



UNIVERSITAT DE
BARCELONA

Estudio Geológico y Metalogenético del Basamento Precámbrico del Sáhara Occidental

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CAPITULO 11

REFERENCIAS

REFERENCIAS

- Abati, J., Aghzer, A.M., Gerdes, A., Ennih, N., (2010): Detrital zircon ages of the Neoproterozoic sequences of the Moroccan Anti-Atlas belt. *Precambrian Research* 181, 115–128.
- Abdel-Rahman A. (1994): Nature of biotites from alkaline, calc-alkaline, and peraluminous magmas. *J. Petrol.* 35, 525–541.
- Abdivall, T. (1994): Caractérisation pétrographique et géochimique du plutonisme birimien de la dorsale Réguibat (Mauritanie, Afrique de l'ouest). Thèse Université Nancy1, (France), inédite. 172 p.
- Abouchami, W., Boher, M., Michard, A., Albarède, F. (1990): A major 2.1 Ga event of mafic magmatism in West Africa: an early stage of crustal accretion. *J. Geophys. Res.* 95, 17605–17629.
- Abu Elatta, S.A., Assran, H.M., Ahmed, A.A. (2013): Preliminary Study on HFSE Mineralization in the Peralkaline Granites of Nusab El Balgum Area, South Western Desert, Egypt. *Geomaterials*, 3, 90-101.
- Affaton, P., Gaviglio, P., Pharisat, A. (2000): Réactivation du craton ouest-africain au Panafricain: paléocontraintes déduites de la fracturation des grès néoprotérozoïques du Karey Gorou (Niger, Afrique de l'Ouest). *C.R. Acad. Sci.* 331, 609-614.
- Aftabi, A., Zarrinkoub, M.H. (2013): Petrogeochemistry of listvenite association in metaophiolites of Sahlabad region, eastern Iran: Implications for possible epigenetic Cu-Au ore exploration in metaophiolites. *Lithos*, vol. 156-159, 186-203.
- Ahmed Mulay, B. (2014): Caracterización geológica y prospección de recursos hídricos en el sur de Tiris (Sahara occidental). Tesis doctoral inédita. Universidad Complutense de Madrid. 323p. Madrid.
- Ahmed, A.H., Arai, S., AbdelAziz, Y.M., Rahimi, A. (2005): Spinel composition as a petrogenetic indicator of the mantle section in the Neoproterozoic Bou Azzer ophiolite, Anti-Atlas, Morocco. *Precambrian Research* 138, 225-234.
- Akbulut, M., Piskin, O., Karayigit, A. (2006): The genesis of the carbonitized and silicified ultramafic known as listvenites: a case study from the Mihaliccik region (Eskisehir), NW Turkey. *Geological Journal*, 41, 557-580.
- Alfonso, P., Melgarejo, J.C., Corbella, M. (1995): Nb-Ta-minerals from the Cap de Creus pegmatite field, eastern Pyrenees: distribution and geochemical trends. *Mineral. Petrol* 55, 53-59.
- Alía-Medina, M. (1943b): Notas de una expedición geológica a los territorios del Sáhara español. *Investigación y progreso*, 34-44 .
- Alía-Medina, M. (1943b): Notas de una segunda expedición geológica por el Sáhara Español. *Bol. R. Soc. Esp. Hist. Nat.* 41, 291-316.
- Alía Medina, M. (1944a): Datos geológicos de la zona septentrional del Sáhara español. *Investigación y progreso* 15, 93-104.
- Alía-Medina, M. (1944b): El Cretácico fosilífero del Sáhara septentrional Español. *Bol. Real Soc. Esp. Hist. Nat* 42, 395-396.
- Alía-Medina, M. (1945a): El Cuaternario en el Sáhara Español, *Bol. Real Sociedad Española de Historia Natural* 43, 149-163.
- Alía-Medina, M. (1945b): Características morfográficas y geológicas de la zona septentrional del Sáhara Español, *Inst. José Acosta, Madrid, Serv. Geol.* 2, 260p., 38 pl.

- Alía-Medina, M. (1945c): Notas de una tercera expedición geológica al Sáhara español. Boletín de la Real Sociedad Española de Historia Natural. 43, 499-513, 4 p. de lám.
- Alía-Medina, M. (1946): La posición tectónica del Sáhara español en el conjunto africano. Bol. Real Soc. Geogr. 82, 179-196, VI p. de lám. mapas.
- Alía Medina, M. (1947a): Enriquecimiento ferruginoso en el Devónico del Sáhara Español. Estudios Geológicos, 6, 101-105.
- Alía Medina, M. (1947b): Observaciones geológicas en el ángulo SE del Sáhara Español. Bol. Real Soc. Esp. Hist. Nat. 45(7-8), 517-522.
- Alía Medina, M. (1948a): Primeros resultados de dos expediciones geológicas al Sáhara español. Descripción física. Boletín de la Real Sociedad Española de Historia Natural 46, 1948, 725-735, 6 p. de lám.
- Alía Medina, M. (1948b): La geología del Sáhara Occidental. Conferencia del curso, organizado por esta Delegación, pronunciada por su autor el 17 de abril de 1947. Alta Comisaría de España en Marruecos, Delegación de Educación y Cultura Tetuán, (Imp. del Majzen). Descripción física, 199-121, 4 h. de lám.
- Alía-Medina, M. (1948c): La tectónica en arcos del Sáhara Español. Las Ciencias 2, 335.
- Alía-Medina, M. (1949a): El Sáhara Español, 2e part. Estudio geológico, Instituto de Estudios Africanos, Madrid, 201-414.
- Alía-Medina, M. (1949b): Contribución al conocimiento geomorfológico de las zonas centrales del Sáhara Español. Instituto de Estudios Africanos. 232 p., XXX h. de lám., 8 h. pleg. de lám.
- Alía Medina, M. (1950a): El descubrimiento de los fosfatos del Sáhara Español. Revista África 97, 8-10.
- Alía Medina, M. (1950b): Sobre el Paleozoico del Tiris (Sáhara Español). Notas Comunic. Inst. Geol. Min. España 20, 93-98.
- Alía Medina, M. (1951): Los yacimientos de fosfatos sedimentarios del Sáhara Español. II Congreso Nac. Ingeniería. Instituto de Ingenieros Civiles de España tomo V, grupo. IV, 89-94.
- Alía Medina, M. (1952a): El Precámbrico del Sáhara Meridional Español. C.R. XIX Congr. Géol. Int. Algers, 20, 73-84.
- Alía Medina, M. (1952b): Interpretación de algunas estructuras petrográficas del Sáhara Español, Archivos del Instituto de Estudios Africanos 20, 7-10.
- Alía Medina, M. (1952c): La arquitectura geológica del Sahara Español, Archivos del Instituto de Estudios Africanos 21, 27-39.
- Alía Medina, M. (1953): Formaciones ferruginosas en el Sáhara meridional Español. Fascículo X, XIX Sesión Congr. Geol. Int. Argel. 10, 39-45.
- Alía-Medina, M. (1954): Sobre la existencia de formaciones de hamada neógena en el Sahara meridional español. Archivos del Instituto de Estudios Africanos 29, 49-54.
- Alía-Medina, M. (1958): Esquema geológico del Sahara Español. Mapa Escala 1:2.000.000 Talleres del Instituto Geográfico y Catastral de España.
- Alía Medina, M. (1960): La tectónica del Sáhara Español. XXI Int. Geol. Congr. 18, 193-202.
- Alía-Medina, M. (1971): Geología básica y aplicada: los fosfatos del Sáhara español. Las Ciencias, 36(1), 1-18.
- Alía-Medina, M., Arribas, A. (1953): Formaciones ferruginosas en el Sáhara Meridional Español. Fascícula 10, XIX Ses. IGC, Argel.
- Alvarado Medina, A. de, Viña, J. de la, Muñoz Cabezón, C. (1958): Mapa geológico del Sáhara Español y zonas limítrofes. Escala 1:500.000. IGME. Ministerio de Industria, Madrid.
- Anders, E., Grevesse, N. (1989): Abundances of the elements: Meteoritic and solar: Geochim. Cosmochim. Acta 53, 197-214.
- Anderson, A.T.Jr., Morin, M. (1968): Two types of massif anorthosites and their implications regarding the thermal history of the crust. In Y.W. Ysachsen (ed): Origin of anorthosite and related rocks. New York State Mus. and Sci. Service Mem. 18, 57-69.
- Anónimo (1966): Descubrimiento, cubicación y evaluación del yacimiento de fosfato de Bu-Craa (Provincia del Sáhara). Madrid: Empresa nacional Minera del Sahara S.A. 203 pp.
- Anónimo (1968): Exploration of Bu-Craa

- deposit, Spanish Sahara. New York: United Nations, Mineral Resour. Div. Ser. 23, 284-291.
- Anónimo (1973): Bu-Craa - major addition to world phosphate mining capacity. Phosphorus & Potassium, 64, 21-27.
- Arden, D.D., JR., Rehrig, W.A. (1964): Middle Devonian stratigraphy of northeastern Spanish Sahara. Bull. AAPG 48, 9, 1513-1525.
- Arévalo, P., Arribas, A. (1960): Estudio mineralógico de los sedimentos cuaternarios actuales de la región occidental del Sáhara meridional español. Estudios Geológicos 16, 163-185.
- Arribas, A. (1960a): El Precámbrico del Sáhara español y sus relaciones con el Precámbrico de otros países africanos. Est. Geol. 16, 199.
- Arribas, A. (1960b): Las formaciones metamórficas del Sáhara Español y sus relaciones con el Precámbrico de otras regiones africanas. Rep. 21st International Geological Congress, Norden 1960, Copenhagen, Denmark, part IX, 51-58.
- Arribas, A. (1968): El Precámbrico del Sáhara español y sus relaciones con las series sedimentarias más modernas. Bol. Geol. Min. 79, 445-480.
- Ashley, P.M., Hartshorn, G.K. (1988): Geological and geochemical characteristics of lode gold deposits in the Nundle Goldfield, northeastern New South Wales. In: J. D. Kleeman (ed.), New England Orogen; tectonics and metallogenesis. University of New England Department of Geology and Geophysics, Armidale, N.S.W., Australia, pp. 249-263.
- Ash, C.H., Arksey, R.L. (1990): The listwanite-lode gold association in British Columbia. Geological Survey Branch, Geological Fieldwork 1989, Paper 1990-1, 359-364.
- Ashley, P.M. (1997): Silica-carbonate alteration zones and gold mineralisation in the Great Serpentinite Belt, New England Orogen, New South Wales. In: P.M. Ashley and P.G. Flood (eds.), Tectonics and Metallogenesis of the New England Orogen, Geological Society of Australia, Special Publication, 19, 212-225.
- Ashwal, L.D. (1993): Anorthosites. Series on Minerals and Rocks 21. Springer-Verlag, New York, Berlin, Heidelberg, 422 pp.
- Atencio D., Andrade M.B., Christy A.G., Giere R., Kartashov, P.M. (2010): The pyrochlore supergroup of minerals: nomenclature. Canadian Mineralogist 48, 569-594.
- Auclair, M., Gauthier, M., Trottier, J., Jébrak, M., Chartrand, F. (1993): Mineralogy, geochemistry and paragenesis of the Eastern Metals serpentinite-associated Ni-Cu-Zn deposit, Quebec Appalachians. Econ. Geol. 88: 123-138.
- Auvray, R., Peucat, J.-J., Potrel, A., Burg, J.-P., Caruba, C., Dars, R., Lo, K. (1992): Données géochronologiques nouvelles sur l'Archéen de l'Amsaga (Dorsale Reguibat Mauritanie). Comptes Rendus de l'Academie des Sciences 315 (1), 63-70.
- Aydal, D. (1990): Gold-bearing listwaenites in the Arac Massif, Kastamonu, Turkey. Terra Nova, 2, 43-52.
- Azer, M.K. (2013): Evolution and economic significance if listwaenites associated with Neoproterozoic ophiolites in South Eastern Desert, Egypt. Geologica Acta, vol. 11, nº 1, 113-128.
- Azzouni-Sekkal, A., Debabha, F., Ikhlef, F. (2003): Malignites et syenites mesocrates associées, stock plutonique sud Tinguicht, zone de jointure Yetti-Eglab (Dorsale Réguibat, Algérie). Bull. Serv. Géol. Algérie 14, 79-95.
- Bach, N. (2013): Dipòsits ortomagmàtics del Sàhara Occidental. Unpublished BSc thesis, Fac Geologia, Univ. Barcelona, 72 pp.
- Baker, F. (1979): Trondhjemite definition, environment and hypothesis of origin. In Baker, F. (Ed.), Trondhjemites, dacites, and related rocks. Elsevier, New York, 1-12.
- Balan, E., De Villiers, J.P.R., Griet Eeckhout, S., Glatzel, P., Toplis, M.J., Fritsch, E., Allard, Th., Galois, L., Calas, G. (2006): The oxidation state of vanadium in titanomagnetite from layered basic intrusions. American Mineralogist 91, 953-956.
- Bambi, A.C.J.M., Costanzo, A., Gonçalves, A.O., Melgarejo, J.C. (2012): Tracing the chemical evolution of primary pyrochlore from plutonic to volcanic carbonatites: the role of fluorine. Mineral. Mag. 76, 377-392.
- Bardet, M.G. (1974): Les gisements kimberlitiques de l'ouest africain. In: Géologie du diamant. Deuxième partie: Gisements de

- dimant de l'Afrique. Mémoires de BRGM 83, 178-212.
- Barker, D. (1996): Carbonatite volcanism. In R.H. Mitchell (ed.): Undersaturated alkaline rocks: mineralogy, petrogenesis and economic potential. MAC Short Course 24, Winnipeg, Manitoba, 45-61.
- Barley, M.E., Groves, D.I. (1992): Supercontinent cycles and the distribution of metal deposits through time. *Geology* 20, 291-294.
- Barnes, I., O'Neil, J.R. (1969): The relationship between fluids in some fresh alpine type ultramafics and possible modern serpentinization, Western United States. *Geological Society of America Bulletin*, 80, 1947-1960.
- Barnes, I., O'Neil, J.R., Rapp, J.V., White, D.E. (1973): Silica-carbonate alteration of serpentine: Wall rock alteration in mercury deposits of the California Coast Ranges. *Economic Geology* 68, 388-398.
- Barrère, J. (1967): Le groupe precambrien de l'Amsaga entre Atar et Akjoujt (Mauritanie). Etude d'un métamorphisme profond et de ses relations avec la migmatisation: Mémoire du BRGM, 42, 278p.
- Barrère, J. (1969): Aperçu sur le métamorphisme et la migmatisation dans le Précambrien de l'Amsaga (Mauritanie sud-occidentale). *Bull. Soc. Géol. Fr.* 7, 150-159.
- Barton, P.B. (1992): Appendix C, Commodity geochemical index, In Cox, D.P. y Singer, D.A. (Eds.): Mineral Deposit Models. US. Geol. Surv. Bull. 1693, 303-317.
- Barton, M.D. (2014): Iron oxide (-Cu-Au-REE-P-Ag-U-Co) systems. In H. Holland y K. Turekian (eds.): Treatise on geochemistry, Vol. 13: Geochemistry of Mineral Deposits, 515-541.
- Bea, F., Montero, P., Haissen, F., El Archi, A., (2013): 2.46 Ga kalsilite and nepheline syenites from the Awsard Pluton, Reguibat Rise of the West African Craton, Morocco. Generation of extremely K-rich magmas at the Archean-Proterozoic transition. *Precambrian Research* 224, 242-254.
- Bea, F., Montero, P., Haissen, F., Molina, J.F., Michard, A., Lazaro, C., Mouttaqi, A., Errami, A., Sadki, O. (2015): First evidence for Cambrian rift-related magmatism in the West African Craton margin: The Derraman Peralkaline Felsic Complex. *Gondwana Research*, <http://dx.doi.org/10.1016/j.gr.2015.07.017>.
- Bell, K. (1989). *Carbonatites: Genesis and Evolution*. London: Unwin Hyman.
- Belolipetskii, A.P. (1997): asociaciones minerales en metasomatitas alcalinas de elementos raros. In J.C. Melgarejo (Ed.), *Atlas de asociaciones minerales en lámina delgada*. Edicions UB, Barcelona, 161-166.
- Berger, B.R., Henley, R.W. (1989): Advances in the understanding of epithermal gold-silver deposits, with special reference to the Western United States. In Keays, R.R., Ramsay, R.H., Groves, D.I. (eds.): *The Geology of Gold deposits: The perspective in 1988*. *Econ. Geol. Monograph* 6: 405-423.
- Berger, J., Diot, H., Lo, Kh., Ohnenstetter, D., Féménias, O., Pivin, M., Demaiffe, D., Bernard, A., Charlier, B. (2013): Petrogenesis of Archean PGM-bearing chromitites and associated ultramafic-mafic-anorthositic rocks from the Guelb el Azib layered complex (West African craton, Mauritania), *Precambrian Research* 224, 612-628.
- Bernstein, D.M., Chevalier, J., Smith, P. (2003): Comparison of calidira chrysotile asbestos to pure tremolite: inhalation biopersistence and histopathology following short-term exposure. *Inhalation Toxicology* 15, 1387-1419.
- Bertrand, H. (1991): The Mesozoic tholeiitic province of Northwest Africa: a volcano-tectonic record of the early opening of the Central Atlantic. In A.B. Kampuzu y R.T. Lubala (eds.): *Magmatism in extensional tectonic setting. The Phanerozoic African plate*. Springer, Berlin. 147-188.
- Besnus, Y., Bronner, G., Mosser, C., Oksengorgn, S. (1969): Études géochimiques et minéralogiques sur la province ferrifère du Tiris (Précambrien de la Dorsale Réguibat, Fort Gouraud, Mauritanie). *Bull. Serv. Carte Géol. Als. Lorr.*, 311-328.
- Bessoles, B. (1977): *Géologie de l'Afrique: le craton Ouest Africain*, Mém. B.R.G.M., Orléans, 88, 403 p.
- Bierlein, F.P., Groves, D.I., Goldfarb, R.J., Dubé,

- B. (2006): Lithospheric controls on the formation of provinces hosting giant orogenic gold deposits: *Mineralium Deposita* 40, 874-887.
- Birkett, T.C., Sinclair, W.D. (1998): Rare-metal replacement deposits (skarn and fenites) associated with alkalic and carbonatite complexes. In D.R. Lentz (Ed.), *Mineralized Intrusion-Related Skarn Systems*. Mineralogical Association of Canada Short Course, vol. 26, 445-473.
- Bodnar, R.J., Reynolds, T.J., Kuehn, C.A. (1985): Fluid-inclusion systematics in epithermal systems. *Reviews in Economic Geology* 2, 73-97.
- Boher, M., Abouchami, W., Michard, A., Albarède, F., Arndt, N.T. (1992): Crustal growth in West Africa at 2.1.Ga. *J. Geophys. Res.* 97, 345-369.
- Bohlke, J.K. (1982): Orogenic (metamorphic-hosted) gold-quartz veins. U.S. Geological Survey Open-file Report, 82-795, 70-76.
- Bohlke, J.K. (1989): Comparison of metasomatic reactions between a common CO₂-rich vein fluid and diverse wall rocks: Intensive variables, mass transfers, and Au mineralization at Alleghany, California. *Economic Geology* 84, 291-327.
- Bolívar, J.P., García-Tenorio, R., García-León, M. (1996): On the fractionation of natural radioactivity in the production of phosphoric acid by the wet acid method. *J. Radional. Nucl. Chem.*, 214, 77-78.
- Bonin ,B. (1996): A-type granite ring complexes: mantle origin through crustal filters and the anorthosite-rapakivi magmatism connection. In: *Petrology and geochemistry of magmatic suites of rocks in the continental and oceanic crusts*. Bruxelles, 201-218.
- Bonin, B. (2007): A-type granites and related rocks: Evolution of a concept, problems and prospects. *Lithos* 97, 1-29.
- Boudreau, A.E., Mathez, E.A., McCallum, I.S. (1986): Halogen geochemistry of the Stillwater and Bushveld Complexes: evidence for the transport of the platinum-group elements by Cl-rich fluids. *J. Petrol.* 27, 967-986.
- Boudreau, A.E., McCallum, I.S. (1992a): Concentration of platinum-group elements by magmatic fluids in layered intrusions. *Econ. Geol.* 87, 1830-1848.
- Boudreau, A.E., McCallum, I.S. (1992b): Infiltration metasomatism in layered intrusions-an example from the Stillwater Complex, Montana. *Journal of Volcanology and Geothermal Research* 52, 171-183.
- Bouougri, E.H., Saquaque, A. (2004): Lithostratigraphic framework and correlation of the Neoproterozoic northern West African Craton passive margin sequence (Siroua-Zenaga-Bouazzer Elgraara Inliers, Central Anti-Atlas, Morocco): an integrated approach. *Journal of African Earth Sciences* 39, 227-238.
- Brenan, J.M., Andrews, D.R.A. (2001): High-temperature stability of laurite and Ru-Ir-Os alloy and their role on PGE fractionation in mafic magmas. *Canadian Mineralogist*. 39, 341-360.
- Brigatti, M.F., Galli, E., Medici, L., Poppi, L., Cibin, G., Marcelli, A., Mottana, A. (2001): Chromium-containing muscovite: crystal chemistry and XANES spectroscopy. *European Journal of Mineralogy*, 13, 377-389.
- Briqueu, L., Bougault, H., Joron, J.L. (1984): Quantification of Nb, Ta, Ti and V anomalies in magmas associated with subduction zones: Petrogenetic implications. *Earth Planet. Sci. Letters*, 68, 297-308.
- Brittes, A.F. Nunes de, Sousa, M.Z Aguiar de, Ruiz, A. Salina, Batata, M.E. Froés, Lafon, M., Plens, D. Pexe (2013): Geology, petrology and geochronology (Pb-Pb) of the Serra da Bocaina Formation: evidence of an Orosirian Amogujá Magmatic Arc in the Rio Apa Terrane, south of the Amazonian Craton. *Braz. J. Geol.*, 43, 48-69.
- Bronner, G. (1970): Plissement, cisaillement, boudinage et laminage: mecanismes essentiels de la formation de la brèche d'Ijlil (Précambrien de la dorsale Réguibat, Fort Gouraud, Mauritanie septentrionale). *Bull. Serv. Carte Géol. Als. Lorr.*, 51-83.
- Bronner, G., Chauvel, J.J. (1979): Precambrian Banded Iron Formations of the Ijlil Group (Kediat Ijlil, Reguibat Shield, Mauritania). *Economic Geology* 74, 77-94.
- Bronner, G., Marchand, J., Sougy, J. (1983):

- Structure en synclinal de nappes des Mauritanides septentrionales (Adrar Souttof, Sahara occidental). 12e Colloque de géologie africaine, Bruxelles, p. 15.
- Bronner, G., Chauvel, J.J., Triboulet, C. (1985a): Archaean metamorphic iron formations and associated basic rocks of Lebzenia (Tasiast, South-Western Reguibat shield, Mauritania). *Sci. Géol. Bull.* 38,4, 337-357.
- Bronner, G., Marchand, J., Sougy, J. (198b5): Carte Géologique du Maroc 1:1.000.000, feuille Sud. Notes et Memoires 260, Editions du Service Géologique du Maroc.
- Bronner, G., Chauvel, J.J., Triboulet, C. (1992): Les formations ferrifères du Précambrien du Mauritanie: origine et evolution des quartzites ferrugineux. *Chronique de la Recherche Minière*, 508, 3-27.
- Buda, G., Nagy, G. (1995): Some REE bearing accessory minerals in two types of variscan granitoids, Hungary. *Geol. Carpathica* 46, 67-78.
- Buisson, G., Leblanc, M. (1985): Gold-bearing listwaenites (carbonatized ultramafic rocks) from ophiolite complexes. In: Gallagher, J.M., Ixer, R.A., Neary, C.R. (eds). *Metallogeny of Basic and Ultrabasic Rock*. London, Institution of Mining and Metallurgy, 121-132.
- Buisson, G., Leblanc, M. (1986): Gold-bearing listwaenites (carbonatized ultramafic rocks) from ophiolite complexes. In: Gallagher, J.M., Ixer, R.A., Neary, C.R. (eds.). *Metallogeny of Basic and Ultrabasic Rocks*. London, Institution of Mining and Metallurgy, 121-132.
- Buisson, G., Leblanc, M. (1987): Gold in mantle peridotites from Upper Proterozoic ophiolites in Arabia, Mali, and Morocco. *Economic Geology*, 82, 2091-2097.
- Cahen, L., Snelling, N.J., Delhal, J., Vail, J.R., Bonhomme, M., Ledent, D. (1984): The geochronology and evolution of Africa. Clarendon Press, Oxford. 512p.
- Calvo, J. (1976): Sahara's phosphate rock- a study and discussion of the systems and methods to mine Bu Craa's deposit. proc. 9th Wld. Min. Congr., Germany, Düsseldorf: Bergbau. Paper III-18. 11pp.
- Cameron, E.N. (1977): Chromite in the central sector of the eastern Bushveld Complex, South Africa. *American Mineralogist* 62, 1082-1096.
- Cameron, E.N., Desborough, G.A. (1969): Occurrence and characteristics of chromite deposits eastern Bushveld Complex. *Economic Geology Monograph* 4, 23-40.
- Campbell, I.H., Naldrett, A.J., Barnes, S.J. (1983): A model for the origin of the platinum-rich sulfide horizons in the Bushveld and Stillwater Complexes. *Journal of Petrology* 24, 133-165.
- Canto Romera, J.M. (1978): Aspectos sedimentológicos de la concentración de fosfatos en el yacimiento de Bu-Craa (Sáhara Occidental), *Tecniterra* 4, 14-30.
- Cawthorn, R.G., McCarthy, T.S. (1980): Variations in Cr content of magnetite from the upper zone of the Bushveld complex-Evidence for heterogeneity and convection currents in magma chambers. *Earth and Planetary Science Letters* 46, 335-343.
- Cawthorn, R.G., Boerst, K. (2006): Origin of the Pegmatitic pyroxenite in the Merensky unit, Bushveld Complex, South Africa. *J. Petrol.* 47, 1509-1530.
- Černý, P. (1982): Anatomy and classification of granitic pegmatites. In P. Černý (ed): *Granitic pegmatites in science and industry. MAC Short course Handbook* 8, 1-39.
- Černý, P. (1991a): Rare-element granitic pegmatites. Part I: Anatomy and internal evolution of pegmatite deposits. *Geoscience Canada* 18, 49-67.
- Černý, P. (1991b): Rare-element granitic pegmatites. Part II: Regional to global environments and petrogenesis. *Geoscience Canada*, 18,2, 68-81.
- Černý, P., Alfonso, P., Melgarejo, J.C. (1997): Pegmatitas graníticas. In J.C. Melgarejo (Ed.), *Atlas de asociaciones minerales en lámina delgada*. Edicions UB, Barcelona, 129-152.
- Černý, P., Ercit, T.S. (2005): The classification of the granitic pegmatites revisited. *Can. Mineral.* 43, 2005-2026.
- Chakhmouradian, A.R., Mitchell, R.H. (1998): Lueshite, pyrochlore and monazite-(Ce) from apatite-dolomite carbonatite, Lesnaya Varaka complex, Kola peninsula, Russia.

- Mineralogical Magazine, 62, 769–782.
- Chakhmouradian, A.R., Mitchell, R.H. (2002): New data on pyrochlore- and perovskite group minerals from the Lovozero alkaline complex, Russia. European Journal of Mineralogy 14, 821–836.
- Chakhmouradian, A.R., Wall, F. (2012): Rare earth elements: minerals, mines, magnets (and more). Elements 8, 333–340.
- Chakhmouradian A.R., Zaitsev A.N. (2012) Rare earth mineralization in igneous rocks: Sources and processes. Elements 8, 347–353.
- Chappell, B.W., White, A.J.R. (1974): Two contrasting granite types. Pac. Geol. 8, 173–174.
- Chardon, D. (1997): Les déformations archéennes: exemples naturels et modélisation thermomécanique. Mémoires de Géosciences Rennes 76, 1–257.
- Charlier, B., Skår, Ø., Korneliussen, A., Duchesne, J.-C., Vander Auwera, J. (2007): Ilmenite composition in the Tellnes Fe–Ti deposit, SW Norway: fractional crystallization, postcumulus evolution and ilmenite–zircon relation. Contrib. Mineral. Petrol. 154, 119–134.
- Charlier, B., Sakoma, E., Sauvé, M., Stanaway, K., Vander Auwera, J., Duchesne, J.-C., (2008): The Grader layered intrusion (Havre-Saint-Pierre Anorthosite, Quebec) and genesis of nelsonite and other Fe–Ti–P ores. Lithos 101, 359–378.
- Charlier, B., Namur, O., Duchesne, J.C., Wiszniewska, J., Parecki, A., Vander Auwera, J., (2009): Cumulate origin and polybaric crystallization of Fe–Ti oxide ores in the Suwalki anorthosite, northeastern Poland. Econ. Geol. 104, 205–221.
- Charlier, B., Duchesne, J.C., Vander Auwera, J., Storme, J.Y., Maquil, R., Longhi, J., (2010a): Polybaric fractional crystallization of high-alumina basalt parental magmas in the Egersund–Ogna massif-type anorthosite (Rogaland, SW Norway) constrained by plagioclase and high-alumina orthopyroxene megacrysts. J. Petrol. 51, 2515–2546.
- Charlier, B., Namur, O., Malpas, S., de Marneffe, C., Duchesne, J.C., Vander Auwera, J., Bolle, O. (2010): Origin of the giant Allard Lake ilmenite ore deposit (Canada) by fractional crystallization, multiple magma pulses and mixing. Lithos 117, 119–134.
- Charlier, B., Namur, O., Bolle, O., Latypovc, R., Duchesne, J.C. (2015): Fe–Ti–V–P ore deposits associated with Proterozoic massif-type anorthosites and related rocks Earth-Science Reviews 141, 56–81.
- Christy, A.G., Atencio, D. (2013): Clarification of status of species in the pyrochlore supergroup. Mineralogical Magazine 77, 13–20.
- Ciampalini, A., Garfagnoli, F., Antonielli, B., Del Ventisette, Ch., Moretti, S. (2012): Photolithological map of the southern flank of the Tindouf Basin (Western Sahara). J. Maps 8,4, 453–464.
- Ciampalini, A., Garfagnoli, F., Antonielli, B., Moretti, S., Righini, G. (2013): Remote sensing techniques using Landsat ETM+ applied to the detection of iron ore deposits in Western Africa. Arabian J. Geosc. 6, 4529–4546.
- Clark, A.M., Criddle, A.J., Fejer, E.E. (1974): Palladium arsenide–antimonides from Itabira, Minas Gerais, Brazil. Mineralogical Magazine 39, 528–543.
- Clark, A.H., Scott, D.J., Sandeman, H.A., Bromley, A.V., Farrar, E. (1998): Siegenian generation of the Lizard ophiolite; U–Pb zircon age data for plagiogranite, Porthkerris, Cornwall. Journal of the Geological Society 155, 595–598.
- Clifford, T.N. (1970): The structural framework of Africa. In: T.N. Clifford y I.G. Gass (Eds.): African magmatism and tectonics, Oliver & Boyd, Edinburgh, 1–26.
- Clout, J.M.F., Simonson, B.M. (2005): Precambrian iron formations and iron formation-hosted iron ore deposits. In J.W. Hedenquist, J.F.H. Thompson, R.J. Goldfarb, J.P. Richards (eds.), Economic Geology One Hundredth Anniversary Volume 1905–2005, Society of Economic Geologists, 643–679.
- Coimbra, A.M., Coutinho, J.M.V., Atencio, D., Iwanuch, W. (1989): Lanthanite-(Nd) from Santa Isabel, state of São Paulo: second Brazilian and world occurrence. Can. Mineral. 27, 119–123.
- Coleman, R.G. (1977): Ophiolites. Ancient Oceanic lithosphere?. Minerals and rocks

- series, Springer. 200 p.
- Comba, J.A. (1961): La investigación minera en la provincia del Sahara. Archivo del Instituto de Estudios Africanos (Madrid) 59, 7-24.
- Comba, J.A. (1965): XXV años de investigación geológica y minera de las provincias africanas. Archivos del Instituto de Estudios Africanos. 19(77), 7-20.
- Combs, J. (2012): Geology and economic potential of the Oum Abana region, Western Sahara, using remote sensing and field mapping. Unpublished BSc thesis. Department of Applied Geology, West Australian School of Mines, Curtin University, 115 p.
- Condie, K.C., Sinha A.K. (1996): Rare earth and other trace element mobility during mylonitization: a comparison of the Brevard and Hope Valley shear zones in the Appalachian mountains, USA. *J. Metamorph. Geol.*, 14, 213-226.
- Coulson, I.M., Russell, J.K., Dipple, G.M. (1999): Origins of the Zippa Mountain pluton: a Late Triassic, arc-derived, ultrapotassic magma from the Canadian Cordillera. *Can. J. Earth Sci.* 36: 1415–1434.
- Cox, K., Bell, J., Pankhurst, R. (1979): The interpretation of igneous rocks. George Allen and Unwin, London, 445p.
- Cox, D.P., Singer, D.A. (eds.) (1986): Mineral Deposits Models. *U. S. Geol. Surv. Bull.* 1693, 379 p.
- Cuney, M., Barbey, P., Bronner, G. (1975): Les paragenèses catazonales des quartzites à magnétite de la province ferrifère du Tiris (Précambrien de la dorsale Réguibat (Mauritanie). *Pétrologie* 2, 103-120.
- Dacheux, A. (1967): Étude photogéologique de la chaîne du Dhlou (Zemmour-Mauritanie septentrionale). Rapport du laboratoire de géologie, Faculté des sciences, Université de Dakar, 22 (45 pp.).
- Dallmeyer, R.D., Lécorché, J.P., Dia, O. (1987): Geotraverse excursion across the central Mauritanide orogen. IUGS-UNESCO IGCP project 233. Terranes in the Circum-Atlantic Paleozoic Orogens. 336 pp.
- Dallmeyer, R.D., Villeneuve, M. (1987): $^{40}\text{Ar}/^{39}\text{Ar}$ mineral age record of polyphase tectonothermal evolution in the southern Mauritanide orogen, southeastern Senegal. *Geological Society of America Bulletin* 98, 602–611.
- Davidson, I. (2005): Central Atlantic margin basins of North West Africa: geology and hydrocarbon potential (Morocco to Guinea). *Journal of African Earth Sciences* 43, 254–274.
- Deer, W.A., Howie, R.A., Zussman, J. (1966): An Introduction to Rock-Forming Minerals, 17th Edition, Longman Ltd., London. 528 pp.
- De La Rosa, J.D., Pérez López, R., Sánchez De La Campa, A.M., Sánchez-Rodas, D.A., Fernández Caliani, J.C., Querol, X. (2015): Evolución química de lixiviados y caracterización del bandeados rítmico de los residuos en depósitos de fosfoyesos. *Macla* 20, 41-42.
- De la Viña, J., Cabezón, M. (1958): Mapa geológico del Sáhara español y zonas limítrofes. Instituto Geología y Minería, Madrid, escala 1:1,500,000.
- Demaiffe, D, Moreau, C. (1996): Crustal growth in Air (Niger, West Africa): significance of the Palaeozoic anorthosite-bearing anorogenic province. In: Petrology and geochemistry of magmatic suites of rocks in the continental and oceanic crusts. Bruxelles, 35-50.
- Demartis, M., Melgarejo, J.C., Colombo, F., Alfonso, P., Coniglio, J.E., Pinoglio, L.P., D'Eramo, F.J. (2014): Extreme F activities in late pegmatitic events as a key factor for LILE and HFSE enrichment: the Angel pegmatite, Central Argentina. *Can. Mineral.* 52, 247-269.
- Deschamps, M., Rocci, G. (1976): Le vulcanisme éburnéen de la Dorsale Réguibat. Caractérisation et comparaisons avec d'autres régions de l'Ouest africain. 4^{ème} réunion annuelle des Sciences de la Terre, 135.
- Deschamps, M., Rocci, G., Taleb, A. (1996): Birimian granitoids of the Réguibat Shield, Mauritania: their contribution to palaeoproterozoic crustal growth. In Demaiffe, D. (ed): Petrology and geochemistry of magmatic suites of rocks in the continental and oceanic crusts: a volume dedicated to professor Jean michot, Bruxelles, Université Libre de Bruxelles,

- Royal Museum for Central Africa, 291-303.
- De Parceval, Ph., Fontan, F., Aigouy, T. (1997): Composition chimique des minéraux de terres rares de Trimouns (Ariège, France). C.R. Acad. Sci. Paris, Ser.1a, 324, 625-630.
- Dergachev, A.L., Eremin, N.I., Sergeeva, N.E. (2010): Volcanogenic massive sulfide deposits of ophiolite associations. Moscow University Geology Bulletin 65, 265-272.
- Deynoux, M., Affato, P., Trompette, R., Villeneuve, M. (2006): Pan-African tectonic evolution and glacial events registered in Neoproterozoic to Cambrian cratonic and foreland basins of West Africa. Journal of African Earth Sciences 46, 397–426.
- Dia, O. (1984): La chaîne panafricaine et hercynienne des Mauritanides face au bassin protérozoïque supérieur à dévonien de Taoudeni dans le secteur-clé de Mejeria (Taganet-Sud, RIM). Ph.D. Thesis, Université Aix-Marseille-3.
- Dillon, R.S., Sougy, J.H.A. (1974): Geology of West Africa and Canary and Cape Verde Islands. In: A.E.M. Naim y F.G. Stehlí (eds.): The ocean basins and margins, 2. The North Atlantic: New York (Plenum Press), 315-390.
- Doebrich, J. L.; Al-Jehani, A. M.; Siddiqui, A. A.; Hayes, T. S.; Wooden, J. L.; Johnson, P. R. (2007): Geology and metallogeny of the Ar Rayn terrane, eastern Arabian shield: Evolution of a Neoproterozoic continental-margin arc during assembly of Gondwana within the East African orogen. Precambrian Research, 158: 17 – 50.
- Dollfus, G.F. (1911): Étude des fossiles recueillis par N. Font y Sagué au Río de Oro. Bull. Soc. Geol. Fr. 4(11), 218-238.
- Dong, G., Morrison, G., Jaireth, S. (1995): Quartz textures in epithermal veins, Queensland-Description, origin and interpretation. Econ. Geol. 90, 1841-1856.
- Dosso, L., Vidal, Ph., Sichler, B., Bonifay, A. (1979). Age précambrien de dolérites de la Dorsale Réguibat (Mauritanie). Comptes Rendus de l'Académie des sciences de Paris, 288, 739-742.
- Downes, H., Balaganskaya, E., Beard, A., Liferovich, R., Demaiffe, D. (2005): Petrogenetic processes in the ultramafic, alkaline and carbonatitic magmatism in the Kola Alkaline Province: a review. Lithos 85, 48-75.
- Drareni, A., Peucat, J.J., Fabre, J. (1996): Isotopic data (Sr, Nd, Pb) from the West African craton : the Dorsale Réguibat, the Eglab Massif (Algeria). Terra Nova 7, 102.
- Drost, K., Gerdes, A., Jeffries, T., Linnemann, U., Storey, C. (2011): Provenance of Neoproterozoic and early Paleozoic siliciclastic rocks of the Teplá-Barrandian unit (Bohemian Massif): evidence from U-Pb detrital zircon age. Gondwana Research 19, 213–321.
- Drysdall, A.R., Jackson, N.J., Ramsay, C.R., Douch C.J., Hackett, D. (1984): Rare element mineralization related to Precambrian alkali granites in the Arabian Shield. Econ. Geol. 79, 1366-1377.
- Drysdall, A.R., Douch, C.J. (1986): Nb-Th-Zr mineralization in microgranite-microsyenite at Jabal Tawlah, Midyan region, Kingdom of Saudi Arabia. J. African Earth Sci. 4, 275-288.
- Dubé, B., Balmer, W., Sanborn-Barrie, M., Skulski, T., Parker, J. (2000): A Preliminary Report on Amphibolite-Facies, Disseminated-Replacement-Style Mineralization at the Madsen Gold Mine, Red Lake, Ontario: Geological Survey of Canada, Current Research 2000-C17, 12 p.
- Du Bray, E.A. (1985): Geology of the Silsilah ring complex, and associated tin mineralization, Kingdom of Saudi Arabia - a synopsis. American Mineralogist 70(11-12), 1075-1086.
- Duchesne, J.C. (1972): Iron-titanium oxide minerals in the Bjerkrem-Sogndal massif, southwestern Norway. Jour. Petrol. 17, 57-81.
- Duchesne, J.C. (1999): Fe-Ti deposits in Rogaland anorthosites (South Norway): Geochemical Characteristics and problem of interpretation. Mineralium Deposita 34, 182-195.
- Dubé, B., Gosselin, P. (2007): Greenstone-hosted quartz-carbonate vein deposits, in Goodfellow, W.D., ed., Mineral Deposits of Canada - A Synthesis of Major Deposit-Types, District Metallogeny, the Evolution of Geological Provinces, and Exploration

- Methods: Geological Association of Canada, Mineral Deposits Division, Special Publication 5, 223-243.
- Dubé, B., Gosselin, P. (2007): Greenstone-hosted quartz-carbonate vein deposits. In W.D. Goodfellow (ed.): Mineral Deposits of Canada: A Synthesis of Major Deposit-Types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods: Geological Association of Canada, Mineral Deposits Division, Special Publication No. 5, 49-73.
- Dudkin, O.B. (1997): Asociaciones minerales agpaíticas. In J.C. Melgarejo (Ed.), *Atlas de asociaciones minerales en lámina delgada*. Edicions UB, Barcelona, 153-160.
- Dumestre, A., Illing, L.V. (1967): Middle Devonian reefs in Spanish Sahara. In: Oswald D.H. (Ed.) - Devonian of the World II. International Symposium on the Devonian System, Vol. 2. Alberta Soc. Petrol. Geol., Calgary, 333-350.
- Eby, G.N. (1990): The A-type granitoids: A review of their occurrence and chemical characteristics and speculations on their petrogenesis. *Lithos*, 26, 115-134.
- Economou-Eliopoulos, M. (1996): Platinum-group element distribution in chromite ores from ophiolite complexes-Implications for their exploration. *Ore Geology Reviews* 22, 363-381.
- Eden, P. (1991): A specialized topaz-bearing rapakivi granite and associated mineralized greisen in the Ahvenisto complex, SE Finland. *Bulletin of the Geological Society of Finland* 63, 25-40.
- Efremov, N. (1952): Origin of listwaenites of the Caucasus and Urals. *Geological Society of America Bulletin*, 63, 1246-1247.
- Einaudi, M.T. Meinert, L.D., Newberry, R.J. (1981): *Skarn* deposits. *Econ. Geol. 75th Ann. Vol.*: 317-391.
- Einsele, G., von Rad, U. (1979): Facies and paleoenvironment of Early Cretaceous sediments in DSDP Site 397 and in the Aaiun Basin (NW Africa). In: U. von Rad, W.B.F. Ryan (eds.), *Initial Reports Deep Sea Drilling Project* 47(1), 559-577.
- El Ghorfi, M., Melcher, F., Oberthür, T., A.E. Boukhari, A.E., Maacha, L., Maddi, A., Mhaili, M. (2008): Platinum group minerals in podiform chromitites of the Bou Azzer ophiolite, Anti Atlas, Central Morocco. *Mineral. Petrol.* 92, 59-80.
- Emine, E.O. (2009): Étude d'un gisément type Banded Iron Formations: Gisément de F'Derik, Kedia d'Ijl (Province de Tiris-Mauritanie). Thèse inédite de Master Spécialisé: Ressources Minérales et Énergétiques: Genèse et Mise en Valeur. Université Mulay Ismail. Faculté des Sciences. Département de Géologie. Meknès. 78 pp.
- Empresa Nacional Minera del Sáhara (1966): Descubrimiento, cubicación y evaluación del yacimiento de fosfato de Bu-Craa (provincia del Sáhara). Madrid. 203 pp, 15 mapas.
- Ercit, T.S. (2002): The mess that is "allanite". *Can. Mineral.* 40, 1411-1419.
- Ercit, T.S. (2005): REE-enriched granitic pegmatites. In R.L. Linnen y I.M. Samson (Eds.), *Rare-element Geochemistry and Ore Deposits*. Geol. Assoc. Canada Short Course Notes 17, 257-296.
- Estrade, G., Salvi, S., Béziat, D., Williams-Jones, A.E. (2015): The origin of Skarn-hosted rare-metal mineralization in the Ambohimirahavavy alkaline complex, Madagascar. *Econ. Geol.* 110, 1485-1513.
- Ethington, R.L., Furnish, W.M. (1962): Silurian and Devonian conodonts from Spanish Sahara. *J. Paleontology* 36(6), 1253-1290.
- Etoh, J., Izawa, E., Watanabe, K., Taguchi, S., Sekine, R. (2002): Bladed quartz and its relationship to gold mineralization in the Hishikari low-sulfidation epithermal gold deposit, Japan. *Economic Geology* 97 (8), 1841-1851.
- Evans, B.W., Frost, B.R. (1975): Chrome-spinel in progressive metamorphism - a preliminary analysis. *Geochim. Cosmochim. Acta*, 39, 959-972.
- Fabre, J. (2005): *Géologie du Sahara Occidental et Central*. Musée Royal de l'Afrique Centrale, Belgique, 572 pp.
- Fabre, J., Jonquet, B., Bronner, G. (1978): *Carte géologique du Nord-ouest de l'Afrique*, 1:500.000, SNED, Alger.
- Fayek, M., Kyser, T.K. (1997): Characterization of multiple fluid-flow events and rare-earth-

- element mobility associated with formation of unconformity-type uranium deposits in the Athabasca Basin, Saskatchewan. *Can. Mineral.* 35, 627–658.
- Fernández-Suárez, J., Gutiérrez-Alonso, G., Jeffries, T.E. (2002): The importance of alongmargin terrane transport in northern Gondwana: insights from detrital zircon parentage in Neoproterozoic rocks from Iberia and Brittany. *Earth and Planetary Science Letters* 204, 75–88.
- Fischer, R.P. (1975): Vanadium Resources in Titaniferous magnetite deposits. U.S. Geol. Surv. Prof. Paper 926b, 10p.
- Fischer, W., Amosse, J., Leblanc, M. (1987): PGE distribution in some ultramafic rocks and minerals from the Bou-Azzer ophiolite complex (Morocco). In: H.M. Prichard, J. Potts Philip, J.F.W. Bowles and S.J. Cribb (eds.), *Geo-Platinum 87*. Elsevier, Essex, United Kingdom, 199–210.
- Flores, A. (1946): El Sáhara Español. Ediciones de la Alta Comisaría de España en Marruecos, 167 pp.
- Font i Sagué, N. (1903): Nota sobre la constitución geológica de Río de Oro, Butlletí de la Institució Catalana d'Història Natural 3(19–21), 65–66.
- Font i Sagué, N. (1909): La formación geológica de Río de oro (Sáhara Español). Actas y Memorias del Primer Congreso de Naturalistas españoles. 7–10 d'octubre 1908 Zaragoza, 1909, 341–348.
- Font i Sagué, N. (1911): Les formations géologiques du Río de Oro (Sahara Occidental). *Bull. Soc. Geol. Fr.* 11(4), 212–217.
- Fournier, R.O. (1985): The behavior of silica in hydrothermal solutions. *Reviews in Economic Geology* 2, 45–61.
- Franklin, J.M., Sangster, D.M., Lydon, J.W. (1981): Volcanic associated massive sulfide deposits. A: Skinner, B. (ed.): *Economic Geology, 75 ann.* 485–627.
- Frost, B.R., Frost, C.D. (2008): A geochemical classification for feldspathic igneous rocks. *J. Petrol.* 49, 1955–1969.
- Galbiatti, H.F., Fonseca, M.A., Pereira, M.C., Polônia, J.C. (2007): Structural control of Au–Pd mineralization (Jacutinga): An example from the Cauê Mine, Quadrilátero Ferrífero, Brazil. *Ore Geology Reviews* 32 (2007) 614–628.
- Gambogi, J. (2010): Titanium, U.S. Geological Survey Minerals Yearbook 2008, 16 pp.
- García-Fuente, S. (1961): La investigación petrolífera en el Sáhara. *Archivos del Instituto de Estudios Africanos* 59, 99–115.
- Gärtner, A., Villeneuve, M., Linnemann, U., El Archi, 568 A., Bellon, H. (2013): An exotic terrane of Laurussian affinity in the Mauritanides and Souttaouïdides (Moroccan Sahara). *Gondwana Research* 24, 687–699.
- Gärtner, A., Villeneuve, M., Linnemann, U., Gerdes, A., Youbi, N., Guillou, O., Rjimati, E.Ch. (2014): History of the West-African Neoproterozoic ocean: key to the geotectonic history of circum-Atlantic Peri-Gondwana (adrar Souttaouïf Massif, Moroccan Sahara). *Gondwana Research* 29, 220–233.
- Gärtner, A., Villeneuve, M., Linnemann, U., Gerdes, A., Youbi, N., Hofmann, M. (2015): Similar crustal evolution in the western units of the Adrar Souttaouïf Massif (Moroccan Sahara) and the Avalonian terranes: insights from Hf isotope data. *Tectonophysics* (2015), doi: 10.1016/j.tecto.2015.11.030
- Garuti, G., Zaccarini, F., Economou-Eliopoulos, M. (1999): Paragenesis and composition of laurite from chromitites of Othrys (Greece): implications for Os–Ru fractionation in ophiolitic upper mantle of the Balkan peninsula. *Mineralium Deposita* 34, 312–319.
- Gasquet, D., Levresse, G., Cheilley, A., Azizi-Samir, M.R., Mouttaqi, A. (2005): Contribution to a geodynamic reconstruction of the Anti-Atlas (Morocco) during Pan-African times with the emphasis on inversion tectonics and metallogenic activity at the Precambrian–Cambrian transition. *Precambrian Research* 140, 157–182.
- Gasquet, D., Ennih, N., Liégeois, J.P., Soulaimani, A., Michard, A. (2008): The Pan-African Belt. Continental Evolution: The Geology of Morocco, 33–64.
- Gavala, J. (1952): Nota sobre los criaderos de hierro del Sáhara Español. *Notas y Comunicaciones IGME* 27, 1–59. VIII lam.
- Gebre-Mariam, M., Hagemann, S.G., Groves, D.I. (1995): A classification scheme for

- epigenetic Archaean lode-gold deposits: Mineralium Deposita 30, 408-410.
- Gevin, P. (1951): Sur la structure du massif cristallin Eglab-Yetti. C.R. Acad. Sci. Paris 233, 1129-1130.
- Gevin, P. (1958): Notice explicative des cartes géologiques au 1:500.000 Tindouf-Eglab. Service de la carte géologiques d'Algérie, Alger.
- Gieré, R., Sorensen, S.S. (2004): Allanite and Other REE-Rich Epidote-Group Minerals. Reviews in Mineralogy and Geochemistry 56(1), 431-493.
- Giraudon, R., Vachette, M. (1964): Mesures d'âges absolus sur des formations de Mauritanie. C.R. Acad. Sci. Paris 258, 3520-3523.
- Goldfarb, R.J., Groves, D.I., Gardoll, S. (2001): Orogenic gold and geologic time: a global synthesis: Ore Geology Reviews 18, 1-75, doi:10.1016/S0169-1368(01)00016-6.
- Goldfarb, R.J., Baker, T., Dube, B., Groves, D.I., Hart, C.J.R., Gosselin, P. (2005): Distribution, character, and genesis of gold deposits in metamorphic terranes. In J.W. Hedenquist, J.F.H. Thompson, R.J. Goldfarb, J.P. Richards (eds.): Economic Geology. 100th Anniversary Volume 1905–2005. Littleton, Colorado, Society of Economic Geologists, 407–450.
- Gow, P.A., Wall, V.J., Oliver, N.S., Valenta, R.K. (1994): Proterozoic iron oxide (Cu-U-Au-REE) deposits: Further evidence of hydrothermal origins. Geology 22, 633-636.
- Groves, D.I. (1993): The crustal continuum model for late-Archaean lode-gold deposits of the Yilgarn Block, Western Australia. Mineralium Deposita 28, 366-374.
- Groves, D.I., Goldfarb, R.J., Gebre-Mariam, M., Hagemann, S.G., Robert, F. (1998): Orogenic gold deposits: a proposed classification in the context of their crustal distribution and relationship to other gold deposit types: Ore Geology Reviews 13, 7-27, doi:10.1016/S0169-1368(97)00012-7.
- Groves, D.I., Goldfarb, R.J., Robert, F., Hart, C.J.R. (2003): Gold deposits in metamorphic belts: overview of current understanding, outstanding problems, future research, and exploration significance. Economic Geology 98, 1-29.
- Groves, D.I., Bierlein, F.P., Meinert, L.D., and Hitzman, M.W. (2010): Iron Oxide-Copper-Gold (IOCG) Deposits Through Earth History: Implications for Origin, Lithospheric Setting and Distinction from Other Epigenetic Iron Oxide Deposits: Econ. Geol. 105, 641-654.
- Grubb, P.L.C. (1971): Silicates and their paragenesis in the Brockman Iron formation of Wittenoom Gorge, Western Australia. Econ. Geol. 66, 281-292.
- Guerrak, S. (1987a): Paleozoic oolitic ironstones of the Algerian Sahara: a review. J. Afr. Earth Sc. 8, 1-18.
- Guerrak, S. (1987b): Metallogenesis of cratonic oolitic ironstone deposits. Bled El Mass, Azzel Matti, Ahnet and Mouydir basins. Central Sahara, Algeria. Geol. Rundschau 78/3, 903-922.
- Guerrak, S. (1988a): Paleozoic marine sedimentation and associated oolitic iron-rich deposits, Tassilis N'Ajjer and Illizi Basin, Saharan Platform, Algeria. Eclogae Geol. Helv. 81/2, 457-485.
- Guerrak, S. (1988b): Geology of Early Devonian oolitic iron-ore of the Gara Djebilet field, Sahara Platform, Algeria. Ore Geology Reviews 3, 333-358.
- Guerrak, S. (1988c): Ordovician ironstone sedimentation in Ougarta Ranges: North Western Sahara (Algeria). Journal of African Earth Sciences, 7, 657-678.
- Guerrak, S. (1991): Paleozoic patterns of oolitic ironstone sedimentation in the Sahara. Journal of African Earth Sciences, 12, 31-39.
- Guerrak, S., Chauvel, J.J. (1985): Les minéralisations ferrifères du Sahara Algérien. Le gisement de fer oolithique de Mecheri Abdelaziz (basin de Tindouf). Mineralium Deposita 20, 249-259.
- Gustafson, L.B., Williams, N. (1981): Sediment-hosted stratiform deposits of copper, lead, and zinc. Econ. Geol. : 139-178.
- Gutiérrez-Alonso, G., Fernández-Suárez, J., Jeffries, T.E., Jenner, G.A., Tubrett, M.N., Cox, R., Jackson, S.E. (2003): Terrane accretion and dispersal in the northern Gondwana margin. An Early Paleozoic analogue of a long-lived active margin.

- Tectonophysics 365, 221–232.
- Gutiérrez-Alonso, G., Murphy, J.B., Fernández-Suárez, J., Hamilton, M.A. (2008): Rifting along the northern Gondwana margin and the evolution of the Rheic Ocean: a Devonian age for the El Castillo volcanic rocks (Salamanca, Central Iberian Zone). Tectonophysics 461, 157–165.
- Gutiérrez-Alonso, G., Fernández-Suárez, J., Jeffries, T.E., Johnston, S.T., Pastor-Galán, D., Murphy, J.B., Franco, M.P., Gonzalo, J.C. (2011): Diachronous post-orogenic magmatism within a developing orocline in Iberia, European Variscides. Tectonics 30, TC5008. <http://dx.doi.org/10.1029/2010TC002845>.
- Haapala, I. (1988): Metallogeny of the Proterozoic rapakivi granites of Finland. In: Taylor, R. P. y Strong, D. F. (eds), Recent Advances in the Geology of Granite-related Deposits. Can. Inst. Mining Metallurgy, Spec. Vol. 39, 124–132.
- Haase, C.S. (1982): Metamorphic petrology of the Negaunee iron formation, Marquette district, Northern Michigan: Mineralogy, Metamorphic reactions, and phase equilibria. Econ. Geol. 77, 60-81.
- Haggerty, S.E. (1991): Oxide textures-a miniatlas. A: Lindsley, D.H. (Ed.); Oxide Minerals: Petrologic and Magnetic Significance. MSA Reviews in Mineralogy 25, 303-321.
- Hallam, A., Bradshaw, M.J. (1979): Bituminous shales and oolitic ironstones as indicators of transgressions and regressions. J. Geol. Soc. London 138, 157-164.
- Halls, H.C. (2010): Regional dyke swarms of the Reguibat Shield, Mauritania and Morocco: plumbing systems for Precambrian Large Igneous Provinces. (<http://www.largeigneousprovinces.org>).
- Halls, C., Zhao, R. (1995): Listwaenite and related rocks: perspectives or terminology and mineralogy with reference to an occurrence at Cregganbaun, Co. Mayo, Republic of Ireland. Mineralium Deposita, 30, 303-313.
- Hanley, J.J., Mungall, J.E., Spooner, E.T.C. (2005): Fluid and melt inclusion evidence for platinum-group element transport by high salinity fluids and halide melts below the J-M Reef, Stillwater Complex, Montana, U.S.A.: International Platinum Symposium, Platinum-Group Elements-from Genesis to Beneficiation and Environmental Impact, 10th, Oulu, Finland, 2005, Proceedings, 94–97.
- Hanno Resources (2011): Geological map of Western Sahara. Unpublished geological map.
- Hansen, L.D., Dipple, G.M., Gordon, T.M., Kellet, D.A. (2005): Carbonated serpentinite (Listwanite) at Atlin, British Columbia: a geological analogue to carbon dioxide sequestration. Can. Mineral. 43, 225-239.
- Hanson, S.L., Simmons, W.B., Webber, K.L., Falster, A.U. (1992): Rare-earth-element mineralogy of granitic pegmatites in the Trout Creek Pass District, Chaffee County, Colorado. Can. Mineral. 30, 673-686.
- Harney, D.M.W., Von Gruenewaldt, G. (1995): Ore-forming processes in the upper part of the Bushveld complex, South Africa. Journal of African Earth Sciences 20, 77-89.
- Harris, N.B.W., Marzouki, F.M.H., Alí, S. (1986): The Jabal Sayid complex, Arabian Shield. Geochemical constraints on the origin of peralkaline and related granites. J. Geol. Soc. London 143, 287-295.
- Hart, C.J.R. (2007): Reduced intrusion-related gold systems, *in* Goodfellow, W.D. (ed.). Mineral deposits of Canada - A Synthesis of Major Deposit Types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods: Geological Association of Canada, Mineral Deposits Division, Special Publication 5, 95-112.
- Hatch, G.P. (2012): Dynamics in the global market for Rare Earths. Elements 8, 341-346.
- Hatcher Jr., R.D. (2010): The Appalachian orogen: a brief summary. In: Tollo, R.P., Bartholomew, M.J., Hibbart, J.P., Karabinos, P.M. (Eds.), From Rodinia to Pangea: The Lithotectonic Record of the Appalachian Region: Geological Society of America Memoir, 206, pp. 1–19.
- Hatton, C.J., von Gruenewaldt, G. (1987): The geological setting and petrogenesis of the Bushveld chromitite layers. In C.W. Stowe (ed.): Evolution of Chromium Ore Fields. New York: Van Nostrand Reinhold, 109-143.
- Hauck, S.A. (1990): Petrogenesis and tectonic

- setting of middle Proterozoic iron oxide-rich ore deposits-An ore deposit model for Olympic Dam-type mineralization. U.S. Geol. Surv. Bull. 1932, 4-39.
- Hayba, D.O., Bethke, P.M., Heald, P., Foley, N.K. (1985): Geologic, mineralogic and geochemical characteristics of volcanic-hosted epithermal precious metal deposits. A: Berger, B.R., Bethke, P.M. (ed.): Geology and geochemistry of epithermal systems. *Rev. Econ. Geol.* 2: 129-168.
- Heald, P., Foley, N., Hayba, D. (1987): Comparative anatomy of volcanic hosted epithermal deposits: Acid sulfate and adularia sericite types. *Econ. Geol.* 82,1, 1-26.
- Hedenquist, J.W., Arribas, R.A., González-Urién, E. (2000): Exploration for epithermal gold deposits. *Reviews in Economic Geology* 13, 245-277.
- Hernández-Pacheco, E., (1941): Relieve y geología del norte del Sáhara Español. *Rev. Geogr. Esp.* 10.
- Hernández-Pacheco, F. (1943): Rasgos fisiográficos y geológicos de las tierras africanas de influencia española. Estades. Artes Gráficas, Univ. Madrid. VIII, 134 p., 13 lám.
- Hernández-Pacheco, F. (1948): Las costas de Ifni y del Sáhara español: rasgos fisiográficos y geológicos: Conferencia del curso organizado por esta Delegación, pronunciada por su autor el 12 de marzo 1947. Alta Comisaría de España en Marruecos, Delegación de Educación y Cultura. Tetuán, Imp. del Majzen, 35-53, 8 p. de lám.
- Hernández-Pacheco, F. (1961): Características fisiográficas del litoral y costa del Sáhara Español. Archivos del Instituto de Estudios Africanos 59, 25-61. 1 h., lám. I-V .
- Hernández-Pacheco, F. (1962): Geografía física y geología del Sáhara español. Organización para el Fomento de la Enseñanza, Cursos de conferencias para preuniversitarios, 527-557.
- Hernández-Pacheco, E., HernándezPacheco, F. (1942): Proyecto para un estudio fisiográfico y geológico del Sáhara español y proposición de problemas a resolver en prospección preliminar. 9 h. Laboratorios de Geografía Física y Geología de la Universidad de Madrid.
- Hernández-Pacheco, F., Alía Medina, M. (1942a): Nota preliminar de una expedición reciente a los territorios del Sáhara Español. *Bol. R. Soc. Esp. Hist. Nat.* 40, 507-512, 2 láms.
- Hernández-Pacheco, F., Alía Medina, M. (1942b): Nota preliminar de una prospección reciente a los territorios del Sáhara Español. *Rev. Real Acad. Ciencias Madrid* 36, 395-408. VIII h. de lám.
- Hernández-Pacheco, E., HernándezPacheco, F. (1942): Sáhara español: expedición científica de 1941. Publ. Universidad de Madrid, Servicio de Publicaciones, 198 p., 82 p. de lám., 4 h. pleg. de map.
- Hernández-Pacheco, E., HernándezPacheco, F., Alía-Medina, M., Vidal, C., Guinea, E. (1949): El Sáhara Español: estudio geológico, geográfico y botánico. Instituto de Estudios Africanos CSIC, 808 p., 134 p. de lám.
- Hernández-Pacheco, F., Alía-Medina, M. (1952): Nota preliminar de una expedición reciente a los territorios del Sahara español. *Bol. Real Sociedad Española de Historia Natural* 40, 507-512, 2 lám.
- Hernández Pacheco, F., Cordero Torres, J.M. (1962): El Sahara español. Colección Empresas políticas 4. Instituto de Estudios Políticos, D.L. (Diana). 178 p. 10 lám., 3 h. pleg. il.
- Heyman, M.A.W. (1990): Tectonic and depositional history of the Moroccan continental margin. In: Tankard, A.J., Balkwill, H.R.(Eds.), Extensional Tectonics and Stratigraphy of the North Atlantic Margins. AAPG Memoir, 46, 323-340.
- Hicks, R.J., Jamieson, R.A., Reynolds, P.H., (1999): Detrital and metamorphic $^{40}\text{Ar}/^{39}\text{Ar}$ ages from muscovite and whole-rock samples, Meguma Supergroup, southern Nova Scotia. *Canadian Journal of Earth Sciences* 36, 23-32.
- Hitzman, H.D. (2000): Iron oxide Cu-Au deposits. What, where, when, and why?. In T.M. Porter (ed.): *Hydrothermal Iron Oxide Copper-Gold and Related Deposits: A Global Perspective*, Volume 1: Adelaide, Australian Mineral Foundation, 201-218.

- Hitzman, M.W., Oreskes, N., Einaudi, M.T. (1992): Geological characteristics and tectonic setting of Proterozoic iron oxide (Cu-U-Au-REE) deposits. *Precambrian Research* 58, 241-287.
- Hogarth, D.D. (1989): Pyrochlore, apatite and amphibole: distinctive minerals in carbonatite. in: *Carbonatites: genesis and Evolution* (K. Bell, editor). Unwin Hyman, London, 105-148.
- Hogarth, D.D., Horne, J.E.T. (1989): Non-metamict uranoan pyrochlore and uranpyrochlore from tuff near Ndale, Fort Portal area, Uganda. *Mineralogical Magazine*, 53, 257-262.
- Hogarth, D.D., Williams, C.T., Jones, P. (2000): Primary zoning in pyrochlore group minerals from carbonatites. *Mineralogical Magazine* 64, 683-697.
- Horbe, M.A., Horbe, A.C., Costi, H.T., Teixeira, J.T. (1991): Geochemical characteristics of cryolite-tin-bearing granites from Pitinga Mine, northwestern Brazil-a review. *J. Geochem. Explor.* 40, 227-249.
- Horbe, A., Costa, M. (1999): Geochemical evolution of a lateritic Sn-Zr-Th-Nb-Y-REE bearing ore body derived from apogranite: the case of Pitinga, Amazonas-Brazil. *J. Geochem. Explor.* 66, 339-351
- Hunt, J.A., Baker, T., Thorkelson, D.J. (2007): A Review of Iron Oxide Copper-Gold Deposits, with Focus on the Wernecke Breccias, Yukon, Canada, as an Example of a Non-Magmatic End Member and Implications for IOCG Genesis and Classification. *Explor. Mining Geol.* 16, 209-232.
- Ibhi, A. (2014): Mécanismes de rétention des métaux lourds par des apatites naturelles: exemple de la fluorapatite des phosphates de Bou-Craa (Maroc) (Heavy metals retention mechanisms by natural apatites: fluorapatite phosphates of Bou Craa, Morocco). *J. Mater. Environ. Sci.* 5(4), 1027-1032.
- IGME (1971a): Mapa geológico del Sáhara Español a escala 1:200.000. Hoja 7. Madrid. Servicio de Publicaciones Ministerio de Industria.
- IGME (1971b): Mapa geológico del Sáhara Español a escala 1:200.000. Hoja 14. Madrid. Servicio de Publicaciones Ministerio de Industria.
- Immega, I.P., Klein, C.Jr. (1976): Mineralogy and petrology of some metamorphic precambrian iron-formations in southwestern Montana. *Amer. Mineral.* 61, 1117-1144.
- Imoekparia, E. G (1985): Geochemical Evolution of the Jarawa Younger Granite complex, *Geological Magazine* 122(2), 163-173.
- Irvine, T.N., Baragar, W.R. (1971): A guide to chemical classification of the common volcanic rocks. *Canad. J. Earth Sci.*, 8: 523-548.
- Irvine, T.N. (1975): Crystallization sequences in the Muskox intrusion and other layered intrusions. Origin of chromitite layers and similar deposits of other magmatic ores. *Geochimica et Cosmochimica Acta* 39, 991-1020.
- Irvine, T.N. (1977a): Origin of chromitite layers in the Muskox intrusion and other layered intrusions: a new interpretation. *Geology* 5, 273-277.
- Irvine, T.N. (1977b): Chromite crystallization in the join Mg_2SiO_4 - $CaMgSi_2O_6$ - $CaAl_2Si_2O_8$ - $MgCr_2O_4$ - SiO_2 . *Carnegie Institution of Washington Yearbook* 76, 465-472.
- Irvine, T.N., Keith, D.W., Todd, S.G. (1983): The J-M platinum-palladium Reef of the Stillwater complex, Montana, II. Origin by double-diffusive convective magma mixing and implications for the Bushveld complex. *Economic Geology* 78, 1287-1334.
- Ismail Ahamed, M. (1994): Geología y recursos del subsuelo del Sáhara occidental. Tesis doctoral inédita. Dept. Ingeniería Geológica. ETSIM Madrid, 126 pp.
- Jago, B.C., Gittins, J. (1993): Pyrochlore crystallization in carbonatites: the role of fluorine. *South African J. Geol.* 96 (3), 149 - 59.
- Jahn, B.M., Glikson, A.Y., Peucat, J.-J., Hickman, A.H. (1981): REE geochemistry and isotopic data of Archaean silicic volcanics and granitoids from the Pilbara Block, western Australia: implications for the early crustal evolution. *Geochim. Cosmochim. Acta* 45, 1633-1652.
- James, T.C., McKie, D. (1958): The alteration of pyrochlore to columbite in carbonatites in

- Tanganyika. Mineral. Mag. 242, 889-902.
- Janoušek, V., Farrow, C. M., Erban, V. (2006): Interpretation of whole-rock geochemical data in igneous geochemistry: introducing Geochemical Data Toolkit (GCDkit). Journal of Petrology 47(6), 1255-1259.
- Jensen, L.S. (1976): A new cation plot for classifying subalkalic volcanic rocks. Ontario Dept. Mines Misc. paper 66, 1-22.
- Jinglan, L. (1990): Mineralogy of iron-formation gold deposit at Dongfengshan. Abstr. 15th. IMA General Meeting Beijing, 1: 70-71.
- Jordana Soler, L. (1940): Posibilidades petrolíferas en la zona de Sikia-el-Hamara (Sáhara Español). 31 pp. 1 mapa.
- Julivert, M. (2003): El Sáhara. Tierras, pueblos y culturas. Publicacions Universitat de Valencia. 410 pp.
- Kahoui, M., Mahdjoub, Y. (2004): An Eburnean alkaline-peralkaline magmatism in the Reguibat Rise: the Djebel Drissa ring complex (Eglab shield, Algeria). J. African Earth Sci. 39, 115-122.
- Kahoui, M., Mahdjoub, Y., Kaminsky, F.V. (2008): Possible primary sources of diamond in the North African diamondiferous province. In N. Ennih y J.P. Liégeois (eds.): The boundaries of the West African Craton. Geol. Soc. London, Spec. Publ. 297, 77-109.
- Kane, M. (1987): Evidence for an ultrabasic-basic complex with ophiolitic characteristics in the central part of the Pan-african Mauritanides. Abst. Progr. Tectonothermal evolution of the West African orogens and Circum-Atlantic terrane linkages, Nouakchott, Mauritania, 113-115.
- Karimpour, M.H., Stern, C.R., Mouradi, M. (2011): Chemical composition of biotite as a guide to petrogenesis of granitic rocks from Maherabad, Dehnow, Gheshlagh, Khajehmourad and Najmabad, Iran. Iranian J. Cristallogr. Mineral. 16, 89-100.
- Kärkkäinen, N. (1997): The Koivusaarenneva gabbro, Finland. A: Papunen, H. (Ed.): Mineral deposits: Research and exploration-Where do they meet?. Balkema, Rotterdam, Holanda: 443-444.
- Kelemen, P.B., Shimizu, N., Dunn, T. (1993): Relative depletion of niobium in some arc magmas and the continental crust: partitioning of K, Nb, La and Ce during melt/rock reaction in the upper mantle. Earth Planet. Sci. Letters 120, 111-134.
- Kerrich, R. (1993): Perspectives on genetic models for lode-gold deposits: Mineralium Deposita 28, 362-365.
- Kerrich, R., Wyman, D. (1990): Geodynamic setting of mesothermal gold deposits: An association with accretionary tectonic regimes. Geology 18, 882-885.
- Key, R. (1992): An introduction to the crystalline basement of Africa. In: Hydrogeology of Crystalline Basement Aquifers in Africa, Geol. Soc. Spec. Publ., London. 66, 29-57.
- Key, R., Loughlin, S., Gillespie, M., Del Rio, M.D.L.M., Horstwood, M., Crowley, Q.G., Derbyshire, F., Pitfield, P., Henney, P. (2008): Two Mesoarchaean terranes in the Reguibat Shield of NW Mauritania. In: Ennih, N., Liegeois, J.-P. (Eds.), The Boundaries of the West African Craton: London, UK, Geological Society of London, Special Publication, 297, pp. 33-52.
- Khuzuguet, R.V., Zaikov, V.V., Lebedev, V.I., Mongush, A.A. (2015): Gold mineralization of the Khaak-Sair gold-quartz ore occurrence in listwänites (Western Tuva). Geology & Geophysics 56, 9, 1693-1712.
- King, P.L., White, A.J.R., Chappell, B.W., Allen, C.M. (1997): Characterization and Origin of Aluminous A-type Granites from the Lachlan Fold Belt, Southeastern Australia. : Petrol. 38, 371-391.
- Kirnarskii, Iu.M. (1997): Carbonatitas. In J.C. Melgarejo (ed.): Atlas de asociaciones minerales en lámina delgada. Ed. UB, 66-78.
- Kjellman, J., Černý, P., Smeds, S.A. (1999): Diversified NYF pegmatite populations of the Swedish Proterozoic: outline of a comparative study. Can. Mineral. 37, 832-833.
- Klein, C. (1973a): Changes in mineral assemblages with metamorphism of some banded Precambrian iron-formations. Econ. Geol. 68: 1075-1088.
- Klein, C. (1973b): Diagenesis and metamorphism of Precambrian banded-iron formations. En: Trendall, A.F., Morris, R.C. (eds.): Iron-

- formations: facts and problems. Elsevier Amsterdam: 417-469.
- Klein, C. (1974): Greenalite, stilpnomelane, minnesotaite, crocidolite and carbonates in a very low-grade metamorphic Precambrian iron-formation. *Can. Mineral.* 12: 475-498.
- Knudsen, C. (1989): Pyrochlore-group minerals from the Qaqarssuk carbonatite complex. Special Publication of the Society for Geology Applied to Mineral Deposits 7(Lanthanides, Tantalum Niobium), 80-99.
- Kogarko, L.N. (1990): Ore-forming potential of alkaline magmas. *Lithos* 26, 167-175.
- Kogarko, L.N., Kononova, V.A., Orlova, M.P., Woolley, A.R. (1995): Alkaline Rocks and Carbonatites of the World. 2. Former USSR. Chapinan & Hall, London, U.K.
- Königshof , P., Kershaw, S. (2006): Growth forms and palaeoenvironmental interpretation of stromatoporoids in a Middle Devonian reef, southern Morocco (West Sahara). *Facies* 52, 299-306.
- Kovalenko, V.I., Tsaryava, G.M., Goreglyad, A.V., Yarmolyuk, V.V., Troitsky, V.A., Hervig, R.L., Farmer, G.L. (1995): The peralkaline granite-related Khaldzan-Buregtey rare metal (Zr, Nb, REE) deposit, western Mongolia. *Econ. Geol.* 90, 530-547.
- Kwak, T.A.P., Abeysinghe, P.B. (1987): Rare earth and uranium minerals present as daughter crystals in fluid inclusions, Mary Kathleen U-REE skarn, Queensland, Australia. *Mineral. Mag.* 51, 665-670.
- Kyser, K., Cuney, M. (2009): Chapter 8: Unconformity-related uranium deposits. In M. Cuney, M. y K. Kyser (eds.), Recent and Not-So-Recent Developments in Uranium Deposits and Implications for Exploration. *Mineral. Assoc. Canada, Short Course Series*, 161-219.
- Labails, C., Olivet, J.-L., Aslanian, D., Roest, W.R. (2010): An alternative early opening scenario for the Central Atlantic Ocean. *Earth and Planetary Science Letters* 297, 355-368.
- Lago, B.L., Rabinowich, M., Nicolas, A. (1982): Podiform chromite ore bodies-A genetic model. *J. Petrol.* 23, 103-125.
- Lahondère, D., Thiéblemont, D., Goujou, J-C., Roger, J., Moussine-Pouchkine, A., Le, Métour, J., Cocherie, A., Guerrot, C. (2003): Notice explicative des cartes géologiques et gîtologiques à 1/200 000 et 1/500 000 du Nord de la Mauritanie. Volume 1. DMG. Ministère des Mines et de l'Industrie, Nouakchott.
- Lalonde, A.E., Bernard, P. (1993): Composition and color of biotites from granites: two useful properties in the characterization of plutonic suites from the Hepburn internal zone of Wopmay orogen, NorthWest Territories. *Can. Mineral.* 31, 203-217.
- Lameyre, J., Lasserre, M. (1967): Étude géochronologique des syénites alcalines et néphéliniques du massif annulaire de Hassi-El-Fogra (Mauritanie du Nord). *Comptes Rendus de l'Academie des Sciences, Paris*, 265D, 733-736.
- Large, R.R. (1977): Chemical evolution and zonation of massive sulfide deposits in volcanic terrains. *Econ. Geol.* 72: 549-572.
- Large, D.E. (1979): Proximal and distal stratabound ore deposits: discussion. *Mineral. Deposita* 14: 123-124.
- Large, D. E. (1980): Geological parameters associated with sediment-hosted, submarine exhalative Pb-Zn deposits: an empirical model for mineral exploration. *Geol. Jb.* D40: 59-129.
- Large, D.E. (1981): Sediment hosted submarine exhalative lead-zinc deposits - a review of their geological characteristics and genesis. A: Wolf, K.H. (ed.): *Handbook of stratabound and stratiform ore deposits* 9: 469-507.
- Large, D.E. (1983): Sediment-hosted massive sulphide lead-zinc deposits: an empirical model. A: Sangster (ed.): *Short course in sediment-hosted stratiform lead-zinc deposits*: 1-25.
- La Viña Villa, J. (1961): La investigacion de fosfatos en el Sáhara. *Archivos del Instituto de Estudios Africanos* 59, 65-83.
- Lameyre, J., Lasserre, M. (1967): Étude géochronologique des syénites alcalines et néphéliniques du massif annulaire de Hassi-el-Fogra, Mauritanie du Nord. *C.R. Acad. Sci. Paris*, 265, 733-736.
- Lasserre, M., Lameyre, J., Buffière, J.M. (1970): Données géochronologiques sur l'axe

- précambrien Yetti-Eglab en Algérie et en Mauritanie du Nord. Bull. BRGM 4, 5-13.
- Leake, B.E., Woolley, A.R., Birch, W.D., Burke, E.A.J., Ferraris, G., Grice, J.D., Hawthorne, F.C., Kisch, H.J., Krivovichev, V.G., Schumacher, J.C., Stephenson, N.C.N., Whittaker, E.J.W. (2004): Nomenclature of amphiboles: additions and revisions to the International Mineralogical Association's amphibole nomenclature. Eur. J. Mineral. **16**, 191-196.
- Leblanc, M. (1986): Co-Ni arsenide deposits, with accessory gold, in ultramafic rocks from: Morocco. Canadian Journal of Earth Sciences, 23, 1592-1602.
- Leblanc, M., Billaud, P. (1982): Cobalt arsenide orebodies related to an Upper Proterozoic ophiolite: Bou Azzer (Morocco). Economic Geology, 77, 162-175.
- Leblanc, M., Nicolas, A. (1992): Les chromitites ophiolitiques. Chron. Recherche Minière 507, 3-25.
- Lecointre, G., Hernández-Pacheco, F. (1962): Sur la géologie de la presqu'île de Villacisneros Río de Oro. C. Re. Acad. Sci. 254, 1121.
- Lecointre, G. (1963): Note sur le Néogène et le Quaternaire marins du Sahara Espagnol (Seguïet el Hamra et Rio de Oro). Notas y Comuns. IGME 71, 5-38.
- Lécorché, J.-P., Bronner, G., Dallmeyer, R.D., Rocci, G., Roussel, J. (1991): The Mauritanide Orogen and its northern extensions (Western Sahara and Zemmour), West Africa. In: Dallmeyer, R.D., Lécorché, J.-P. (Eds.), The West African Orogens and Circum-Atlantic Correlatives. Springer-Verlag, Berlin, 187-227.
- Lee, M.J., Lee, J.I., Garcia, D., Moutte, J., Williams, C.T., Wall, F., Kim, Y. (2006) Pyrochlore chemistry from the Sokli phoscorite-carbonatite complex, Finland: implications for the genesis of phoscorite and carbonatite association. Geochemical Journal, 40, 1-13.
- Le Goff, E., Guerrot, C., Maurin, G., Johan, V., Tegyey, M., Ben Zarga, M. (2001): Découverte d'éclogites hercyniennes dans la chaîne septentrionale des Mauritanides (Afrique de l'Ouest). Comptes Rendus de l'Academie des Sciences Paris, Series IIa 333, 711-718.
- Legrand, P. (1967): Le Dévonien du Sahara algérien. In: Oswald, D.H. (ed), International Symposium of the Devonian System. Alta, Calgary, 245-284.
- Legrand, P. (1969): Découverte de graptolites entre Gara Djebilet et Aouinet el Egra (Synéciese de Tindouf, Sahara Algérien). Bull. Soc. Hist. Nat. Afr. Nord Algerie 59, 99-114.
- Legrand, P. (1970): Les couches à Diplograptus du Tassili de Tarit (Ahnet, Sahara algérien). Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord 60, 3-58.
- Legrand, P. (1977): Contribution à l'étude des graptolites du Llandoverien inférieur de l'Oued In Djerane (Tassili N'Ajjer oriental, Sahara algérien). Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord 67, 141-196.
- Legrand, P. (1986): The Silurian graptolites of Oued In Djerane: a study of populations at the Ordovician-Silurian boundary, 145-163. In Hughes, C.P. y Rickards, R.B. (eds) Palaeoecology and biostratigraphy of graptolites, Geological Society Special Publication 20, 1-277.
- Legrand, P. (1995): À propos d'un niveau à Neodiplograptus dans le Silurien inférieur à l'est de Ouallene, Asejrad (Sahara algérien). Implications stratigraphiques et paléogéographiques. 118 Congrès national des Sociétés historiques et scientifiques, 4ème colloque sur la Géologie africaine, Pau, 409-424.
- Legrand, P. (2000): Une région de référence pour la limite Ordovicien-Silurien: l'Oued In Djerane, Sahara algérien. Comptes Rendus de l'Académie des Sciences, Paris, Sciences de la Terre et des Planètes 330, 61-66.
- Legrand, P. (2002): La Formation des Argiles de Tedjert (Ordovicien terminal-Silurien inférieur) au Tassili Oua-n-Ahaggar oriental (Sahara algérien) et sa faune graptolitique. Annales de la Société Géologique du Nord (Série 2) 9, 215-229.
- Legrand, P. (2003): Silurian stratigraphy and paleogeography of the northern African margin of Gondwana. New York State Museum Bulletin 493, 59-104.
- Legrand, P. (2009): Faunal specificity, endemism

- and paleobiogeography: the post-glacial (Hirnantian-early Rhuddanian) graptolite fauna of the North-African border of Gondwana: a case study. *Bulletin de la Société Géologique de France* 180, 353–367.
- Lemoigne, Y. (1967): Reconnaissance paléobotanique dans le Sahara occidental (Région de Tindouf et Gara-Djebilet). *Annales de la Société Géologique du Nord* 87, 31–38.
- Lemoine, S., Tempier, P., Bassot, J.P., Caen-Vachette, M., Vialette, Y., Touré, S., Wenmenga, U. (1990): The Burkinian orogenic cycle, precursor of the Eburnian orogeny in West Africa. *Geol. Journ.* 25(2), 171-188.
- Lenz, O. (1886): Timbouctou, voyage au Maroc, au Sahara et au Sudan. Paris. (traducción del alemán de R Lechautcourt). Hachette, París, 2 vols., 467 y 436 pp
- Le Roy, P., Piqué, A. (2001): Triassic–Liassic Western Moroccan synrift basins in relation to the Central Atlantic opening. *Marine Geology* 172, 359–381.
- Lehbib, S., Arribas, A., Melgarejo, J.C., Proenza, J.A., Zaccarini, F., Thalhammer, O., Garuti, G. (2008): Chromite deposits from Western Sahara: textures, composition and Platinum Group Minerals. *Macla*, 9, 143-144.
- Lehbib, S., Arribas, A., Melgarejo, J.C. (2009a): Depósitos de hierro de tipo BIF en la región del Tiris, Sahara Occidental. *Macla* 11, 111-112.
- Lehbib, S., Arribas, A., Melgarejo, J.C. (2009b): Primeros datos de las anortositas de Gleibat Madada, Sahara Occidental. *Macla* 11, 113-114.
- Lehbib, S., Arribas, A., Melgarejo, J.C. (2010): Banded iron formation deposits from the Tiris region, Western Sahara; structure, mineralogy and textures. *Acta Mineralogica-Petrographica. Abstract Series* 6: 236.
- Lehbib, S., Arribas, A., Melgarejo, J.C., Martin, R.F. (2011): Rare-element minerals of the alkaline suites of the Western Sahara. *Peralk-carb*, Thübingen.
- Lehbib, S., Domènec, R., Belaústegui, Z., Martinell, J. (2016): Bioerosion in Rugosa corals from the Devonian of Tindouf basin (Western Sahara). *Ichnia* 2016, Vol. Abstracts, 118.
- Lemaître, R.W., Streckeisen, A., Zanettin, B., Le Bas, M.J., Bonin, B., Bateman, P., Bellieni, G., Dudel, A., Efremova, S., Keller, A.J., Lameyre, J., Sabine, P.A., Schmid, R., Sørensen, H., Woolley, A.R. (2002): Igneous Rocks: a Classification and Glossary of Terms. 2nd Edition. Cambridge (Cambridge University Press), 236 pp.
- Li, Z.X., Bogdanova, S.V., Collins, A.S., Davidson, A., De Waele, B., Ernst, R.E., Fitzsimons, I.C.W., Fuck, R.A., Gladkochub, D.P., Jacobs, J., Karlstrom, K.E., Lu, S., Natapov, L.M., Pease, V., Pisarevsky, S.A., Thrane, K., Vernikovsky, V. (2008): Assembly, configuration, and break-up history of Rodinia: a synthesis. *Precambrian Research* 160, 179–210.
- Linnemann, U., Gerdes, A., Drost, K., Buschmann, B. (2007): The continuum between Cadomian orogenesis and opening of the Rheic Ocean: constraints from LA-ICPMS U–Pb zircon dating and analyses of plate-tectonic setting (Saxo-Thuringian zone, northeastern Bohemian Massif, Germany). *Geological Society of America Special Paper* 423, 61–96.
- Linnemann, U., Pereira, F., Jeffries, T.E., Drost, K., Gerdes, A. (2008): The Cadomian Orogeny and the opening of the Rheic Ocean: the diacrony of geotectonic processes constrained by LA-ICP-MS U–Pb zircon dating (Ossa-Morena and Saxo-Thuringian Zones, Iberian and Bohemian Massifs). *Tectonophysics* 461, 21–43.
- Linnemann, U., Romer, R.L., Gerdes, A., Jeffries, T.E., Drost, K., Ulrich, J. (2010): The Cadomian Orogeny in the Saxo-Thuringian Zone. In: Linnemann, U., Romer, R.L. (Eds.), *Pre-Mesozoic Geology of Saxo-Thuringia — From the Cadomian ActiveMargin to the Variscan Orogen*. Schweizerbart, Stuttgart, pp. 37–55.
- Linnemann, U., Ouzegane, K., Draren, A., Hofmann, M., Becker, S., Gärtner, A., Sagawe, A. (2011): Sands of West Gondwana: an archive of secular magmatism and plate interactions — a case study from the Cambro-Ordovician section of the Tassili Ouan Ahaggar (Algerian Sahara) using U–

- Pb-LA-ICP-MS detrital zircon ages. *Lithos* 123, 188–203.
- Linnemann, U., Herbosch, A., Liégeois, J.-P., Pin, C., Gärtner, A., Hofmann, M. (2012): The Cambrian to Devonian odyssey of the Brabant Massif within Avalonia: a review with new zircon ages, geochemistry, Sm-Nd isotopes, stratigraphy and palaeogeography. *Earth Science Reviews*, 112, pp. 126–154.
- Linnen, R.L., Van Lichtervelde, M., Černý, P. (2012): Granitic pegmatites as sources of strategic metals. *Elements* 8, 275-280.
- Lipin, B.R. (1993): Pressure increases in the formation of chromite seams and the development of the ultramafic series in the Stillwater complex, Montana. *Journal of Petrology* 34, 955-976.
- Loi, A., Ghienne, J.-F., Dabard, M. P., Paris, F., Botquelen, A., Christ, N., Elaouad-Debbaj, Z., Gorini, A., Vidal, M., Videt, B., Destombes, J. (2010): The Late Ordovician glacio-eustatic record from a high-latitude storm-dominated shelf succession: the Bou Ingarf section (Anti-Atlas, Southern Morocco). *Palaeogeography, Palaeoclimatology, Palaeoecology* 296, 332-358.
- London, D. (2008): Pegmatites. *Can. Mineral. Spec. Publ.* 10, 347 pp.
- Lottermoser, B.G., England, B.M. (1988): Compositional variation in pyrochlores from the Mt. Weld carbonatite laterite, Western Australia. *Mineral. Petrol.*, 38, 37 - 51.
- Lowell, J.D., Guilbert, J.M. (1970): Lateral and vertical alteration-mineralization in porphyry deposits. *Econ. Geol.* 65: 378-404.
- Lumpkin, G.R., Ewing, R.C. (1985) Natural pyrochlores: analogs for actinide host phases in radioactive waste forms. In: Materials Research Society Symposium Proceedings 44. The Scientific Basis for Nuclear Waste Management (C.M. Jantzen, J.A. Stone and R.C. Ewing, editors). Materials Research Society, Pittsburgh, PA, USA, 647-654.
- Lumpkin, G.R., Ewing, R.C. (1995) Geochemical alteration of pyrochlore group minerals: pyrochlore subgroup. *American Mineralogist*, 80, 732-743.
- Lumpkin, G.R., Mariano, A.N. (1996): Natural occurrence and stability of pyrochlore in carbonatites, related hydrothermal systems, and weathering environments. Materials Research Society Symposium Proceedings: Scientific Basis for Nuclear Waste Management XIX, 412, pp. 831–838.
- Lyche, Ch. (2013): Lithology, Mineral Alteration and Mineralisation of Agarasras Labiad, Oum Abana Greenstone Belt, West African Craton, Western Sahara. Unpublished BSc thesis. Department of Applied Geology, Curtin University, 158 pp.
- Lydon, J.W. (1988): Volcanogenic massive sulphide deposits: I. A descriptive model. A: Roberts, R.G., Sheanen, P.A. (eds.): *Ore deposit models*. Geoscience Canada, reprint series 3: 145-182.
- Macdonald, R., Baginski, B., Fettes, D.J., Upton, B.G.J. (2013): Chevkinite-group minerals in UK Palaeogene granites: underestimated REE-bearing accessory phases. *Can. Mineral.* 51, 333-347.
- Macías Suárez, F., Pérez-López , R., Ruiz Cánovas, C. (2015): Evaluación ambiental de los fosfoyesos de Huelva según normativas de Europa y Norteamérica. *Macla* 20, 85-86.
- MacMillan, W.J., Panteleyev, A. (1988): Porphyry Copper Deposits. A: Roberts, R.G., Sheanen, P.A. (ed.): *Ore deposit models*. Geoscience Canada, reprint series 3: 45-58.
- Mahdjoub, Y., Draren, A., Gani, R. (1994): Accrétion crustale et tectonique verticale à l'Eburnéen dans les massifs des Eglab et du Yetti (Dorsale Réguibat, Algérie). *Bull. Serv. Géol. Algérie* 5, 97 -107.
- Maier, W.D. (2005): Platinum-group element (PGE) deposits and occurrences: mineralization styles, genetic concepts, and exploration criteria. *Journal of African Earth Sciences* 41, 165-191.
- Maier, W.D., Barnes, S.-J. (1999): Platinum-group elements in silicate rocks of the lower, critical and main zones at Union Section, western Bushveld Complex. *J. Petrol.* 40, 1647-1671.
- Maier, W.D., Prichard, H.M., Barnes, S.J., Fisher, P.C. (1999): Compositional variation of laurite at Union section in the western Bushveld Complex. *South African Journal of Geology* 102, 286–292.
- Maier, W.D., Arndt, N.T., Curl, E.A. (2000):

- Progressive crustal contamination of the Bushveld Complex: evidence from Nd isotopic analyses of the cumulate rocks. Contributions to Mineralogy and Petrology 140, 316-327.
- Maliotis, G., Michaelides, A. (1979): The asbestos and chromite mineralizations of the Troodos Plutonic Complex, in Field excursion guidebook, International Ophiolite Symposium, Nicosia-Cyprus, 1-8 April 1979: Nicosia, Geological Survey Department, p. 51-60.
- Marchand, J., Sougy, J., Rocci, G. (1971): Etude photogeologique de la partie orientale de la dorsale Reguibat et de sa couverture sud (Mauritanie). Trav. Lab. Sci. Terre 10, 167 pp.
- Marchand, J., Bronner, G., Sougy, J. (1984): Carte géologique provisoire du Maroc à l'échelle du 200 000. Notice explicative de la feuille de Bir Anzarane (NF 28 XXII). Service Géologique du Maroc, Notes et Mémoires 342, 1-18.
- Marelle, A., Abdulla, M.A. (1970): Iron ore deposits of Africa. In Survey of world iron ore resources: New York, United Nations Dept. Econ. and Social Affairs, 62-101.
- Mariano, A.N. (1989a): Nature of economic mineralization in carbonatites and related rocks. In K. Bell (Ed.): Carbonatites-Genesis and Evolution. Unwin Hyman, London, 149-176.
- Mariano, A.N. (1989b): Economic geology of rare-earth elements. In: B.R. Lipin y G.A. McKay (eds): Geochemistry and mineralogy of rare earth elements. MSA Rev. Mineral. 21, 309-337.
- Marmont, S. (1990): Unconformity-type uranium deposits. In R.G. Roberts y P.A. Shean (eds.): Ore deposit models. Goescience Canada Reprinr Series 3, 103-115.
- Martin, R.F., Barkov, A.Y. (2002): Negative Nb and Ta anomalies in subduction-related magmas: insights from the discovery of edgarite. Abstracts 18th. Gen. Meeting IMA, Edinburgh, Scotland, 219.
- Martin, R.F., De Vito, C. (2005): The pattern of enrichment in felsic pegmatites ultimately depend on tectonic setting. Can. Mineral. 43, 2027-2048.
- Martin, R.F., Sokolov, M., Magaji, S.S. (2012): Punctuated anorogenic magmatism. *Lithos*, 152, 132-140.
- Martínez-Catalán, J.R., Arenas, R., Díaz García, F., Gómez-Barreiro, J., González Cuadra, P., Abati, J., Castiñeiras, P., Fernández-Suárez, J., Sánchez Martínez, S., Andonaegui, P., González Clavijo, E., Diez Montes, A., Rubio Pascual, F.J., Valle Aguado, B. (2007): Space and time in the tectonic evolution of the northwestern Iberian Massif. Implications for the comprehension of the Variscan belt. In: Hatcher Jr., R.D., Carlson, M.P., McBride, J.H., Martínez-Catalán, J.R. (Eds.), 4-D Framework of Continental Crust: Geological Society of America Memoir, 200, pp. 403-423.
- Martinis, B., Visintin, V. (1966): Données géologiques sur le bassin sédimentaire côtier de Tarfaya (Maroc Meridional). In: D. Reyre (ed.): Sedimentary Basins of the African Coast, part 1 (Atlantic coast), Ass. Afr. Geol. Surv., UNESCO: 13-26.
- Martyn, J., Strickland, C. (2004): Stratigraphy, structure and mineralization of the Akjoujt area, Mauritania. J. African Earth Sci., 38, 489-503.
- Mathez, E.A. (1999): On factors controlling the concentrations of platinum group elements in layered intrusions and chromitites. In: Keays, R.R., Lesher, C.M., Lightfoot, P.D. Farrow, C.E.G. (eds): Dynamic Processes in Magmatic Ore Deposits and their Application in Mineral Exploration. Geological Association of Canada Short Course Notes 13, 251-286.
- Mathez, E.A., Mey, J.L. (2005): Character of the UG2 chromitite and host rocks and petrogenesis of its pegmatoidal footwall, northwestern Bushveld Complex. Economic Geology 100, 1617-1630.
- Mathison, C.I. (1975): Magnetite and ilmenite in the Somerset dam layered basic intrusion, southern Queensland. Lithos 8, 93-111.
- Maurin, G. (1997): Notice explicative de la carte géologique au 1:200 000, feuille Chami, RIM, 1-32.
- McDonough, W.F., Sun, S., Rinwood, A.E., Jagoutz, E., Hoffmann, A.W. (1991): K, Rb, Cs, in the Earth and Moon and evolution of the Earth's mantle. Geochim. Cosmochim.

- Acta 56, 1001-1012.
- McLaren, C.H., De Villiers, J.P.R. (1982): The platinum-group chemistry and mineralogy of the UG2 chromitite layers of the Bushveld Complex. *Economic Geology* 77, 1348-1366.
- McPhie, J., Kamenetsly, V., Allen, Sh., Ehrig, K., Agangi, A., Bath, A. (2011): The fluorine link between a supergiant ore deposit and a silicic large igneous province. *Geology* 39, 1003-1006.
- Meinert, L.D. (1983): Variability of *skarn* deposits: guides to exploration. In: Boardman S.J. (ed): *Revolution in the Earth Sciences—Advances in the Past Half Century*. Kendall/Hunt Publishing Co., Iowa: 301-316.
- Meinert, L.D. (1989): Gold *skarn* deposits—Geology and Exploration criteria. *Econ. Geol. Mon.* 6: 533-552.
- Meinert, L.D. (1992): *Skarns* and *skarn* deposits. *Geosci. Canada* 19,4: 145-162.
- Meinert, L.D., Dipple, G.M., Nicolescu, S. (2005): World skarn deposits. *Econ. Geol.* 100th Anniv. Vol., 299-336.
- Melcher, F., Graupner, T., Gäßler, H.E., Sitnikova, M., Henjes-Kunst, F., Oberthür, Th., Gerdes, A., Dewaele, S. (2015): Tantalum-(niobium-tin) mineralisation in African pegmatites and rare metal granites: Constraints from Ta–Nb oxide mineralogy, geochemistry and U–Pb geochronology. *Ore Geology Reviews* 64, 667–719.
- Melgarejo, J.C., Alfonso, P. (1997): Depósitos estratiformes de Fe y de Mn. In J.C. Melgarejo (ed.). *Atlas de asociaciones minerales en lámina delgada*. Ed. Universitat de Barcelona, 309-322.
- Melgarejo, J.C., Costanzo, A., Bambi, A.C.J.M., Gonçalves, A.O., Neto, A.B. (2012): Subsolidus processes as a key factor on the distribution of Nb species in plutonic carbonatites: The Tchivira case, Angola. *Lithos* 152: 187-201.
- Menchikoff, N. (1930): Recherches géologiques et morphologiques dans le Nord du Sahara Occidental. *Rev. Géogr. Phys. Geol. Dynamique*. Sér. A, 1289. 148 pp, 8 láms.
- Menchikoff, N. (1933a): Données nouvelles sur la géologie du Sahara Occidental. *C.R. Acad. Sci. Paris*. 196, 1237-1238.
- Menchikoff, N. (1933b): Sur le Devonien de Menakeb (Sahara Occidental). *C.R. Acad. Sci. Paris*. 196, 1038.
- Menchikoff, N. (1935a): Le Devonien des confins de Rio de Oro. *C.R. Soc. Geol. Fr.* 37-39.
- Menchikoff, N. (1935b): Le Devonien inférieur de Menakeb (Sahara Occidental). *C.R. Soc. Geol. Fr.* 74-75.
- Menchikoff, N., Hsu, T-Y. (1935): Les polypiers carbonifères du Sahara occidental. *Geological Society of France, Bulletin*, 4-5, 229-261.
- Menchikoff, N. (1949): Quelques traits de l'histoire géologique du Sahara Occidental. *Livre jubilaire Charles Jacob, Annales Hébat et Haug*, 7, 303-325.
- Michard, A., Hoepffner, C., Soulaimani, A., Baider, L. (2008): The Variscan Belt. In: Michard, A., Saddiqi, O., Chalouan, A., Frizon de Lamotte, D. (Eds.), *Continental Evolution: The Geology of Morocco — Structure, Stratigraphy, and Tectonics of the Africa-Atlantic- Mediterranean Triple Junction*. Springer, Berlin and Heidelberg, pp. 65–132.
- Michard, A., Soulaimani, A., Hoepffner, C., Ouanaimi, H., Baider, L., Rijimati, E.C., Saddiqi, O. (2010): The South-Western Branch of the Variscan Belt: evidence from Morocco. *Tectonophysics* 492, 1–24.
- Middlemost, A.K. (1994): Naming materials in the magma/igneous rock system. *Earth-Science Reviews* 37, 215-224.
- Mingarro, E., Arribas, A. (1956): Consideraciones sobre la edad absoluta del Precámbrico de Bulautad (Sáhara Meridional Español). *Abstracts XX Int. Geol. Congress*, Mexico city, México, 220.
- Mitchell, R.H. (2005): Carbonatites and carbonatites and carbonatites. *Can. Mineral.* 43, 2049-2068.
- Mitchell-Thomé, R.C. (1964): The Precambrian of West Africa. *Geol. Rundschau* 54, 1088-1143.
- Miyano, T., Klein, C. (1983a): Conditions of riebeckite formation in the iron-formation of the Dales Gorge Member, Hamersley Group, Western Australia. *Amer. Mineral.* 68, 517-529.

- Miyano, T., Klein, C. (1983b): Phase relations of orthopyroxene, olivine, and grunerite in high-grade metamorphic iron formation. *Amer. Mineral.* 68, 699-716.
- Miyashiro, A. (1975): Volcanic Rock Series and Tectonic Setting. *Annual Review of Earth and Planetary Sciences* 3, 251-269.
- Möller, P. (1989): REE(Y), Nb, and Ta enrichment in pegmatites and carbonatite-alkalic rock complexes. In P. Möller, P. Černý, F. Saupé (eds): *Lanthanides, Tantalum and Niobium*. Springer-Verlag, Berlin, 104-144.
- Mondal, S.K., Mathez, E.A. (2007): Origin of the UG2 chromitite layer, Bushveld complex. *J. Petrology* 48, 495-510.
- Montero, P., Haissen, F., El Archi, A., Rjimati, E., Bea, F. (2014): Timing of Archean crust formation and cratonization in the Awsard-Tichla zone of the NW Reguibat Rise, West African Craton: A SHRIMP, Nd-Sr isotopes, and geochemical reconnaissance study. *Precambrian Research* 242, 112-137.
- Montero, P., Haissen, F., Mouttaqi, A., Molina, J.F., Errami, A., Sadki, O., Cambeses, A., Bea, f. (2016): Contrasting SHRIMP U-Pb zircon ages of two carbonatite complexes from the peri-cratonic terranes of the Reguibat Shield: implications for the lateral extension of the West African Craton. *Gondwana Research* (2016): doi:10.1016/j.gr.2015.12.005.
- Morimoto, N., Fabries, J., Ferguson, A.K., Ginzburg, I.V., Ross, M., Seifert, F.A., Zussman, J., Aoki, K., Gottardi, G. (1988): Nomenclature of pyroxenes. *American Mineralogist* 73, 1123-1133.
- Moritz, R.P., Crocket, J.H. (1990): Mechanics of formation of the goldbearing quartz-fuchsite vein at the Dome mine, Timmins area, Ontario: *Canadian Journal of Earth Sciences* 27, 1609-1620.
- Morrison, G.W., Rose, W.J., Jareith, S. (1991): Geological and geochemical controls on the silver content (fineness) of gold in gold-silver deposits: *Ore Geology Reviews* 6, 333-364.
- Moulin, M., Aslanian, D., Unternehr, P. (2010): A new starting point for the South and Equatorial Atlantic Ocean. *Earth-Science Reviews* 98, 1-37.
- Muñoz Cabezón, C. (2005): The Bu-Craa phosphate deposit, Western Sahara, Morocco. In A.J. Notholt, R.P. Sheldon y D.F. Davidson (eds.), *Phosphate deposits of the world* (176-182). New York: Cambridge University Press.
- Murck, B.N., Campbell, I.H. (1986): The effects of temperature, oxygen fugacity and composition on the behavior of chromium in basic and ultramafic melts. *Geochimica et Cosmochimica Acta* 50, 1871-1887.
- Murphy, J.B. (2007): Igneous Rock Associations 8. Arc Magmatism II: Geo-chemical and Isotopic Characteristics. *Geoscience Canada* 34(1), [S.1], ISSN 1911-4850. Available at: <<http://journals.hil.unb.ca/index.php/GC/article/view/10230/10607>>
- Murphy, J.B., Nance, R.D. (2008): The Pangea conundrum. *Geology* 36, 703-706.
- Murphy, J.B., Pisarevsky, S.A., Nance, R.D., Keppie, J.D. (2004a): Neoproterozoic-early Paleozoic configuration of peri-Gondwanan terranes: implications for Laurentia-Gondwanan connections. *International Journal of Earth Sciences* 93, 659-682.
- Murphy, J.B., Fernández-Suárez, J., Keppie, J.D., Jeffries, T.E. (2004b): Contiguous rather than discrete Paleozoic histories for the Avalon and Meguma terranes based on detrital zircon data. *Geology* 32 (7), 585-588.
- Murphy, J.B., Gutierrez-Alonso, G., Damian, R.D., Fernandez-Suarez, J., Keppie, J.D., Quesada, C., Strachan, R.A., Dostal, J. (2006a): Origin of the Rheic Ocean: rifting along a Neoproterozoic Suture? *Geology* 34 (5), 325-328.
- Murphy, J.B., Keppie, J.D., Damian, R.D., Miller, B.V., Dostal, J., Middleton, M., Fernandez-Suarez, J., Jeffries, T.E., Storey, G.D. (2006b): Geochemistry and U-Pb protolith ages of eclogitic rocks of the Asis lithodeme, Piaxla Suite, Acatlan Complex, southern Mexico: tectonothermal activity along the southern margin of the Rheic Ocean. *Journal of the Geological Society of London* 163, 683-695.
- Murphy, J.B., Keppie, J.D., Nance, R.D., Dostal, J. (2010): Comparative evolution of the Iapetus and Rheic Oceans: a North America

- perspective. *Gondwana Research* 17, 482–499.
- Murphy, J.B., Waldron, J.W.F., Kontak, D.J., Pe-Piper, G., Piper, D.J.W. (2011a): Minas Fault Zone: Late Paleozoic history of an intra-continental orogenic transform fault in the Canadian Appalachians. *Journal of Structural Geology* 33, 312–328.
- Murphy, J.B., van Staal, C.R., Collins, W.J. (2011b). A comparison of the evolution of arc complexes in Paleozoic interior and peripheral orogens: speculations on geodynamic correlations. *Gondwana Research* 19, 812–827.
- Nachit, H., Razafimahefa, N., Stussi, J.-M., Carron, P.J. (1985): Composition chimique des biotites et typologie magmatique des granitoïdes. *C. R. Acad. Sci.* 301, 813–818.
- Naldrett, A.J., Lehmann, J. (1988): Spinel non-stoichiometry as an explanation for Ni-, Cu-, and PGE-enriched sulphides in chromitites. In: Prichard, H. M., Potts, P. J., Bowles, J. F.W. & Cribb, S. J. (eds) *Geo-platinum 87 Symposium*. Amsterdam: Elsevier, pp. 93–109.
- Naldrett, A.J., Wilson, A., Kinnaird, J., Yudovskaya, M., Chunnett, G. (2012): The origin of the chromitites and related PGE mineralization in the Bushveld Complex: new mineralogical and petrological constraints. *Mineralium Deposita* 47, 209–232.
- Nance, R.D., Linnemann, U. (2008): The Rheic Ocean: origin, evolution, and significance. *GSA Today* 18 (12), 4–8.
- Nance, R.D., Gutiérrez-Alonso, G., Keppie, J.D., Linnemann, U., Murphy, J.B., Quesada, C., Strachan, R.A., Woodcock, N.H. (2010): Evolution of the Rheic Ocean. *Gondwana Research* 17, 194–222.
- Nance, R.D., Gutiérrez-Alonso, G., Keppie, J.D., Linnemann, U., Murphy, J.B., Quesada, C., Strachan, R.A., Woodcock, N.H. (2012): A brief history of the Rheic Ocean. *Geoscience Frontiers* 3 (2), 125–135.
- Nasir, S., Al Sayigh, A.R., Al Harthy, A., Al-Khirbash, S., Al-Jaaidi, O., Musllam, A., Al-Mishwat, A., Al-Bu'saidi, S. (2007): Mineralogical and geochemical characterization of listwaenite from the Semail ophiolite, Oman. *Chemie Der Erde*, 67, 213–228.
- Nasraoui, M., Bilal, E. (2000): Pyrochlores from the Lueshe carbonatite complex (Democratic Republic of Congo): a geochemical record of different alteration stages. *Journal of Asian Earth Sciences* 18, 237–251.
- Neill, I., Russell, J.K. (1993): Mineralogy and chemistry of the Rugged Mountain pluton: a melanite-bearing alkaline intrusion. In *Geological fieldwork 1992*, British Columbia Ministry of Energy, Mines and Petroleum Resources. Paper 1993-1, pp. 149–157.
- Neto, A.C.B., Pereira, V.P., Ronchi, L.H., de Lima, E.F., Frantz, J.C. (2009): The world-class Sn, Nb, Ta, F (Y, REE, Li) deposit and the massive cryolite associated with the albite-enriched facies of the Madeira A-type granite, Pitinga mine district, Amazonas State, Brazil. *Can. Mineral.* 47, 1329–1357.
- Neybergh, H., Laduron, D., Martin, H., Verkaeren, J. (1980): The Vanadiferous Magnetite Deposits of the Oursi Region, Upper-Volta. *Economic Geology* 75, 1980, 1042–1052.
- Nicholson, D.M., Mathez, E.A. (1991): Petrogenesis of the Merensky Reef in the Rustenburg section of the Bushveld Complex. *Contributions to Mineralogy and Petrology* 107, 293–309.
- Nilsson, L.P., Korneliussen, A., Gautneb, H., McEnroe, S., Schiellerup, H. (1999): Titanium deposits in Norway. A: Stanley *et al.* (Eds.): *Mineral deposits: processes to processing*. Balkema, Rotterdam, Holanda: 1137–1140.
- Notholt, A.J.G. (1965): Phosphate prospecting in the Spanish Sahara. *Overseas Geol. Miner. Resour.* 9(4), 443–444.
- O'Connor, E.A., Pitfield, P.E.J., Schofield, D.I., Coats, S., Waters, C., Powell, J., Ford, J., Clarke, S., Gillespie, M. (2005): Notice explicative des cartes géologiques et gîtologiques à 1/200,000 et 1/500,000 du Sud de la Mauritanie, v. 1 – Géologie. DMG, Ministère des Mines et l'Industrie, Nouakchott.
- Olivo, G.R., Gauthier, M., Bardoux, M., Leão De Sá, E., Fonseca, J.T.F., Carbonari, F. (1995): Palladium-bearing gold deposit hosted by Proterozoic Lake Superior-type iron-formation at the Cauê Iron mine, Itabira

- District, Southern São Francisco Craton, Brazil: Geologic and Structural Control. *Economic Geology* 90, 118–134.
- Ohnenstetter, D., Watkinson, D.H. Jones, P.C., Talkington, R. (1986): Cryptic Compositional Variation in Laurite and Enclosing Chromite from the Bird River Sill, Manitoba. *Economic Geology* 81, 1159-1168.
- ONHYM (Office National des Hydrocarbures et des Mines) (2016a): Annular structures of Lahjeira (REE, Nb, Fe, Mo, Au, V).
- ONHYM (Office National des Hydrocarbures et des Mines) (2016b): Glibat Lafhouda carbonatites, South Provinces, Morocco. http://www.onhym.com/pdf/en/PromotionEn/1_Glibat%20Lafhouda_February%202016.pdf
- ONHYM (Office National des Hydrocarbures et des Mines) (2016c): Minéralisations de Niobium, Tantale, Uranium, Fer et Terres Rares dans les carbonatites de Glibat Lafhouda. http://www.onhym.com/pdf/fiche-promotion/1_Glibat%20Lafhouda_F%C3%A9vrier%202016.pdf
- ONHYM (Office National des Hydrocarbures et des Mines) (2016d): Drag and Al Farnan carbonatites, South Provinces, Morocco. http://www.onhym.com/pdf/en/PromotionEn/4_Drag%20Farnan_February%202016.pdf
- ONHYM (Office National des Hydrocarbures et des Mines) (2016e): Annular structure of Twihinate, REE, Nb, Fe, U, South Provinces, Morocco. http://www.onhym.com/pdf/en/PromotionEn/2_Twihinate_February%202016.pdf
- ONHYM (Office National des Hydrocarbures et des Mines) (2016f): Annular structure of Lahjeyra, REE, Nb, Fe, Mo, Au, V, South Provinces, Morocco. http://www.onhym.com/pdf/en/PromotionEn/5_Lahjeyra_February%202016.pdf
- ONHYM (Office National des Hydrocarbures et des Mines) (2016g): Uranium and Rare Earth Metals mineralizations in the Aghracha prospect, South Provinces, Morocco. http://www.onhym.com/pdf/en/PromotionEn/7_Aghracha_February%202016.pdf
- ONHYM (Office National des Hydrocarbures et des Mines) (2016h): Rare Earth and Uranium mineralizations in the Awhifrite prospect, South Provinces, Morocco. http://www.onhym.com/pdf/en/PromotionEn/8_Awhifrite_REE-U_February%202016.pdf
- Orche, E. (2006): Descubrimiento, investigación y cubicación del yacimiento de fosfato de Bu-Craa (Sáhara Occidental). I congreso internacional e Minería y Metalurgia en el contexto de la Historia de la Humanidad: pasado, presente y futuro. Mequinenza, 13, 148-166.
- Oreskes, N., Einaudi, M.T. (2006): Origin of rare earth element-enriched hematite breccias at the Olympic Dam Cu-U-Au-Ag deposit, Roxby Downs, South Australia. *Econ. Geol.* 85, 1-28.
- Ortlieb, L. (1975): Recherches sur les formations plio-quaternaires du littoral ouest-saharien (28°30'–20°40' lat. N). *Travaux et documents de l'O.R.S.T.O.M.* 48, 290 pp.
- Oyarzun, R., Doblas, M., López-Ruiz, J., Cebriá, J.M. (1997): Opening of the central Atlantic and asymmetric mantle upwelling phenomena: implications for long-lived magmatism in western North Africa and Europe. *Geology* 25, 727–730.
- Page, N.J. (1979): Stillwater complex, Montana: Structure, mineralogy and petrology of the basal zone with emphasis on the occurrence of sulfides. *USGS Prof. Paper* 1038, 67 pp.
- Pan, Y., Fleet, M.E. (1991): Barian feldspar and barianchromian muscovite from the Hemlo area, Ontario. *The Canadian Mineralogist*, 29(3), 481-498.
- Panina, L., Sharygin, V., Proshenkin, I. (1995): Synnyrites-New complex alumina-potassic raw material. *Resource Geol.* 45, 223-233.
- Papp, J.F. (1993): Chromium. *Bureau of Mines. Mineral Yearbook* 1993,1, 201-247.
- Pašava, J. (1993): Anoxic sediments- an important environment for PGE; an overview. *Ore Geol. Rev.* 8: 425-445.
- Pasteris, J.D. (1985): Relationship between temperature and oxygen fugacity among Fe-Ti oxide in two regions of the Duluth Complex, *Can. Mineral.* 23, 11-127.
- Peach, C.L., Mathez, E.A. (1996): Constraints on the formation of platinum group element deposits in igneous rocks. *Economic Geology* 91, 439-450.
- Pearce, J.A. (1982): Trace element

- characteristics of lavas from destructive plate boundaries. In R.S. Thorpe (ed.): Orogenic andesites and related rocks, Chichester, England: John Wiley and Sons, 528-548.
- Pearce, T.H., Gorman, B.E., Birkett, T.C. (1975): The TiO₂-K₂O-P₂O₅ Diagram, a Method of Discrimination between Oceanic and Non-Oceanic Basalt. *Earth and Planetary Science Letters* 24, 419-426.
- Pearce, J. A. (1983): Role of sub-continental lithosphere in magma genesis at active continental margin. In C.J. Hawkesworth, M.J. Norry (eds.). Continental basalts and mantle xenoliths. Shiva Publishers Limited Nantwich, 230-249.
- Pearce, J.A., Harris, N.B.W., Tindle, A.G. (1984): Trace element discrimination diagrams for the tectonic interpretation of granitic rocks: *J. Petrol.* 25, 956-983.
- Pell, J. (1996): Mineral deposits associated with carbonatites and related alkaline igneous rocks. In R.H. Mitchell (ed.): Undersaturated alkaline rocks: mineralogy, petrogenesis and economic potential. MAC Short Course 24, Winnipeg, Manitoba, 271-312.
- Pereira, M.F., Chichorro, M., Johnston, S.T., Gutiérrez-Alonso, G., Silva, J.B., Linnemann, U., Hofmann, M., Drost, K. (2012): The missing Rheic Ocean magmatic arcs: provenance analysis of Late Paleozoic sedimentary clastic rocks of SW Iberia. *Gondwana Research* 22, 882-891.
- Pérez-López, R., Álvarez-Valero, A., Nieto, J.M. (2007): Changes in mobility of toxic elements during the production of phosphoric acid in the fertilizer industry of Huelva (SW Spain) and environmental impact of phosphogypsum wastes. *J. Hazard. Mater.*, 148, 745-750.
- Pérez-López, R., Castillo, J., Sarmiento, A.M., Nieto, J.M. (2011): Assessment of phosphogypsum impact on the salt-marshes of the Tinto river (SW Spain): Role of natural attenuation processes. *Mar. Pollut. Bull.*, 62, 2787-2796.
- Perring, C.S., Pollard, P.J., Dong, G., Nunn, A.J., Blake, K.L. (2000): The Lightning Creek Sill Complex, Cloncurry district, Northwest Queensland: a source of fluids for Fe Oxide Cu-Au mineralization and sodic-calcic alteration. *Econ. Geol.* 95, 1067-1089.
- Peterson, R.C., MacFarlane, D.B. (1993): The rare-earth-element chemistry of allanite from the Grenville Province. *Can. Mineral.* 31, 159-166.
- Peucat, J.-J., Capdevila, R., Draren, A., Mahdjoub, Y., Kahoui, M. (2004): The Eglab massif in the West African Craton (Algeria), an original segment of the Eburnean orogenic belt: petrology, geochemistry and geochronology. *Precambrian Research* 136, 309-352.
- Philpotts, A.R. (1966): Origin of the Anorthosite-Mangerite Rocks in Southern Quebec. *J. Petrol.* 7, 1-64.
- Pinckston, D.R., Smith, D.G.W. (1995): Mineralogy of the Lake zone, Thor Lake rare-metals deposit, N.W.T., Canada. *Can. J. Earth Sci.* 32, 516-532.
- Piqué, A. (2001): Geology of Noortwest Africa. I-XIV, 1-310, Gebrüder Borntraeger, Berlin, Stuttgart.
- Pitfield, P.E.J., Key, R.M., Waters, C.N., Hawkins, M.P.H., Schofield, D.I., Loughlin, S., Barnes, R.P. (2005): Notice explicative des cartes géologiques et gîtologiques à 1/200,000 et 1/500,000 du Sud de la Mauritanie, v. 1 - Géologie. DMG, Ministère des Mines et l'Industrie, Nouakchott.
- Plissart, G., Femenias, O. (2009): Mineralogy and geothermometry of gabbro-derived listvenites in the Tisovita-Iuti ophiolite, southwestern Romania. *Can. Mineral.* 47, 81-105.
- Pohl, W. (1990): Genesis of magnesite deposits - models and trends. *Geologische Rundschau*, 79, 291-299.
- Pollock, J.C. (2007): The Neoproterozoic-Early Paleozoic Tectonic Evolution of the Peri-Gondwanan Margin of the Appalachian Orogen: An Integrated Geochronological, Geochemical and Isotopic Study from North Carolina and Newfoundland. Ph.D. Thesis, North Carolina State University.
- Polovina, J.S., Hudson, D.M., and Jones, R.E. (2004): Petrographic and geochemical characteristics of postmagmatic hydrothermal alteration and mineralization in the J-M Reef, Stillwater Complex, Montana. *Canadian Mineralogist* 42, 261-277.
- Potrel, A. (1997): Geochemistry of the Amsaga area orthogneisses (archean Reguibat Rise, Mauritania). *Rev. Brasileira Geociências* 27(2),

- 211-218.
- Potrel, A., Peucat, J.J., Fanning, C.M., Auvray, B., Burg, J.P., Caruba, C. (1996): 3.5 Ga old terranes in the West African Craton, Mauritania. *Journal of the Geological Society of London* 153, 507–510.
- Potrel, A., Peucat, J.J., Fanning, C.M. (1998): Archean crustal evolution of the west African craton: example of the Amsaga area (Reguibat rise). U–Pb and Sm–Nd evidence for crustal growth and recycling. *Precambrian Research* 90, 107–117.
- Pouclet, A., Vidal, M., Delor, C., Simeon, Y., Alric, G. (1996): Le volcanisme birmien du nord-est de la Côte-d'Ivoire, mise en évidence de deux phases volcano-tectoniques distinctes dans l'évolution géodynamique du Paléo-protérozoïque. *Bull. Soc. Géol. France*, 167, 320–330.
- Pouit, G. (1984): Les gisements à sulphures massifs exhalatifs-sédimentaires: une mise au point sur leur classification et la méthodologie de leur recherche. *Chron. Rech. Min.* 476: 31-34.
- Poulsen, K.H., Robert, F., Dubé, B. (2000): Geological Classification of Canadian Gold Deposits: Geological Survey of Canada, Bulletin 540, 106 p.
- Pounds, N.J.G. (1963): The Geography of Iron and Steel. Second edition. London: Hutchinson University Library.
- Powell, R., Will, T.M., Phillips, G.N. (1991): Metamorphism in Archaean greenstone belts: Calculated fluid compositions and implications for gold mineralisation: *Journal of Metamorphic Geology*. 9, 141–150, doi:10.1111/j.1525-1314.1991.tb00510.x.
- Priesemann, F.D., Krause, H. (1999): The Selvåg deposit: A Proterozoic Fe-Ti-V occurrence on Vesterålen, Northwest Norway. *Norges Geol. Unders. Bull.* 402: 79-91.
- Proenza, J.A., Melgarejo, J.C. (1998): Una introducción a la metalogenia de Cuba bajo la perspectiva de la tectónica de placas. *Acta Geologica Hispanica*, 33(1-4), 89-131.
- Proenza, J.A., Gerville, F., Melgarejo, J.C., Bodinier, J.L. (1999): Al- and Cr-rich Chromitites from the Mayarí-Baracoa Ophiolitic Belt (Eastern Cuba): consequence of interaction between volatile-rich melts and peridotites in suprasubduction mantle. *Econ. Geol.* 94, 547-566.
- Proenza, J.A., Ortega-Gutiérrez, F., Camprubí, A., Tritlla, J., Elías-Herrera, M., Reyes-Salas, M. (2004): Paleozoic serpentinite-enclosed chromitites from Tehuitzingo, (Acatlan complex, southern Mexico): a petrological and mineralogical study. *J. South Am. Earth Sci.* 16, 649-666.
- Prol-Ledesma, R.M., Melgarejo, J.C., Martin, R.F. (2012): The strikingly allanite-(Ce)-monazite-enriched El Muerto anorogenic granitic pegmatite, Oaxaca, Mexico. *Can. Mineral.* 50, 1055-1076. DOI: 10.3749/canmin.50.4.1055.
- Quiroga, F. (1886a): Apuntes de un viaje por el Sáhara Occidental. *Anales Soc. Esp. Hist. Nat.* 15, 495-523.
- Quiroga, F. (1886b): Geología y Geografía del Sáhara Occidental. *Rev. Geografía Comercial Madrid*. 2(25-30), 63-66.
- Quiroga, F. (1886c): Estudio de la Península de Río de Oro. *Rev. Geografía Comercial Madrid* 2(25-30), 8-10.
- Quiroga, (1886d): La exploración al Sáhara occidental. *Bol. Institución Libre de Enseñanza. Madrid*. 10(235), 337-342.
- Quiroga, (1887a): El nivel del Sáhara occidental. *Rev. Geografía Comercial Madrid* 23(35), 242-246.
- Quiroga, (1887b): La estructura geológica del Occidente sahariano. *Bol. Soc. Geográfica Madrid* 22, 21-27.
- Quiroga, F. (1889): Observaciones geológicas hechas en el Sáhara Occidental. *Ann. Soc. Esp. Hist. Nat. Madrid*. 18, 337-393.
- Quiroga, F. (1892): Observaciones al mapa geológico del Sáhara, de M. Rolland. *Ann. Soc. Esp. Hist. Nat. Madrid*. 21, 29-32.
- Ranke, U., von Rad, U., Wissmann, G. (1982): Stratigraphy, Facies and Tectonic Development of the On- and Offshore Aaiun-Tarfaya Basin - A Review. In U. von Rad, K. Hinz, M. Samthein, E. Seibold (eds.): *Geology of the Northwest African Continental Margin*. Springer Verlag, Berlin, 86-105.
- Ratschiller, L.K. (1967): Sahara. Correlazioni geologico-litostratigrafiche fra Sahara Centrale ed occidentale. *Mem. Museo Tridentino Scienze Naturali* 16(1), 190 pp, 50 láms.
- Ratschiller, L.K. (1970): Lithostratigraphy of the northern Spanish Sahara. *Mem. Museo*

- Tridentino Scienze Naturali, Trento, 18, 9-84.
- Requir, E. (2001): Aspects of the mineralogy of the Murun alkaline complex, Yakutia, Russia. Tesis de maestría inédita. Department of Geology, Lakehead University, Thunder Bay, Ontario, Canada, 193 pp.
- Reynolds, I.M. (1980): Ore petrography and mineralogy of vanadium bearing titaniferous magnetite layers of the Kaffirkraal intrusion, Heidelberg district, Transvaal. Trans. Geol. Soc. South Africa 83, 221-230.
- Reynolds, I.M. (1985a): Contrasted mineralogy and textural relationships in the uppermost titaniferous magnetite layers of the Bushveld Complex in the Bierkraal area, north of Rustenburg. Econ. Geol. 80, 1027-1048.
- Reynolds, I.M. (1985b): The nature and origin of titaniferous magnetite-rich layers in the upper zone of the Bushveld Complex: A review and synthesis. Econ. Geol. 80, 1089-1108.
- Richards, J.P., Mumin A.H. (2013): Magmatic-hydrothermal processes within an evolving Earth. Iron oxide copper-gold and porphyry Cu±Mo±Au deposits. Geology 41, 767-770.
- Rieder M., Cavazzini G., Yakonov Y.D., Frank-Kanetskii V.A., Gottardi G., Guggenheim S., Koval P.V., Müller, G., Neiva A.M.R., Radoslovich E.W., Robert J.L., Sassi F.P., Takeda H., Weiss Z., Wones D.R. (1988): Nomenclature of the micas. Can. Mineral. 36, 905-912.
- Ríos, J.M. (1974a): Gestación y desarrollo de un gran proyecto minero: la exploración e fosfatos en el Sáhara Occidental. Industria Minera 152, 20 pp.
- Ríos García, J.M. (1975): Gestión y desarrollo de un gran proyecto minero: la explotación de los fosfatos en el Sáhara Occidental. Discurso inaugural del año académico 1974-1975, Madrid, Real Academia de Ciencias Exactas, Físicas y Naturales. 5, 29.
- Rjimati, E-Ch., Zemmouri, A. (2002): Notice de la carte géologique du Maroc au 1:50,000, feuille Asward. Service Géologique du Maroc, Notes et Mémoires 439, 1-38.
- Rjimati, E.-Ch., Michard, A., Saddiqi, O. (2011): Anti-Atlas Occidental et provinces sahariennes. In A. Michard, O. Saddiqi, A. Chalouan, E. Rjimati, A. Mouttaqi (Eds.): Nouveaux guides géologiques et miniers du Maroc. Notes Mém. Serv. Géol. Maroc. 561, 42-93.
- Roberts, R.G. (1988): Archean lode gold deposits. A: Roberts, R.G., Sheanan, P.A. (eds.): *Ore deposit models*. Geoscience Canada, reprint series 3: 1-20.
- Robinson, P.T., Malpas, J., Zhou, M.-F., Ash, C., Yang, J.-S., Bai, W.J. (2005): Geochemistry and origin of Listwanites in the Sartohay and Luobusa ophiolites, China. Int. Geol. Rev. 47, 177-202.
- Rocci, G., Bronner, G., Deschamps, M. (1991): Crystalline basement in the West African Craton. In: Dallmeyer, R.D., Lécorché, J.-P. (Eds.), *The West African Orogens and Circum-Atlantic Correlatives*. Springer-Verlag, Berlin, 31-61.
- Rocha, E., Nasraoui, M., Soubies, F., Bilal, E., De Parseval, Ph. (2001): Évolution géochimique du pyrochlore au cours de l'altération météorique du gisement de Catalão II (Goiás, Brésil). Comptes Rendus de l'Academie des Sciences, Série IIa: Sciences de la Terre et des Planètes 332, 91-98.
- Rodríguez Mellado, M.T (1948): El Devónico en el Sáhara Español. Bol. Real Soc. Española Hist. Nat. 46, 425-442.
- Roggli, V.L., Coin, P. (2004): Mineralogy of asbestos. In V.L. Roggli, T.D. Oury, Th.A. Sporn (eds): *Pathology of asbestos-associated diseases*. Springer, Berlin, 1-16.
- Rolland, Y., Cox, S., Boullier, A.M., Pennacchioni, G., Mancktelow, N. (2003): Rare earth and trace element mobility in mid-crustal shear zones: insights from the Mont Blanc Massif (Western Alps). Earth Planet. Sci. Lett. 214, 203-219.
- Ross, M., Virta, R.L. (2001): Occurrence, production and uses of asbestos. Can. Mineral. Spec. Publ. 5, 79-88.
- Ross, M., Nolan, R.P. (2003): History of asbestos discovery and use and asbestos-related disease in context with occurrence of asbestos within ophiolite complexes. Geol. Soc. Am. Spec. Paper. 373, 447-470.
- Russell, M.J. (1983): Major sediment-hosted exhalative zinc+lead deposits: formation from hydrothermal convection cells that deepen during crustal extension. A: Sangster, D.F.

- (ed.): *Short Course in sediment-hosted stratiform lead-zinc deposits*. MAC Short C. Handbook 9: 251-282.
- Russell, M.J. (1988a): Chimneys, chemical gardens and feldspar horizons ± pyrrhotine in some SEDEX deposits: aspects of alkaline environments of deposition. *Proc. 7th. IAGOD Symposium*. E. Schweizerbart'sche Verlagsbuchhandlung (Nägele u. Obermiller): 183-190.
- Russell, M.J. (1988b): A model for the genesis of sediment-hosted exhalative (SEDEX) ore deposits. *Proc. 7th. IAGOD Symposium*. E. Schweizerbart'sche Verlagsbuchhandlung (Nägele u. Obermiller): 59-66.
- Russell, M.J., Solomon, M., Walshe, J.L. (1981): The genesis of sediment-hosted, exhalative zinc + lead deposits. *Mineral. Deposita* 16: 113-127.
- Ruzicka, V. (1995): Unconformity-type uranium deposits. In R.V. Kirkham, W.D. Sinclair, R.I. Thorpe, J.M. Duke (eds.), *Mineral Deposit Modeling*, Geol. Assoc. Canada Spec. Paper 40, 125-150.
- Sabaté, P. (1972): Structure de la Serie du Yetti (Sahara occidental algerien). CR Acad Sci, Paris 275: 2591-2594.
- Sabaté, P. (1973): La jointure Yetti-Eglab dans la Dorsale precambrienne du Pays Reguibat (Sahara occidental algerien). CR Acad Sci, Paris 276: 2237-2239
- Sabaté, P. (1978): Données géochimiques et radiométriques sur les volcanites calco-alcalines precambriennes de l'Eglab (Sahara occidental algerien). Esquisse de leur évolution geotectonique. Bull. Soc. Geol. Fr. 7120 (1): 81-90.
- Sabaté, P., Lameyre, J. (1973): Magmatism and metamorphism in the Yetti-Eglab precambrian formations of the Reguibat Dorsale (occidental Algerian Sahara). 7eme Col. Afr. Geol., Florence. Trav. Lab. Sci. Terre St-Jerome, Marseille, 1975, 11, 131-132.
- Sabaté, P., Lomax, K. (1975): Données stratigraphiques et paléomagnétiques de la région Yetti-Églab (Sahara Occidental algerien). Bull. BRGM, Chronique des Mines, 4, 293-311
- Salters, V.J.M., Shimizu, N. (1988). World-Wide Occurrence of HFSE-Depleted Mantle. *Geochim. Cosmochim. Acta* 52(8), 2177-2182.
- Salvi, S., Williams-Jones, A.E. (1990): The role of hydrothermal processes in the granite-hosted Zr, Y, REE deposit at Strange Lake, Québec-Labrador: Evidence from fluid inclusions. *Geochim. Cosmochim. Acta* 54, 2403-2418.
- Salvi, S., Williams-Jones, A.E. (1996): The role of hydrothermal processes in concentrating high-field strength elements in the Strange Lake peralkaline complex, northeastern Canada. *Geochim. Cosmochim. Acta* 60, 1917-1932.
- Salvi S, Williams-Jones AE (2005): Alkaline granite-syenite deposits. In: Linnen RL, Samson IM (eds) *Rare Element Geochemistry and Mineral Deposits*. Geological Association of Canada Short Course Notes 17, pp 315-341.
- Salvi, S., Fontan, F., Monchoux, P., Williams-Jones, A.E., Moine, B. (2000): Hydrothermal mobilization of high field strength elements in alkaline igneous systems: evidence from the Tamazeght Complex (Morocco). *Econ. Geol.* 95, 559-576.
- Sanetra, S. (1985): The Rødsand Fe-Ti-V deposit, Møre, Western Norway. *Norges Geol. Unders. Bull.* 402, 39-49.
- Sato, H., Banno, S. (1983): NiO-Fo relation of magnesian olivine phenocryst in high-magnesian andesite and associated basalt-andesite-sanukite from Northeast Shikoku, Japan. *Bull. Volcano. Soc. Japan*, Ser. 2, 141-156.
- Sawkins, F.J. (1990): *Metal deposits in relation to plate tectonics*. II ed. Springer-Verlag, 461 p.
- Schemm-Gregory, M., Jansen, U. (2005): Middle and Upper Devonian Brachiopods from the Western Sahara (Morocco). Fifth International Brachiopod Congress: Abstracts, 27, Copenhagen.
- Schemm-Gregory, M. (2011): A new species of cyrtospirifer (Brachiopoda) from the Middle Devonian of the Western Sahara (Northwestern Africa). *Rivista Italiana di Paleontologia e Stratigrafia* 117(1), 3-13.
- Schenk, P.E. (1997): Sequence stratigraphy and provenance on Gondwana's margin: the

- Meguma Zone (Cambrian to Devonian) of Nova Scotia, Canada. Geological Society of America Bulletin 107 (4), 395–409.
- Schindler, E., Wehrmann, A. (2010): Genesis and internal architecture of the Middle to Upper Devonian Gwirat Al Hyssan reef-mound (Western Sahara). Palaeogeography, Palaeoclimatology, Palaeoecology 304, 184–193.
- Schoenberg, R., Kruger, F.J., Nägler, T.F., Meisel, T., Kramers, J.D. (1999): PGE enrichment in chromitite layers and the Merensky Reef of the western Bushveld Complex; a Re-Os and Rb-Sr isotope study. Earth and Planetary Science Letters 172, 49–64.
- Schofield, D.I., Gillespie, M. (2007): A tectonic interpretation of “Eburnean terrane” outliers in the Reguibat Shield, Mauritania. Journal of African Earth Sciences 49, 179–186.
- Schofield, D.I., Horstwood, M.S.A., Pitfield, P.E.J., Crowley, Q.G., Wilkinson, A.F., Sidaty, H.C.H.O. (2006): Timing and kinematics of Eburnean tectonics in the central Reguibat Shield, Mauritania. J. Geol. Soc. London 163, 549–560.
- Schofield, D.I., Horstwood, M.S.A., Pitfield, P.E.J., Gillespie, M., Derbyshire, F., O’Connor, E.A., Abdouloye, T.B. (2012): U–Pb dating and Sm–Nd isotopic analysis of granitic rocks from the Tiris Complex: new constraints on key events in the evolution of the Reguibat Shield, Mauritania. Precambrian Research 204–205, 1–11. <http://dx.doi.org/10.1016/j.precamres.2011.12.008>.
- Schulte, R.F., Taylor, R.D., Piatak, N.M., Seal, R.R., II (2010): Stratiform chromite deposit model: U.S. Geological Survey Open-File Report 2010-1232, 7 p., available at <http://pubs.usgs.gov/ofr/2010/1232>.
- Schlüter, T. (2006): Geological Atlas of Africa, with Notes on Stratigraphy, Tectonics, Economic Geology, Geohazards and Geosites of Each Country. Berlin: Springer, 272 pps.
- Seer, H.J., de Moraes, L.C. (2013): Within plate, arc, and collisional Neoproterozoic granitic magmatism in the Araxá Group, Southern Brasília belt, Minas Gerais, Brazil. Braz. J. Geol. 43, Braz. J. Geol. [online], 333–354. Disponible en: <http://pgegeo.igc.usp.br/scielo.php?script=sci_arttext&pid=S2317-48892013000200010&lng=pt&nrm=iso>. ISSN 2317-4889. <http://dx.doi.org/10.5327/Z2317-48892013000200010>.
- Seibold, E. (1982) The northwest African continental margin - an introduction. In: Geology of the Northwest African Continental Margin (Eds. U.von Rad, K.Hinz, M.Sarnthein and E.Seibold), pp.3-20. Springer-Verlag, New York.
- Service géologique du Maroc (1985): Carte géologique du Maroc 1:1,000,000, Service Géologique du Maroc, Notes et mémoires, 260, 1 coloured map on 2 sheets.
- Service géologique du Maroc (1999): Carte géologique du Maroc 1:1,000,000, Service Géologique du Maroc, Notes et mémoires, 374, 1 coloured map on 2 sheets.
- Sheard, E.R., Williams-Jones, A.E., Heiligmann, M., Pederson, C., Trueman, D.L. (2012): Controls on the concentration of zirconium, niobium, and the rare earth elements in the Thor Lake rare metal deposit, Northwest Territories, Canada. Econ. Geol. 107, 81–104.
- Sherlock, R.L., Tosdal, R.M., Lehrman, N.J., Graney, J.R., Losh, S., Jowett, E.C., Kesler, S.E. (1995): Origin of the McLaughlin Mine sheeted vein complex; metal zoning, fluid inclusion, and isotopic evidence. Econ. Geol. 90(8), 2156–2181.
- Sherlock, R.L., Lehrman, N.J. (1995): Occurrences of dendritic gold at the McLaughlin Mine. MASH, C.H. and Arksey, R.L. (1990b): Tectonic controls on the distribution of listwanite lode gold deposits in northwestern British Columbia. Program with Abstracts Geological Association of Canada; Mineralogical Association of Canada; Canadian Geophysical Union, Joint Annual Meeting 15, 4.
- Sibson, R.H., Robert, F., Poulsen, K.H. (1988): High-angle reverse faults, fluid pressure cycling, and mesothermal gold-quartz deposits. Geology 16, 551–555, doi:10.1130/0091-7613(1988)016<0551:HARFFP>2.3.CO;2.
- Simmons, S.F., Christenson, B.W. (1994): Origins of calcite in a boiling geothermal system. Amer. J. Sci. 294, 361–400.

- Simmons, S.F., White, N.C., John, D.A. (2005): Geological characteristics of epithermal precious and base metal deposits. Economic Geology 100th Anniversary Volume, Economic Geology: One Hundredth Anniversary Volume, 1905–2005, 485–522.
- Simmons, W.B., Hanson, S.L., Falster, A.U., Webber, K.L. (2012): A comparison of the mineralogical and geochemical character and geological setting of Proterozoic REE-rich granitic pegmatites of the North-Central and Southwestern US. *Can. Mineral.* 50, 1695–1712.
- Škoda, R., Novák, M. (2007): Y,REE,Nb,Ta,Ti-oxide (AB_2O_6) minerals from REL-REE euxenite-subtype pegmatites of the Třebíč Pluton, Czech Republic; substitutions and fractionation trends. *Lithos* 95, 43–57.
- Slack, J.F. (2012): Strata-Bound Fe-Co-Cu-Au-Bi-Y-REE Deposits of the Idaho Cobalt Belt: Multistage Hydrothermal Mineralization in a Magmatic-Related Iron Oxide Copper-Gold System. *Econ. Geol.* 107, 1089–1113.
- Smeds, S.A. (1990): Regional trends in mineral assemblages of Swedish Proterozoic granitic pegmatites and their geological significance. *Geol. För. Stock. Förh.* 112, 227–242.
- Smith, M.P., Henderson, P., Jeffries, T. (2002): The formation and alteration of allanite in skarn from the Beinn an Dubhaich granite aureole, Skye. *Eur. J. Mineral.* 14, 471–486.
- Smith, M.P., Henderson, P., Jeffries, T.E.R., Long, J., Williams, C.T. (2004): The rare earth elements and uranium in garnets from the Beinn an Dubhaich aureole, Skye, Scotland, UK: constraints on processes in a dynamic hydrothermal system. *J. Petrol.* 45, 457–484.
- Söderlund, U., Ernst, R.E., Youbi, N., Rjimati, E.C., Ikenne, M., Bertrand, H., Guillou, O. (2014): A major 1041 Archean (2688 Ma) dyke swarm discovered in the western Reguibat Shield, West African craton, Morocco. 25th Colloquium of African Geology (CAG 25), 15th Congress of Geological Society of Africa (GSAf 15).
- Sørensen, H. (Ed.) (1974): The alkaline rocks. John Wiley & Sons, London. 622 p.
- Sørensen, H. (1992): Agpaitic nepheline syenites: a potential source of rare elements. *Appl. Geochem.* 7, 417–427.
- Sougy, J. (1961): Les formations paléozoïques du Zemmour Noir (Mauritanie septentrionale). Étude stratigraphique, pétrographique et paléontologique. Thèse de Doctorat, Université de Nancy, 680 p. Published 1964 in: Université de Dakar, Annales de la Faculté des Sciences, Série Sciences de la Terre 15, I–XII, 1–695.
- Sougy, J. (1962a): Contribution à l'étude géologique des gueilbs Bou-Leriah (région d'Aoucert, Sahara espagnol). *Bulletin de la Société Géologique de France* 4, 436–445.
- Sougy, J. (1962b): West African Fold Belt. *Geological Society of America Bulletin* 73, 871–876.
- Sougy, J. (1969): Grandes lignes structurales de la chaîne des Mauritanides et de son avant-pays (socle précambrien et sa couverture infrafacambrienne et paléozoïque), Afrique de l'Ouest. *Bulletin de la Société Géologique de France* 11, 133–149.
- Spandler, C., Mavrogenes, J., Arculus, R. (2005): Origin of chromitites in layered intrusions: Evidence from chromite-hosted melt inclusions from the Stillwater Complex. *Geology* 33, 893–896.
- Staatz, M.H. (1972): Geology and description of the thorium-bearing veins, Lemhi Pass quadrangle, Idaho and Montana: U.S. Geological Survey Bulletin 1351, 94 p.
- Staatz, M.H. (1974): Thorium veins in the United States: *Econ. Geol.* 69, 494–507.
- Staatz, M.H. (1979): Geology and mineral resources of the Lemhi Pass thorium district, Idaho and Montana: U.S. Geol. Surv. Prof. Paper 1049-A, 90 p.
- Staatz, M.H. (1983): Geology and description of thorium and rare-earth deposits in the southern Bear Lodge Mountains, northern Wyoming: U.S. Geol. Surv. Prof. Paper 1049-D, 52 p.
- Staatz, M.H. (1985): Geology and description of the thorium and rare-earth veins in the Laughlin Peak area, Colfax County, New Mexico: U.S. Geol. Surv. Prof. Paper 1049-E, 32 p.
- Staatz, M.H. (1992): Descriptive model of Thorium-rare-earth veins. In J.D. Bliss (ed.): Developments in mineral deposit modeling:

- U.S. Geol Surv., Bull. 2004, 13-15.
- Stanger, G. (1985): Silicified serpentinite in the Semail nappe of Oman. *Lithos* 18, 13-22.
- Stanton, R.L. (1991): Understanding volcanic massive sulfides - Past, present and future. In Hutchinson, R.W., Grauch, R.I. (eds.): Historical Perspectives of Genetic Concepts and Case Histories of Famous Discoveries. *Econ. Geol. Monograph* 8: 82-95.
- St. Onge, M.R., Ijewliw, O.J. (1996): Mineral corona formation during high-P retrogression of granulitic rocks, Ungava orogen, Canada. *J. Petrol.* 37, 553-582.
- Suita, M.T.F., Strider, A.J. (1996): Cr-spinels from Brazilian mafic-ultramafic complexes: metamorphic modifications. *Int. Geol. Rev.* 38, 245-267.
- Tait, J., Straathof, G., Söderlund, U., Ernst, R.E., Key, R., Jowitt, S.M., Lo, K., Dahmada, M.E.M. N'Diaye, O. (2013). The Ahmeyim Great Dyke of Mauritania: A newly dated Archaean intrusion. *Lithos* 174, 1323-1332.
- Talkington, R.W., Lipin, B.R. (1986): Platinum-group minerals in chromite seams of the Stillwater Complex, Montana. *Econ. Geol.* 81, 1179-1186.
- Tatsumi, Y., Ishizaka, K. (1982): Origin of high-magnesian andesites in the Setouchi volcanic belt, southwest Japan: I. Petrographical and chemical characteristics. *Earth Planet. Sci. Lett.* 60(2), 293-304.
- Tayibi, H., Choura, M., López, F.A., Alguacil, F.J., López-Delgado, A. (2009): Environmental impact and management of phosphogypsum. *J. Environmental Management*, 90, 2377-2386.
- Taylor, C.D., Anderson, E.D., Bradley, D.C., Beaudoin, G., Cosca, M.A., Eppinger, R.G., Fernette, G.L., Finn, C.A., Friedel, Giles, M.J. S.A., Goldfarb, R.J., Horton, J.D., Lee, G.K., Marsh, E.E., Mauk, J.L., Motts, H.A., Ould ElJoud, M.Y., Ould Soueidatt, S., Ould Taleb Mohamed, A., Rockwell, B.W. (2012): Mauritania: A greenfields exploration opportunity in North West Africa. *SEG Newsletter* 91, 1-17.
- Taylor, R.N., Nesbitt, R.W., Vidal, Ph., Harmon, R.S., Auvray, B., Croudace, I.W. (1994): Mineralogy, Chemistry, and Genesis of the Boninite Series Volcanics, Chichijima, Bonin Islands, Japan. *Journal of Petrology* 35, 577-617.
- Taylor, R.P., Pollard, P. J. (1996): Rare earth element mineralization in peralkaline systems: the T-zone REE-Y-Be deposit, Thor Lake, Northwest Territories, Canada. In Jones, A.P., Wall, F., Williams, C.T. (eds.), Rare Earth minerals-chemistry, origin and ore deposits. *Mineral. Soc. Ser.* 7, 167-192.
- Teixeira, R.J.S., Neiva, A.M.R., Gomes, M.E.P. (2010): Geochemistry of amphibole asbestos from Northeastern Portugal and its use in monitoring environmental impact of asbestos from quarrying. *Comunicações geológicas* 97, 99-112.
- Theurkauf, E., Grover, B. (1974): Ein neues itabiritisches eisenerzvorkommen in Spanisch-Sahara. *Stahl u Eisen* 94, 23, 1094-1096.
- Thirlwall, M.F., Smith, T.E., Graham, A.M., Theodorou, N., Hollings, P., Davidson, J.P., Arculus, R.J. (1994): High field strength element anomalies in arc lavas: source or process? *J. Petrol.* 35, 819-838.
- Thompson, J.F.H., Sillitoe, R.H., Baker, T., Lang, J.R., Mortensen, J.K. (1999): Intrusion-related gold deposits associated with tungsten-tin provinces: *Mineralium Deposita* 34, 323-334.
- Thurston, P.C., Rogers, M.C. (1995): Iron formation: Algoma and Lake Superior types. In M.C. Rogers, P.C. Thurston, J.A. Fyon, R.I. Kelly, F.W. Breaks (comps.), *Descriptive Mineral Deposit Models of Metallic and Industrial Deposit Types and Related Mineral Potential Assessment Criteria*, Ontario Geological Survey, Open File Report 5916, 76-81.
- Titley, A.R., Beane, R.E. (1981): Porphyry copper deposits: Part I: Geologic setting, petrology and tectogenesis. A: Skinner, B. (ed.): *Econ. Geol. 75 ann.*: 214-234.
- Todd, S.G., Keith, D.W., Le Roy, L.W., Schissel, D.J., Mann, E.L., Irvine, T.N. (1985): The J-M platinum-palladium reef of the Stillwater complex, Montana, I: stratigraphy and petrology. *Econ. Geol.* 77, 1454-1480.
- Toplis, M., Corgne, A. (2002): An experimental study of element partitioning between magnetite, clinopyroxene and iron-bearing

- silicate liquids with particular emphasis on vanadium. Contributions to Mineralogy and Petrology 144, 22–37.
- Torró, L., Villanova, C., Castillo, M., Campeny, M., Gonçalves, A.O., Melgarejo, J.C. (2012): Niobium and rare earth minerals from the Virulundo carbonatite, Namibe, Angola. *Mineral. Mag.* 76, 393–409.
- Toteu, S.F., Deloule, E., Penaye, J., Tcameni, R., (2004): Preliminary U–Pb ionic microprobe data on zircons from Poli and Lom volcano-sedimentary basins (Cameroon): Evidence for a late-Mesoproterozoic to Early Neoproterozoic (1100–950) magmatic activity in the Central African fold belt. 20th Colloquium on African Geology –Orléans – 2–7 June 2004, Abstracts: BRGM, p. 409.
- Tsikouras, B., Karipi, S., Grammatikopoulos, T.A., Hatzipanagiotou, K. (2006): Listwaenite evolution in the ophiolite melange of Iti Mountain (continental Central Greece). *Eur. J. Mineral.* 18, 24–255.
- Uçurum, A. (2000): Listwaenites in Turkey: perspectives on formation and precious metal concentration with reference to occurrences in east-central Anatolia. *Ophioliti* 25, 15–29.
- Ulmer, G.C. (1969): Experimental investigations of chromite spinels. *Economic Geology Monograph* 4, 114–131.
- Vachette, M., Rocci, G., Sougy, J., Caron, J.P., Marchand, J., Tempier, C. (1973): Ages radiométriques Rb/Sr, de 2000 à 1700 Ma, des séries métamorphiques et granites intrusifs précambriens de la partie N et NE de la Dorsale Reguibat (Mauritanie). 7ème Col. Géol. Afr., Florence. Trav. Lab. Sci. Terre St-Jérôme, Marseille 11, 142–143.
- Van Staal, C., Lissenberg, J., Rogers, N., McNicoll, V., Valverde-Vaquero, P., Whalen, J., Zagorevski, A. (2006): The northern Appalachians: an accretionary Orogen. *Geophysical Research Abstracts* 8, 00915.
- Van Wambeke, L. (1977): The Karonge rare earth deposits, Republic of Burundi: new mineralogical-geochemical data and origin of the mineralization. *Mineralium Deposita* 12, 373–380.
- Veevers, J.J. (2004): Gondwanaland from 650–500 Ma assembly through 320 Ma merger in Pangea to 185–100 Ma breakup: supercontinental tectonics via stratigraphy and radiometric dating. *Earth-Science Reviews* 68, 1–132.
- Ventisette, Ch. del, Garfagnoli, F., Ciampalini, A., Antonielli, B., Moretti, S. (2012): Remote sensing techniques to map geologic unit in arid environment: the example of southern flank of the Tindouf Basin (Western Sahara). 4th EARSeL Workshop on Remote Sensing and Geology 88 Mykonos, Greece, 24–25.
- Verplanck, P.L., Van Gosen, B.S., Seal, R.R., McCafferty, A.E. (2014): A deposit model for carbonatite and peralkaline intrusion-related rare earth element deposits: U.S. Geol. Surv. Sci. Invest. Rep. 2010–5070–J, 58 p, <http://dx.doi.org/10.3133/sir20105070J>.
- Viladkar, S.G., Bismayer, U. (2010) Compositional variation in pyrochlores of Amba Dongar carbonatite complex, Gujarat. *Journal of the Geological Society of India*, 75, 495–502.
- Viladkar, S.G., Ghose, I. (2002) U-rich pyrochlore in carbonatite of Newania, Rajasthan (India). *Neues Jahrbuch für Mineralogie, Monatshefte*, 3, 97–106.
- Villeneuve, M. (2008): Review of the orogenic belts on the western side of the West African craton: Bassarides, Rokelides and Mauritanides. In: Ennih, N., Liegeois, J.-P. (Eds.), *The Boundaries of the West African Craton*: London, UK, Geological Society of London, Special Publication, 297, 169–201.
- Villeneuve, M., Cornée, J.J. (1994): Structure evolution and paleogeography of the West African craton and bordering belts during the Neoproterozoic. *Prec. Res.* 69, 307–326.
- Villeneuve, M., Bassot, J.-P., Robineau, B., Dallmeyer, R.D., Ponsard, J.F. (1991): The Bassaride Orogen. In: Dallmeyer, R.D., Lécorché, J.-P. (Eds.), *The West African Orogens and Circum-Atlantic Correlatives*. Springer, Berlin, pp. 151–185.
- Villeneuve, M., Bellon, H., El Archi, A., Sahabi, M., Rehault, J.P., Olivet, J.L., Aghzer, A.M. (2006): Événements panafricains dans l'Adrar Souttof (Sahara marocain). *Comptes Rendus Geoscience* 338, 359–367.
- Villeneuve, M., El Archi, A., Nzamba, J., 2010. Les chaînes de la marge occidentale du craton

- ouest africain, modèles géodynamiques. Comptes Rendus Geoscience 342, 1–10.
- Villeneuve, M., Gärtner, A., Youbi, N., Archi, A.E., Vernhet, E., Rjimati, E., Linnemann, U., Bellon, H., Gerdes, A., Guillou, O., Corsini, M., Paquette, J-L. (2015): The Southern and Central parts of the “Souttoufide” belt, Northwest Africa, African Earth Sciences, doi: <http://dx.doi.org/10.1016/j.jafrearsci.2015.04.016>.
- Van Gosen, B.S. (2007): The geology of asbestos in the United States and its practical applications. Environmental & Engineering Geosc. 13,1, 55-68.
- Von Gruenewaldt, G., Klemm, D.D., Henckel, J., Dehm, R.M. (1985): Exsolution features in titanomagnetites from massive magnetite layers and their host rocks of the Upper Zone, Eastern Bushveld Complex. Economic Geology 80, 1041-1061.
- von Rad, U., Wissmann, G. (1982): Cretaceous-Cenozoic history of the West Saharan continental margin (NW Africa): Development, destruction and gravitational sedimentation. In: Geology of the Northwest African Continental Margin (Eds. U. von Rad, K. Hinz, M. Sarnthein and E. Seibold), pp. 106-131. Springer-Verlag, Berlin.
- Von Raumer, J.f. (1969): Stilpnometelan als alpinmetamorphes Produkt im Mont-Blanc-Granit. 21, Contrib. Mineral. Petrol. 21, 257-278.
- Villaseca, C., Barbero, L., Rogers, G. (1998): Crustal origin of Hercynian peraluminous granitic batholiths of central Spain: petrological, geochemical and isotopic (Sr, Nd) constraints. Lithos, 43, 55-79.
- Villeneuve, M., Bellon, H., El Archi, A., Sahabi, M., Rehault, J.P., Olivet, J.L., Aghzer, A.M., (2006): Evénements panafricains dans l’Adrar Souttouf (Sahara marocain). Comptes Rendus Geoscience 338, 359–367.
- Villeneuve, M., El Archi, A., Nzamba, J. (2010): Les chaînes de la marge occidentale du craton ouest africain, modèles géodynamiques. Comptes Rendus Geoscience 342, 1–10.
- Vlasov, K.A. (1966): Geochemistry and mineralogy of rare elements and genetic types of their deposits. Jerusalem, Israel Program for Scientific Translations vol 1, 688 p., vol. 2, 945 p., vol. 3, 916 p.
- Waldron, J.W.F., White, C.E., Barr, S.M., Simonetti, A., Heaman, L.M. (2009): Provenance of the Meguma terrane, Nova Scotia: rifted margin of early Paleozoic Gondwana. Canadian Journal of Earth Sciences 46, 1–8.
- Waldron, J.W.F., Schofield, D.I., White, C.E., Barr, S.M. (2011): Cambrian successions of the Meguma Terrane, Nova Scotia, and Harlech Dome, North Wales: dispersed fragments of a peri-Gondwanan basin? Journal of the Geological Society of London 168, 83–98.
- Wall, F., Mariano, A.N. (1996): Rare earth minerals in carbonatites: a discussion centred on the Kangankunde Carbonatite, Malawi. In: Rare Earth Minerals: Chemistry, Origin and Ore Deposits. (A.P. Jones, F. Wall and C.T. Williams, eds.). Mineralogical Society Series, 7. Chapman and Hall, London, 193-225.
- Wall, F., Williams, C.T., Woolley, A.R. (1999): Pyrochlore in niobium ore deposits. Mineral deposits: processes to processing. Proceedings of the Fifth Biennial SGA Meeting and the Tenth Quadrennial IAGOD Symposium, London, United Kingdom, Aug. 22–25, 1999 1, pp. 687–690.
- Wang, X., Griffin, W.L., Chen, J., Huang, P., Li, X. (2011): U and Th contents and Th/U ratios of zircon in felsic and mafic magmatic rocks: improved zircon-melt distribution coefficients. Acta Geologica Sinica (English Edition) 85 (1), 164–174.
- Wendt, J., Kaufmann, B. (2006): Middle Devonian (Givetian) coral-stromatoporoid reef in West Sahara (Morocco). Journal of African Earth Sciences, 44, 339-350.
- Westra, G., Keith, S.B. (1981): Classification and genesis of stockwork molybdenum deposits. Econ. Geol. 76: 844-873.
- Whalen, J.B., Currie, K.L., Chappell, B.E. (1987): A-type granites: geochemical characteristics, discrimination and petrogenesis. Contributions to Mineralogy and Petrology 95, 407-419.
- White, W.H., Bookstrom, A.A., Kamilli, R.J., Gangster, M.W., Smith, R.P., Ranta, D.E., Stinenger, R.C. (1981): Character and origin of the Climax type molybdenum deposits. A:

- Skinner, B. (ed.): *Econ. Geol.* 75 ann.: 270-316.
- White, N.C. (1991): High sulphidation epithermal gold deposits: characteristics and a model for their origin. In Matsuhsisa, Y., Aoki, M., and Hedenquist, J.W. (eds): High temperature acid fluids and associated alteration and mineralisation: Geological Survey of Japan Report 277, 9-20.
- White, N.C., Hedenquist, J.W. (1995): Epithermal gold deposits: Styles, characteristics and exploration: SEG Newsletter, 23, 9-13.
- Wise, M.A., Cerny, P., Falster, A.U. (1998): Scandium substitution in columbite-group minerals and ixiolite. *Can. Mineral.* 36, 673-680.
- Whitmore, D.R.E., Berry, L.G., Hawley, J.E. (1946): Chrome micas. *Amer. Mineral.* 31 (1-2), 1-21.
- Wiedmann, J., Butt, A., Einsele, G. (1978): Vergleich von marokkanischen Kreide-KUstenaufschlUssen und Tiefseebohrungen (DSDP): Stratigraphie, Palaoenvironment und Subsidenz an einem passi ven Kontinentalrand. *Geol Rundschau* 67(2): 454-508.
- Wilhemhij, H.R., Cabri, L.J. (2016): Platinum mineralization in the Kapalagulu Intrusion, western Tanzania. *Mineralium Deposita* 51, 343-367.
- Villanova de Benavent, C. (2010): Dipòsits de Fe-Ti-V en roques anortosítiques del complex de Cunene (Angola). Unpublished MSc thesis, Dept. Cristal·lografia, Mineralogia i Dipòsits Minerals. Universitat de Barcelona, 23 pp.
- Williams, C.T., Wall, F., Woolley, A.R., Phillip, S. (1997) Compositional variation in pyrochlore from the Bingo carbonatite, Zaire. *Journal of African Earth Sciences*, 25, 137-145.
- Williams, P.J., Barton, M.D., Fontboté, L., de Haller, A., Johnson, D.A., Mark, G., Marschik, R., Oliver, N.H.S. (2005): Iron-oxide-copper-gold deposits. Geology, space-time distribution, and possible modes of origin: *Econ. Geol.* 100th Anniversary Volume, 371-406.
- Willimse, J. (1969): The vanadiferous magnetic iron of the Bushveld igneous complex. *Econ. Geol.*, Mono. 4, 187-208.
- Wilson, M. (1989): Igneous Petrogenesis. Unwin Hyman, London, 456 pp.
- Wood, D.A., Joron, J.L., Treuil, M., Norry, M., Tarney, J. (1979): Elemental and Sr isotope variation in basic lavas from the Iceland and surrounding ocean floor. *Contrib. Mineral. Petrol.* 70, 219-339.
- Woolley, A.R., Kjarsgaard, B.A. (2008): Paragenetic types of carbonatite as indicated by the diversity and relative abundances of associated silicate rocks: evidence from a global database. *Can. Mineral.* 46, 741-752.
- Zaitsev, A.N., Williams, C.T., Wall, F., Zolotarev, A.A. (2012): Evolution of chemical composition of pyrochlore group minerals from phoscorites and carbonatites of the Khibina alkaline massif. *Geology of Ore Deposits*, 54(7), 503-515.
- Zaitsev, A.N., Terry Williams, C., Jeffries, T.E., Strekopytov, S., Moutte, J., Ivashchenkova, O.V., Spratt, J., Petrov, S.V., Wall, F., Seltmann, R., Borozdin, A.P. (2014): Rare earth elements in phoscorites and carbonatites of the Devonian Kola Alkaline Province, Russia: Examples from Kovdor, Khibina, Vuoriyarvi and Turiy Mys complexes, *Ore Geology Reviews* 61, 204-225.
- Zhang, P., Wiegel, R., El Shall, H. (2006): Phosphate rock. In J.E. Kogel, Trivedi, N.C., Barker, J.M., Kruckowsky, S.T. (eds.): Industrial Minerals and rocks. Commodities, markets and uses. 7th edition. Society for Mining, Metallurgy and Exploration, Inc., Littleton, Colorado, USA, 703- 722.
- Zhang, J.-J., Zheng, Y.-F., Zhao, Z.-F. (2009): Geochemical evidence for interaction between oceanic crust and lithospheric mantle in the origin of Cenozoic continental basalts in east-central China. *Lithos* 110, 305-326.
- Zhou, M., Robinson, P.T., Lesher, C.M., Keays, R.R., Zhang, C.J., Malpas, J. (2005): Geochemistry, Petrogenesis and Metallogenesis of the Panzhihua gabbroic layered intrusion and associated Fe-Ti-V deposits, Sichuan province, SW China. *Jour. Petrol.* 46, 2253-2280.
- Zoheir, B.A., Lehmann, B. (2011): Listvenite-lode association at the Barramiya gold mine, Eastern Desert, Egypt. *Ore Geology*

- Reviews, 39, 101-115.
- Zozulya, D.R., Bayanova, T.B., Eby, G.N. (2005): Geology and age of the Late Archean Keivy alkaline province, Northeastern Baltic Shield. *J. Geol.* 113, 601-608.
- Zurevinski, S.E., Mitchell, R.H. (2004) Extreme compositional variation of pyrochlore group minerals at the Oka Carbonatite Complex, Québec: evidence of magma mixing? *The Canadian Mineralogist*, 42, 1159-1168.