International course on
Ore Deposit Models and Exploration: Base and Precious Metal Deposits
1-7 Oct. 2016, Tehran, Iran

Organizer: Samaneh Kamsar Zamin (SKZ)
Sponsor: Iranian Mines & Mining Industries Development & Renovation Organisation (IMIDRO)

Instructors:

Jeremy P. Richards: Porphyry and Epithermal Deposits (Professor of University of Alberta, Department of Earth and Atmospheric Sciences)

Richard Goldfarb: Orogenic Gold Deposits (U.S. Geological Survey (Retired), Professor of Colorado School of Mines)

David L. Leach: Mississippi Valley-Type (MVT) Deposits (U.S. Geological Survey (Retired), Professor of Colorado School of Mines)

David Lowell Huston: Volcanogenic Massive Sulfide (VMS) Deposits (Principal Research Scientist, Resources Division, Geoscience Australia)
Course info:

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<td>R. Goldfarb</td>
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Terms and Conditions:
- All fees are VAT included.
- Registration of all theoretical courses (1-5 Oct. 2016) receives 20% discount.
- Registration of two field trips receives 5% discount.
- Registration of all theoretical courses (1-5 Oct. 2016) and the two field trips (6-7 Oct. 2016) receives 30% discount.
- Field trips are subject to cancellation 30 days prior to the event if the minimum number of participant is not met.
- Registration fees include:
  - Attendance to the course
  - Course package, including copies of manuals
  - Certificate of attendance
  - Lunch and tea/coffee
  - Shuttle bus transportation for field trips from Yazd/Isfahan to Kushk, Muteh, Irankuh, Kahang sites and return to Yazd/Isfahan
  - Light meals and refreshments during field trips
Field trips:

1. Kahang Cu-Mo±Au Porphyry Deposit (led by J. Richards)

The Kahang deposit is located about 73 km NE of Isfahan in Central Iran. This deposit contains more than 100 million tonnes of sulphide ore with an average grade of 0.5 % Cu and 90 ppm Mo according to the NICICO latest exploration results (Afzal et al. 2012; 2013). The deposit is situated in the Cenozoic Urumieh-Dokhtar magmatic belt. This deposit is mainly composed of Eocene volcanic-pyroclastic rocks, which were intruded by quartz monzonite, monzogranite-diorite to dioritic intrusions in Oligo-Miocene rocks. The extrusive rocks, including tuffs, breccias and lavas are dacitic to andesitic composition. On the other hand, these intrusions are roots of acidic to intermediate domes in the Kahang porphyry deposit. The main structural features are two fault systems trending NE-SW and NW-SE. The major alteration zones of potassic, phyllic, argillic and propylitic types were accompanied by vein to veinlets fillings of quartz, quartz-magnetite and Fe-hydroxides. Mineralization within intrusive bodies and their surrounding host rocks consists of chalcoite, chalcopyrite, pyrite, malachite, magnetite, limonite jarosite, goethite and chalcantite in quartz stockworks and advanced argillic alteration (Afzal et al. 2010; Yasrebi et al. 2013).
You can see the following references for this deposit:


2. Muteh gold complex (led by R. Goldfarb)

Muteh gold complex is located 55 Km east of Golpayegan City, Central Iran (below figure). The complex occurred in Sanandaj–Sirjan structural–metamorphic zone which is 1,500 Km in length and 150 to 200 Km in width. The Muteh complex which consists of nine gold deposits such as Chah Khaton and Senjedeh have been extracted since 1991. The rocks in the vicinity of the Muteh deposit are predominantly schist and gneiss, subsidiary amphibolite and quartzite, local marble, and magnetite horizons. Hydrothermal alteration associated with the gold occurrences is characterized by intense, pervasive bleaching of the host rocks. In areas where alteration is less intense, it can be seen that the bleaching occurs along small fractures crosscutting the sub-horizontal foliation of the host rocks. Alteration zones in the deposit consist of silicification and argilic types. There is silicic veins and veinlets by aperture between 1 cm and 1 m and rarely consist of pyrite, chalcopyrite, malachite, and Fe oxides (Rachidnejad-Omran et al., 2002; Moritz et al. 2006; Mohammadi et al. 2013; Kouhestani et al. 2014;

You can see the following references for this deposit:


- Moritz, R, Ghazban, R., Singer, B.S., 2006, Eocene Gold Ore Formation at Muteh, Sanandaj-Sirjan Tectonic Zone, Western Iran: A Result of Late-Stage Extension and
Exhumation of Metamorphic Basement Rocks within the Zagros Orogen. *Economic Geology*, 101, pp


(gold), and Angouran (mixed sulfide–nonsulfide zinc) at the intersection of the Sanandaj–Sirjan metamorphic zone with Cenozoic–Quaternary magmatic belt of Urumieh–Dokhtar (Moritz et al. 2006).

3. Irankuh Zn-Pb mines (led by D. Leach)

The Irankuh district includes several sulfide and non-sulfide Zn–Pb deposits located in Irankuh Mountains, 20 km south of Esfahan (Central Iran), and belongs to the Sanandaj-Sirjan zone from the Zagros orogenic belt. The Irankuh region comprises several Zn–Pb deposits especially Goushfil (mainly sulfide ore) and Kolahdarvazeh (predominantly non-sulfide ore). The whole area shows an intensive and extensive faulting. The Irankuh deposits are identified as Mississippi Valley Type (MVT) based on their discordant nature, emplacement along the Irankuh Fault, progressive depletion in stable C isotope ratios of the host dolomites and isotopic characteristics of the ore-stage dolomites and barites. These deposits are stratabound and carbonate-hosted bodies with an ore mineral assemblage consisting of sphalerite, galena, pyrite, marcasite, dolomite, calcite, quartz, rarely barite, fluorite, celestine, gypsum, anhydrite and pyrrhotite (Hosseini-Dinani et al. 2015; Mokhtari, 2015; Hosseini-Dinani and Aftabi, 2016).

Geological map of the Irankuh area within its location in the map of Iran (Mokhtari et al. 2015)
You can see the following references for this deposit:

4. Kushk Zn-Pb mines (led by D. Huston)

The zinc–lead SEDEX stratiform deposits at Kushk, Chahmir, and Zarigan formed in the same tectono-sedimentary environment (Posht-e-Badam Block). The SEDEX type Kushk zinc–lead deposit is the biggest zinc–lead deposit of Bafq area. Related to a caldera structure, the area contains outcrop of various rock types including volcanic and sub-volcanic rocks (rhyolites, rhyodacites, dacites, and rhyolitic tuffs) and sedimentary rocks (shale, limestones, and dolomites). Mineralization at the deposit is hosted by Neoproterozoic black shales, and sedimentary breccias exist in the lower sandstone and silty limestone lithologies recorded in the northeastern part of the deposit. The paragenetic sequence of minerals indicates two stages of lead ore (galena) mineralization and one stage of zinc ore formation. Overall, the Kushk deposit is a fine-grained stratiform-banded deposit, with sphalerite, galena and pyrite the main sulfides developed. The ore-bearing sequence of footwall limestones and hanging-wall dolomites within black shales outcrops in the Zardu Syncline and is truncated by the northwest–southeast trending Kushk Fault (Samani, 1988; Rajabi et al. 2012; Heidari Dahooei et al. 2016).

You can see the following references for this deposit:
The Zarigan-Chahmir basin map within Zn–Pb SEDEX deposits and Geological map of Kushk deposit (Rajabi et al. 2012; Heidari Dahooei et al. 2016)
Registration Form:

General Information:
Given name:          Surname:          Title (Mr./Ms./Dr./Prof.):
Date of birth:       Gender:          City:          Passport no.:
Country of residence:

Education:
Graduated☐        Student☐        Major study:
Bs☐        Msc☐        Ph.D☐        University name:

Applicant Position:
Job title:          Institute/Organization:
Experience (years):
Are you a member of geosciences/mining associations? Please list your memberships.

Contacts:
Email:          Adress:          Tel:

I am applying for the following courses:

- Orogenic Gold Deposits (R. Goldfarb)          Saturday          1 Oct.☐
- Porphyry Deposits (J. Richards)          Sunday          2 Oct.☐
- Volcanogenic Massive Sulfide (VMS) deposits (D. Huston)          Tuesday          4 Oct.☐
- Mississippi Valley-Type (MVT) deposits (D. Leach)          Wednesday          5 Oct.☐
- All theoretical courses          Saturday- Wednesday          1-5 Oct.☐

I am applying for the field trips:

- Irankuh Zn-Pb Mines (D. Leach)          Friday          7 Oct.☐
- Kahang Porphyry Deposit (J. Richards)          Friday          7 Oct.☐

Please fill the registration form and send it to info@samanehkansar.ir or info@samanehkansar.com
If you have any questions please, do not hesitate to contact Ali Sholeh: sholeh@samanehkansar.ir

Applicant name          Date          Applicant signature