

Deposit / Mine	Deposit type	Craton/ Orogenic belt	Au (t)/ Grade (g/t)	Principal host rock	Mineral assemblage	Age (Ma)	Reference
Telfer gold copper deposit	Orogenic	Paterson province in Australia	1564/1.50	Calcareous, argillaceous, and locally carbonaceous siltstones, sandstones, dolomitic rocks.	Quartz, pyrite, chalcopyrite, pyrrhotite, galena, sphalerite, free gold, tourmaline, rutile, xenotime, monazite	U-Pb of monazite and xenotime: 659 – 638 Ma; U-Pb of monazite: 592 Ma; U-Pb of zircon: 645 – 600 Ma.	(Rowins et al., 1997; Schindler et al., 2016)
Bendigo-Ballarat	Orogenic	Central Victoria in Australia	533/12.91	Flyschoid sedimentary facies, shales, muds, rhythmically interbedded with sandstone and greywacke.	Free gold, pyrite, arsenopyrite, white mica, carbonates, sphalerite, galena, stibnite, quartz, monazite	<sup>40</sup> Ar/ <sup>39</sup> Ar of white mica: 455 – 440 Ma; 420 – 400 Ma; 385 – 365 Ma	(Goldberg et al., 2007; Willman, 2007; Phillips et al., 2012)
Nezhdaninsky	Orogenic	Okhotsk–Chukotka belt in Russia	629/5.10	Siltstone, sandstone, carbonaceous shale	Scheelite, pyrite, arsenopyrite, ankerite, quartz, gold, chalcopyrite, galena, sphalerite, sulfosalt, dolomite, chalcostibnite, stibnite, spessartine, monazite	105 – 80 Ma; 95 – 70 Ma; 153 Ma, 154 Ma, 168 Ma	(Bortnikov et al., 2007)
Natalka	Orogenic	Yana–Kolyma orogenic belt in Russia	716/4.20	Carbonaceous-terrigenous (black shale) complexes	Arsenopyrite, pyrite, pyrrhotite, galena, sphalerite, scheelite, chalcopyrite, native gold, ilmenite, rutile, monazite	U-Pb of zircon: 262 Ma; 269 Ma	(Mikhailitsyna and Sotskaya, 2020)

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Olimpiada	Orogenic	Eastern gold-bearing belt of the Yenisei Ridge in Russia	700/10.90	Brown-gray quartzite-like biotite–quartz schists; gray and greenish-gray metasiltstones; carbonate and carbonaceous substance; carbonate rocks; black carbonaceous shales;	Arsenopyrite, pyrite, pyrrhotite, chalcopyrite, stibnite, berthierite, gudmundite, tetrahedrite, bismuth tellurides, ullmannite, gersdorffite, visible gold, aurostibite, monazite	$^{40}\text{Ar}/^{39}\text{Ar}$ : 817 – 660 Ma	(Gibsher et al., 2019; Silyanov et al., 2021)
Sukhoi log	Orogenic	Siberian craton in Russia	1237/8.34	Carbonaceous shales	Pyrite, chalcopyrite, pyrrhotite, sphalerite, pentlandite, carbonate, chlorite, monazite	546 ± 22 Ma; 320 ± 16 Ma; 370 – 350 Ma; U-Pb of monazite: 573 ± 12 Ma; 516 ± 10 Ma	(Meffre et al., 2008; Yakubchuk et al., 2014)
Bodaybo	Orogenic	Mamsko-Bodaybinsky District in Russia	1200/2.80	Carbonaceous shales; metamorphosed sandstones and siltstones	Pyrite, chalcopyrite, sphalerite, galena, chalcocite, covellite, visible gold, tennantite, monazite		(Palenova et al., 2015; Ankusheva et al., 2020)
Tarkwa	Orogenic	West African Craton in Ghana	200/1.13	Sandstones, conglomerates with minor grits, breccias and argillites	Pyrite, pyrrhotite, chalcopyrite, marcasite, chalcocite, bornite, hematite, magnetite, rutile, zircon, xenotime, monazite	U–Pb dates from detrital zircons: 2133 ± 4 Ma; 2200 – 2100 Ma; U–Pb age of xenotime: 2063 ± 9 Ma	(Pigois et al., 2003)

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Witwatersrand	gold – uranium deposit	Transvaal and Orange Province in South Africa	900/ 3.0 – 9.5	Conglomerates, arkosic sandstones, quartzites, andesitic lavas and tuffs, tillites	Pyrite, native gold, sphalerite, chalcopyrite, pyrrhotite, cassiterite, columbite–tantalite, monazite, ilmenite, garnet	Zircon: 2.5 Ga; Pb-Pb age of rutile: 2.58 ± 0.03 Ga; U-Pb age of zircon: 2.02 Ga	(Frimmel, 1997; Shilo, 2007)
Muruntau Open Pit	Orogenic	Tien Shan belt in Uzbekistan	5290/ 3.5 – 4.0	Metamorphosed Cambrian-Ordovician shales and carbonaceous siltstones	Pyrite, arsenopyrite, pyrrhotite, marcasite and chalcopyrite, sphalerite, galena, gold, native silver, electrum, ilmenite, scheelite, monazite, rutile	Re-Os of arsenopyrite: 287.5 ± 1.7 Ma; <sup>40</sup> Ar/ <sup>39</sup> Ar of sericite: 221.8 ± 0.9 Ma; Rb-Sr: from 257 ± 13 and 219 ± 4.2 Ma U-Pb of zircon and monazite: 291 ± 3 Ma; 292 ± 8 Ma	(Bierlein and Wilde, 2010; Kempe et al., 2015)

#### References cited:

- Ankusheva, N.N., Palenova, E.E., and Shanina, S.N. (2020) Fluid inclusion evidences for the P-T conditions of quartz veins formation in the black shale-hosted gold deposits, Bodaybo ore region, Russia. *Journal of Earth Science*, 31, 514-522.
- Bierlein, F.P., and Wilde, A.R. (2010) New constraints on the polychronous nature of the giant Muruntau gold deposit from wall-rock alteration and ore paragenetic studies. *Australian Journal of Earth Sciences*, 57, 839-854.
- Bortnikov, N.S., Gamyagin, G.N., Vikent'eva, O.V., Prokof'ev, V.Y., Alpatov, V.A., and Bakharev, A.G. (2007) Fluid composition and origin in the hydrothermal system of the Nezhdaninsky gold deposit, Sakha (Yakutia), Russia. *Geology of Ore Deposits*, 49, 87-128.
- Frimmel, H. (1997) Detrital origin of hydrothermal Witwatersrand gold—a review. *Terra Nova*, 9, 192-197.
- Gibsher, N.A., Sazonov, A.M., Travin, A.V., Tomilenko, A.A., Ponomarchuk, A.V., Sil'yanov, S.A., Nekrasova, N.A., Shaparenko, E.O., Ryabukha, M.A., and Khomenko, M.O. (2019) Age and duration of the formation of the Olimpiada gold deposit (Yenisei Ridge, Russia). *Geochemistry International*, 57, 593-599.
- Goldberg, I.S., Abramson, G.Y., Haslam, C.O., and Los, V.L. (2007) Depletion and enrichment zones in the Bendigo gold field: A possible source of gold and implications for exploration. *Economic Geology*, 102(4), 745-753.
- Kempe, U., Seltmann, R., Graupner, T., Rodionov, N., Sergeev, S.A., Matukov, D.I., and Kremenetsky, A.A. (2015) Concordant U–Pb SHRIMP ages of U-rich zircon in granitoids

- from the Muruntau gold district (Uzbekistan): Timing of intrusion, alteration ages, or meaningless numbers. *Ore Geology Reviews*, 65, 308-326.
- Meffre, S., Large, R.R., Scott, R., Woodhead, J., Chang, Z., Gilbert, S.E., Danyushevsky, L.V., Maslennikov, V., and Hergt, J.M. (2008) Age and pyrite Pb-isotopic composition of the giant Sukhoi Log sediment-hosted gold deposit, Russia. *Geochimica et Cosmochimica Acta*, 72, 2377-2391.
- Mikhailitsyna, T.I., and Sotskaya, O.T. (2020) The role of black-shale strata in the formation of the Nataika and Pavlik gold deposits (Yana–Kolyma Orogenic Belt). *Russian Geology and Geophysics*, 61, 1354-1373.
- Palenova, E.E., Belogub, E.V., Plotinskaya, O.Y., Novoselov, K.A., Maslennikov, V.V., Kotlyarov, V.A., Blinov, I.A., Kuzmenko, A.A., and Griboedova, I.G. (2015) Chemical evolution of pyrite at the Kopylovsky and Kavkaz black shale-hosted gold deposits, Bodaybo district, Russia: Evidence from EPMA and LA-ICP-MS data. *Geology of Ore Deposits*, 57, 64-84.
- Phillips, D., Fu, B., Wilson, C.J.L., Kendrick, M.A., Fairmaid, A.M., and Miller, J.M. (2012) Timing of gold mineralisation in the western Lachlan Orogen, SE Australia: A critical overview. *Australian Journal of Earth Sciences*, 59, 495-525.
- Pigois, J., Groves, D.I., Fletcher, I.R., McNaughton, N.J., and Snee, L.W. (2003) Age constraints on Tarkwaian palaeoplacer and lode-gold formation in the Tarkwa-Damang district, SW Ghana. *Mineralium Deposita*, 38, 695-714.
- Rowins, S.M., Groves, D.I., McNaughton, N.J., Palmer, M.R., and Eldridge, C.S. (1997) A reinterpretation of the role of granitoids in the genesis of Neoproterozoic gold mineralization in the Telfer Dome, Western Australia. *Economic Geology*, 92, 133-160.
- Schindler, C., Hagemann, S.G., Banks, D., Mernagh, T., and Harris, A.C. (2016) Magmatic hydrothermal fluids at the sedimentary rock-hosted, intrusion-related Telfer gold-copper deposit, Paterson orogen, Western Australia: Pressure-temperature-composition constraints on the ore-forming fluids. *Economic Geology*, 111, 1099-1126.
- Shilo, N.A. (2007) The Witwatersrand deposit and the problem of the ore formation. *Russian Journal of Pacific Geology*, 1, 495-502.
- Silyanov, S.A., Sazonov, A.M., Tishin, P.A., Lobastov, B.M., Nekrasova, N.A., Zvyagina, E.A., and Ryabukha, M.A. (2021) Trace elements in sulfides and gold of the Olimpiada deposit (Yenisei Ridge): Ore substance sources and fluid parameters. *Russian Geology and Geophysics*, 62, 306-323.
- Willman, C.E. (2007) Regional structural controls of gold mineralisation, Bendigo and Castlemaine goldfields, Central Victoria, Australia. *Mineralium Deposita*, 42, 449-463.
- Yakubchuk, A., Stein, H., and Wilde, A. (2014) Results of pilot Re–Os dating of sulfides from the Sukhoi Log and Olimpiada orogenic gold deposits, Russia. *Ore Geology Reviews*, 59, 21-28.