies in reducing drilling, analytical and processing costs, in order to increase resource efficiency. This can only be achieved in a smart combination of regional and local data on the ore deposits (structures, footprints, mineralogical and chemical vectoring tools) using airborne and ground sensing technologies (e.g. seismic, gravity, radar, IP resistivity, electromagnetics) adapted to explore at surface and depths. Smart drilling followed by closed sensing data on drill-cores (portable instruments, automated core-logging) will speed up exploration, reduce waste and environmental impact while increasing metal recoveries. Geometallurgical key parameter definition can be used for smart beneficiation and processing designs.

The 6th short SGA short course on Gold will cover these topics. It is addressed to researchers, lecturers, PhD students, geologists from exploration, mining companies and government institutions.

Venue

The five-day short course will be held at the Institut National Polytechnique Félix Houphouët-Boigny, Yamassoukro about 3h north of Abidjan. from 28th October to 1st November 2019. The short course is composed of 2,5 days of lectures and 2 days excursion (Yaoure gold mine and surroundings).

Participants must arrive 27th of October. In Abidjan. The transfer by minibus from Abidjan airport to the hotel will be organized. Participants will leave together the 28th October in the morning from Abidjan to Yamoussoukro by minibus and dropped-off at their accommodation.

Number of participants

A maximum of 45 participants is set for logistic reasons and in order to ensure maximum benefits for each participant. It is expected that participants from industry meet and exchange with academia (researchers, lecturers and students).

Accommodation: (proposition)

Hotel	Localitycontact	Approximative price
Hôtel FANON	Rue des Lacs / hotelfanon@aviso.ci Cel. : +225 08 58 60 32	15 000 à 35 000 FCFA
Hôtel BEHIRA	Quartier Millionnaire	15 000 à 35 000 FCFA
Hôtel FONDI	Quartier Assabou	15 000 à 25 000 FCFA
Hôtel Bacambel	Quartier Assabou	15 000 à 25 000 FCFA

Fees short course

The course fee includes the 2,5-day lectures and 2,5 day- field trips, mine visit, course materials and light meals during the course, and a short-course banquet.

Lectures

- Industries: 900 €
- Government/academia: 400 €
- Students (2.5 days): 300 €

Field Trip

- Industries: 700 €
- Government/academia: 200 €
- Students (2.5 days): 100 €

Costs for travel to and from Abidjan, accommodation, breakfast and dinner are excluded. Students and young researchers can request a grant. Grant application is available on the website).

Social events: ice-breaker party, dinner and visit to the cathedral in Yamoussoukrou

VISA: After inscription and payment, a formal letter will be sent for VISA application.

Language: the workshop will be held in French and English.

Lecturers



Lenka BARATOUX, PhD, researcher at Institute de Recherche pour le Développement (IRD), Toulouse, France. She is a field geologist with a specialization in structural geology and petrology. She is particularly interested in geodynamics of Precambrian terrains and timing of the gold and base metal mineralization within the global tectonic scenario. Since 2006, she has been working in West Africa (Burkina Faso, Ghana, Niger, Senegal, Ivory Coast) in the framework of the West African Exploration Initiative project.



David BARATOUX, a senior research at the French National Research Institute for Sustainable Development. His research interest is the evolution and differentiation of planetary crusts. The objective of this research is to understand the distribution of chemical elements within the crust at all scales, including extreme concentrations of metals (i.e, ore deposits of economic interests). An important aspect of his research activities is to develop partnerships with scientists in developing countries and focus on research areas corresponding to the most pressing issues in these countries. He is involved in the West African Exploration Initiative (<http://www.tectonique.net/waxi3/>), the AMEDEE network (Mining Activities, Environment, Economic and Ethical

Development, (<http://www.amedee-network.science>), and is also leading the Africa Initiative for Planetary and Space Science, AFIPS, (<https://africapss.org>).



Lionel BOYA PhD. Since 4 years, Lionel is Research professor at Université Félix HOUPHOUET-BOIGNY and consultant at GEORECO. PhD in Earth Sciences, option Petrology-Geochemistry-Metallogeny, Lionel worked for almost 10 years on different topics: petrology, metallogeny and geochemistry of hydrothermal alterations of gold deposits in west Anti-Atlas (Morocco), on geology of epithermal deposits of El Hammam district (fluorite) and Imiter Mine of silver (east Anti-Atlas), also in Morocco. He began his career as a geologist, tin exploration project manager at MANAGEM Group, before working to the group's largest project, Imiter, like geology responsible of production areas. He has contributed to some research works on Birimian gold mineralization, particularly located on Toumodi-Fètêkro greenstone belt. As a consultant, he assisted some companies in research (gold mineralization, diamond, raw material cement ...). It also provides training for officials of the Ministry of Mines and Geology.



Jochen KOLB, Professor, Karlsruhe Institut of Technology (KIT), Karlsruhe, Germany. Jochen Kolb has more than 20 years of experience in research on Archean and Paleoproterozoic orogenic gold deposits worldwide. He has both, university experience and experience in working in a geological survey. Jochen studies orogenic gold deposits with a holistic approach, using structural geology, petrology, geochemistry and isotope data. He also worked on other hydrothermal gold mineralization types, such as copper porphyry and epithermal deposits. He has a strong field work background from projects in Greenland, with mapping of Archean and Paleoproterozoic terranes.



Beate ORBERGER is Associate Professor at the University of Paris Sud, Orsay, France and president of Catura Geoprojects (Geoscience Conseil). She has 30 years of experience in economic geology and geometallurgy, mainly on sediment-hosted Iron and Manganese deposits (Brazil, Australia, South Africa, Zimbabwe, Gabon), but also on Ni and Mn laterites. She worked for 5 years for ERAMET. Her major research contributions are in the field of metal transfer and trapping during fluid circulation (magmatic, hydrothermal and weathering processes). At present, she is scientific coordinator of several EU financed projects (H2020, EIT-KIC) constructing combined drilling and on-line-on-mine-real time analytical expert systems to increase resource efficiency during exploration, mining and processing. She is SEG fellow and SGA councilor.



Stéphane Perrouy is Assistant Professor of Precambrian Geology in the Mineral Exploration Research Center, Harquail School of Earth Sciences, Goodman School of Mine, at Laurentian University, Canada. He completed a PhD at the University of Toulouse, France, a post-doctoral fellowship at the Institute of Research for the Development, France, and a post-doctoral fellowship at the University of Western Ontario, Canada. He is currently involved in several > \$10M multidisciplinary collaborative research programs, including the AMIRA West African Exploration Initiative, the NSERC-CMIC Exploration Footprints project, and the CFREF Metal Earth project. His research integrates structural geology, mineralogy, lithogeochemistry, applied geophysics, and three-dimensional modeling to understand tectonic processes associated with Precambrian ore deposits.

Stéphane is sponsored by the Society of Economic Geologists to give his lecture at this short course.



Peter WILLIAMS has a lifelong experience in exploration geophysics. He worked for Western Mining Corporation, Australia, as Chief Geophysicist and Manager of Geoscience Technology. Since then he has been on the forefront of exploration and founded several companies that were directly responsible for major discoveries and asset identification, also in West Africa. As well as working in industry he also holds adjunct positions at the Western Australian School of Mines, Curtin University, and lectures at ENAG (Ecole nationale d'applications des geosciences) in France.

Program

6th Workshop on African Metallogeny Yamoussoukro, Ivory Coats

Gold deposits: from exploration to mining

Monday Day 1: morning: travel from Abidjan to Yamoussoukrou together by bus

Lunch

- 14H00-14H30: Welcome (OFFICIALS)
- 14H30-15H00: Introduction to the geology and metallogeny of Ivory Coast (Lionel Boya)
- 15H00-16H00: Metallogeny of Gold deposits (Jochen Kolb)
- Coffee break
- 16H30 –17H30 Gold deposits in Ivory Coast (Alain Kouamelan or Ycouba Coulibaly)
- 17H30-18H30: Geodynamics and Metallogeny of the West African Craton and Structural control of Gold deposits (Lenka Baratoux)

Tuesday: Day 2 Gold Exploration

09H00 – 10H30: Mineralogy of Gold deposits, footprints and vector minerals (Stéphane Perrouty). Sponsored by the Society of Economic Geologists

Coffee break

11H00-12H30: Out of the silos - the role of smart adaptive cross discipline exploration (Peter Williams)

LUNCH

14H00-15H30: The roles of geophysics from crystal to prospect scale in large scale gold deposits (Peter Williams)

Coffee

16H30-17H00: Combining drilling and on-line-on-mine-real-time analyses: on-line geometallurgy to increase resource efficiency (Beate Orberger)

17H00-17H30: Sonic Drilling: increasing resource efficiency (Beate Orberger)

Wednesday: Day 3

09H00-10H30: Portable instruments, multi-scale analyses of the distribution of chemical elements and exploration (David Baratoux)

Coffee break

11H00-12H30: Exploration modelling (Stephane Perrouty)

12H30-13H00: Conclusions

Lunch

Thursday Day 4 and Friday Day 5

**Excursions -field work
details will be presented**

study of drill cores Yaoure Mine (Ghislain Tourigny?)

Friday afternoon: Departure to Abidjan