

AGE AND DISTRIBUTION OF PEGMATITES

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(Continued from page 105)

EUROPE

ENGLAND. Principal localities: Southwestern England (especially Devon, Cornwall, and Scilly Isles), Lundy Island, Isle of Man, and North of England. Types of pegmatite: Granite simple and complex and quartz monzonite complex. Granite pegmatites in Cornwall have ore minerals (including compounds of tin, tungsten, and molybdenum) and beryllium phases. Ore mineral phase also present at Carrock Fells, North of England. Lundy Island pegmatites have topaz and beryl phase. Quartz vein phase is present near Foxdale, Isle of Man. Pegmatites on Dartmoor are quartz monzonite with free gold phase.

REFERENCES: Brammall, A., and Harwood, H. F., The occurrence of a gold-bearing pegmatite on Dartmoor: *Mineral. Mag.*, vol. 20, no. 105, pp. 201-211, 1924. Davison, E. H., The variation in the composition of Cornish granites and its relation to the occurrence of tin lodes: *Trans. Roy. Geol. Soc. Cornwall*, vol. 16, no. 1, pp. 11-14, 1928. Finlayson, A. M., Ore-bearing pegmatites of Carrock Fells: *Geol. Mag.*, new ser., vol. 7, pp. 19-28, 1910. Lomas, J., Quartz dikes near Foxdale, Isle of Man: *Geol. Mag.*, new ser., decade 4, vol. 10, pp. 34-36, 1903. McIntock, W. F. P., and Hall, T. C. F., On topaz and beryl from the granite of Lundy Island: *Mineral. Mag.*, vol. 16, pp. 294-301, 1912. Osman, Chas. W., The granites of the Scilly Isles and their relation to the Dartmoor granites: *Quart. Jour. Geol. Soc. London*, vol. 84, no. 2, pp. 258-292, 1928.

SCOTLAND. The pre-Cambrian gneissic rocks of the Scottish Highlands and the islands to the northwest abound with simple granite and granodiorite pegmatites. Beryl is present in a pegmatite at Rubislaw, near Aberdeen.

REFERENCES: Barrow, George, On an intrusion of muscovite-biotite gneiss in the South-Eastern Highlands of Scotland: *Quart. Jour. Geol. Soc. London*, vol. 49, pp. 330-356, 1893. MacGregor, A. G., and Kennedy, W. Q., The Morvern-Strontian "Granite": *Summary of Progress of Geol. Survey for 1931*-Pt. II, pp. 105-119, 1932. Read, H. H., A diopside-bearing pegmatite near Ellon in Aberdeenshire: *Trans. Edinburgh Geol. Soc.*, vol. 11, pp. 353-356, 1925; The geology of Central Sutherland (Sheets 108 and 109): *Geol. Survey Scotland, Mem.*, 1931. Stewart, Malcolm, Notes on the geology of Sula Sgeir and the Flannan Islands: *Geol. Mag.*, vol. 70, no. 825, pp. 110-116, March, 1933.

IRELAND. Localities: Carlingford-Mourne Mts. district of Louth and Down counties, and vicinity of Killiney, near Dublin. Types

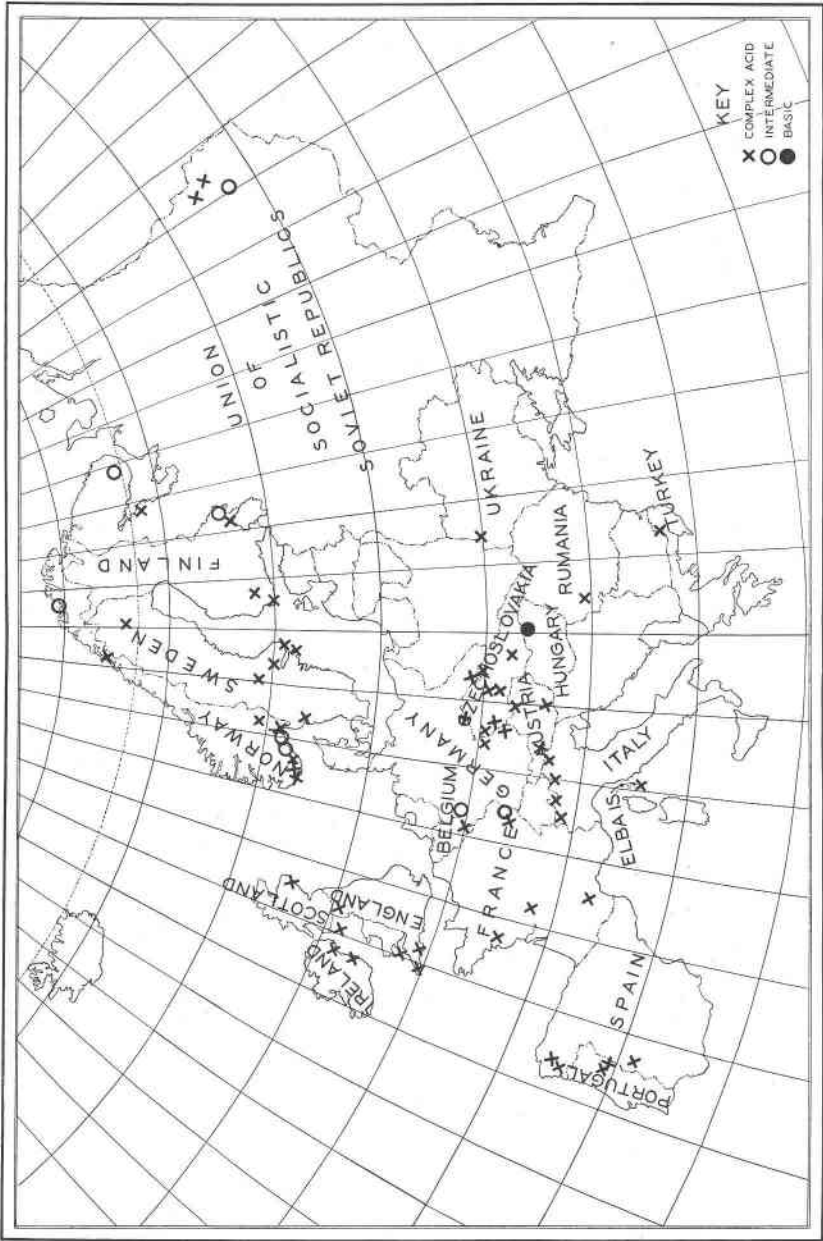


PLATE III. Distribution of complex acid, intermediate, and basic pegmatites in Europe.

of pegmatite: Granite simple and complex. Latter have a beryllium phase in Mourne Mts. and at Killiney.

REFERENCES: Delesse, A., Sur la Pegmatite de l'Ireland: *Bull. Soc. Geol. de France* (2), vol. 10, pp. 568-588, 1853. Osborne, G. D., The metamorphosed limestones and associated contaminated igneous rocks of the Carlingford district, Co. Louth: *Geol. Mag.*, vol. 69 (815), pp. 209-233, 1932.

NORWAY. Principal localities: The southern Norwegian coastal zone extending from the Swedish boundary to beyond Hittero (including Moss, Kragero, Risor, Arendal, and Iveland) and the northern coast from Trondhjem to North Cape. Types of pegmatite: Granite simple and complex and intermediate complex. Granite pegmatites with a rare-earth mineral phase at Moss, Kragero, Arendal, Iveland, Hittero, and many other southern Norwegian localities. Beryllium phase at Iveland and Minne (northeast of Oslo). Molybdenite phase at Kvina and Knaben mines, southern Norway. Flourine phase at Hundholmen and Drag (68° N). Syenite and nephelite syenite pegmatites abundant between Christianafjord and Langesundfjord. Dioritic pegmatites occur at Kragero. Complex nephelite syenite pegmatites are found on Seiland, an island in Arctic Norway.

REFERENCES: Andersen, Olaf, Feldspat I: *Norway Geol. Survey*, no. 128 A, 57 pp., 1926; Feldspat II and III (latter by Barth): *Norway Geol. Survey*, no. 128 B, pp. 1-154, 1931. (Norwegian with English summary). Andersen, Olaf, Discussion of certain phases of the genesis of pegmatites: *Norsk. Geol. Tidsskr.*, vol. 12, pp. 1-56, 1931. Abstract in *Annotated Bibliography of Econ. Geology*, 4, no. 2, 192. Barth, Tom, Die Pegmatitgänge der Kaledonischen Intrusivgesteine im Seiland-gebete: *Skrifter Norske Vidensk. Akad.*, p. 123, 1927, [I Mat. Naturv. Klass, No. 8, Oslo (Jacob Dybwad)]. Reviewed by Knopf in *Am. J. Sci.*, pp. 272-273, March, 1928. Björlykke, Harald, Norwegische Mikrolithminerale: *Norsk. Geol. Tidsskr.*, vol. 14, pp. 145-161, 1933. Brögger, W. C., Die Mineralien der Syenitpegmatitgänge der Südnorwegischen Augit-und Nephelinsyenite: *Zeit. Kryst.*, vol. 16, 1890. Brögger, W. C., Die Mineralien der Südnorwegischen Granitpegmatitgänge, I: *Vid.-selsk. Skr., Math. Nat. Kl.*, no. 6, 1906. Goldschmidt, V. M., Die Contactmetamorphose in Kristiania Gebiet: *Skrifter utgitt av Videna, i. Kristiana (Mat.-Natur. Kl.)*, 1911 (pub. 1912). Hoel, Adolf, and Schetelig, J., Nephelite-bearing pegmatite dikes in Seiland: *Festkrift, Armund Helland, Kristiana*, pp. 110-131, 1916, Abstract in *Mineral. Abstracts*, 1, p. 282. Vogt, J. H. L., The physical chemistry of the magmatic differentiation of igneous rocks: *Skrifter utgitt av Det Norske, Videnskaps-Akademi i Oslo*, no. 3, First half, pp. 1-131, 1929; *I. Mat.-Naturv. Klasse*, Second half, pp. 1-242, 1930. Woakes, Ernest R., Molybdenite in Norway: *Trans. Inst. Min. and Met.*, vol. 27, pp. 184-195, Jan. 17, 1918.

SWEDEN. Exposures of crystalline rocks cover almost all of Sweden. Principal pegmatite districts: West coast, from Norwegian

boundary south to Goteberg, including the localities of Nohl, Trollhättan, and Bohuslän; the south of Sweden; the vicinity of Stockholm and the region to the north and west, including the localities of Üto, Ytterby, Broddbo, Finbo, and Mansjö Mt.; and the mining district of far northern Sweden. Types of pegmatite: Mainly granite simple. Complex with rare earth mineral phase at Nohl, Ytterby, and Broddbo; lithium phase at Üto; beryllium phase at Finbo; and iron ore (magnetite) phase at Gellivarre, northern Sweden.³⁸

REFERENCES: Eckerman, Harry von, The rocks and contact minerals of the Mansjö Mt.: *Geol. För. Förh. Stockholm*, vol. 44, pp. 203-410, 1922. Abstract in *Mineral. Abstracts*, 1, pp. 396-397. Johansson, H. E., Om Svenska kvarts-och fältspatförekomster: *Geol. Fören. Förh.*, vol. 36, pp. 116-129, 1915. Loostroem, R., Pegmatitgang i Getlycke: *Geol. För. Förh. Stockh.*, vol. 52, pp. 431-434, 1930. Nordenskjöld, Iver, Der Pegmatit von Ytterby: *Bull. Geol. Inst. Univ. Upsala*, vol. 9, pp. 183-228, 1910.

FINLAND. Pegmatites are abundant throughout Finland. Important localities are Carelia (east Finland), northern shore of Lake Ladoga, and the Kimito Island vicinity and Tammela in southwestern Finland. Types of pegmatite: Mostly granite simple. Granite complex with rare earth mineral phase at Lake Ladoga, lithium and beryllium phases at Tammela, and beryllium, phosphate, and minor fluorine, tantalum, and ore mineral phases on southwestern coast. Uuksu (Carelia) pegmatite a rare type, probably a syenite, with beryllium phase.

REFERENCES: Eskola, P., On the petrology of the Orijärvi Region, etc.: *Bull. Comm. Géol. Finlande*, no. 40, pp. 1-277, 1914. Krancke, E. H., A beryl-bearing pegmatite from Uuksu in Carelia, east Finland: *Bull. Comm. Géol. Finlande*, no. 85, pp. 70-77, 1929. Abstract in *Mineral. Abstracts*, 4, no. 7, pp. 328-329. Lokka, Lauri, Über Wilkit: *Bull. Comm. Géol. Finlande*, no. 82, p. 68, 1928. Abstract in *Mineral. Abstracts*, 4, no. 6, p. 249. Makinen, Eero, Die Granitpegmatite von Tammela in Finnland und ihre Minerale: *Bull. Comm. Géol. Finlande*, vol. 35, pp. 1-101, 1913.

RUSSIA. Pegmatites occur in three widely separated districts: (1) The Fennoscandian Shield which extends into northwestern Russia (Carelia and Kola Peninsula); (2) the intrusive rock belt of Volhynia in southwestern Russia (Ukraine); and (3) the Ural Mountains, both north and south of Ekaterinburg. Types of pegmatite: Granite and syenite simple and complex. Granite pegmatites have a rare earth mineral phase in belt lying west of White Sea (Carelia) and in Volhynia. Beryllium, boron, and other phases

³⁸ Ries, H., Personal communication dated June 5, 1933.

present in pegmatites of Ekaterinburg-Mursinka district, Ural Mountains. The southern Urals (Ilmen Mts.) contain complex syenite pegmatites. Nephelite syenite pegmatites with a rare alkaline mineral phase occur on Kola Peninsula.

REFERENCES: Omelandov, A., Industrial evolution of the Vishnegorsk feldspar deposit: *U.S.S.R. Geol. and Prosp. Service, Bull.* **43**, pp. 685-706, 1931. (English summary pp. 704-706). Abstract in *Annotated Bibliography of Econ. Geology*, **5**, 1, 520. Fersman, A. E., Sur les tantaloniobates de l'Oural d'Ekaterinburg: *Compt. rend. Acad. Sci. Russie*, pp. 10-12, **1925**, Abstract in *Mineral. Abstracts*, no. **3**, p. 103, 1926. Fersman, A. E., Sur l'age de l'uraninite dans les filons de pegmatite: *Bull. Acad. Sci. U.S.S.R.*, vol. **20**, pp. 775-780, 1926. Abstract in *Mineral. Abstracts*, no. **3**, p. 263, 1927. Fersman, A. E., Ueber die Natur der Pegmatitbildungen: *Compt. Rend. Acad. Sci. Russie*, pp. 89-92, **1924**, Abstract in *Mineral. Abstracts*, no. **2**, p. 399. Grigorev, P. K., Uranium pitchblende in northern Karelia: *Botschafter Geol. Komitäl's*, no. **1**, pp. 33-34, 1925. Abstract in *Mineral. Abstracts*, no. **3**, p. 146, 1926. Labuntzov, A. N., Sur la découverte des gisements d'ouranates dans la Carélie russe: *Compt. Rend. Acad. Sci. Russie*, pp. 113-114, **1925**. Abstract in *Mineral. Abstracts*, no. **3**, p. 107. Piatnitsky, P., Geological explorations in the emerald district in the Urals: *Trans. Geol. and Prosp. Service U.S.S.R.*, Fascicle **75**, pp. 1-71, 1932. (English summary pp. 68-71).

POLAND. Simple granite pegmatites occur in the Sarny district of eastern Poland at the northwestern extremity of the Volhynian intrusive rock belt.

REFERENCE: Chlípalska, Eugenja Zaniewska, Contrib. a l'étude des filons pegmatiques et aplitiques des environs de Klesowo (Pologne): *l'Archive du Lab. de Min. de la Soc. des Sciences de Varsovie*, vol. **1**, pp. 174-183, 1923.

GERMANY. Principal localities: The mountainous zone bordering Czechoslovakia between south-central Silesia and the Danube, including south-eastern Saxony (the Erzgebirge) and northeastern and eastern Bavaria (the Fichtelgebirge, Oberpfälzer Wald, and Bayerischer Wald). Also in the vicinity of Laacher See, near Coblenz. Types of pegmatites: Alkaline syenite with calcite phase at Laacher See; elsewhere granite simple and complex. Beryllium phase exhibited in a number of pegmatites in Silesia, Erzgebirge, and Bayerischer Wald. Phosphate phase in Oberpfälzer Wald (several localities) and in Bayerischer Wald. Ore mineral (especially cassiterite) and lithium phases in vicinity of Zinnwald in the Erzgebirge.

REFERENCES: Laubmann, H. und Steinmetz, H., Phosphatführende Pegmatite des Oberpfälzer und Bayerischen Waldes: *Zeit. Kryst.* vol. **55**, pp. 523-586, 1915-1920. Abstract in *Mineral. Abstracts*, no. **1**, pp. 124-125. Müllbauer, F., Die Phosphatpegmatite von Hagendorf i. Bayern: *Zeits. Krist.*, vol. **61**, pp. 318-336, 1925.

Abstract in *Mineral. Abstracts*, no. 2, p. 417. Müllbauer, F., Die Pegmatit und Kontaktlagerstätte am Wimhof bei Vilshofen a. d. Donau in Bayern: *Centr. f. Min.*, pp. 96-112, 1930-A, Schuster, Ernst, Calcitführende Auswürflinge aus dem Laacher Seegebiet: *Neues Jahrb. Min., Beil.-Bd.* 43, pp. 295-318, 1919. Abstract in *Mineral. Abstracts*, no. 2, p. 123.

BELGIUM. Veins of plagioclase, biotite, and quartz with subordinate xenotime and yttracrasite in the Bastogne region of south-eastern Belgium are considered by Corin to be pegmatites.

REFERENCE: Corin, F., Contrib. a l'étude pétrographique des filons de la région de Bastogne: *Bull. Acad. Roy. Cl. Sci.*, 5th ser., t. XVI, no. 2, 1 fevr. 1930, pp. 130-134; Sur la présence de xenotime et d'autres minéraux contenant des terres rares dans les veines a bastonite de Bastogne: *Bull. Soc. Belge de Geol.*, t. XLI, 1 fev.-28 avr., pp. 109-111, 1931. Abstract in *Rev. Geol.*, vol.13, fasc. 1, pp. 11-12, 1923-33.

FRANCE. Principal localities: Three areas in France contain crystalline rocks in which pegmatites occur. These are the hercynienne Vosge of northeastern France; Brittany; and the Central Plateau. Types of pegmatite: Mainly granite, both simple and complex. Latter exhibit an ore mineral phase in the southern part of the hercynienne Vosge, an ore mineral and beryllium phase near Nantes in Brittany, a lithium and beryllium phase near Brassac in the southern part of the Central Plateau, and lithium, beryllium, tin, and antimony phases in the region surrounding Limoges (Haute-Vienne) in the northern part of the Central Plateau. Lime-alkaline pegmatites cut calcareous rocks in the hercynienne Vosge of Alsace.

REFERENCES: Arsandaux, H., Sur quelques minéraux des environs de Brassac (Tarn): *Bull. Min. Soc. Fran.*, vol. 24, pp. 428-432, 1901. Abrard, René, Présence de l'apatite dans les pegmatites des environs de Dinard: *Bull. Min. Soc. France*, vol. 46, p. 5, 1923. Abstract in *Mineral. Abstracts*, no. 3, p. 54. De Launay, M. L., Excursion a quelques gîtes minéraux et métallifères du Plateau Central: *Extrait du Compte-Rendu du VIII^e Congrès Géologique International (Paris)*, pp. 10 et seq., 1901. Jung, Jean, Contribution a la géologie des Vosges hercyniennes d'Alsace: *Mem. Serve. Carte. Geol. Alsace et Lorraine*, no. 2, pp. 1-481, 1928. Karpinski, R. W., Contrib. a l'étude métallogénique des Vosges méridionales, Nancy, pp. 1-142, 1931. Abstract in *Annotated Bibliography of Econ. Geology*, 4, no. 2, p. 216. Rastall, R. H., Molybdenum ores: *Monograph, Imperial Inst.*, pp. 1-86, 1920.

PORTUGAL. Localities: Scattered over the area of outcrop of the Sierra da Estrella Massif in the provinces of Beira Alta and Beira Baixa, northern Portugal. Guarda and Mangualda are cities within the district. Types of pegmatite: Granite. Pegmatites are complex, exhibiting lithium, beryllium, tin and tungsten, and rare earth mineral phases at several localities.

REFERENCES: Dittmann, Adolf, Kurze Mitteilungen über Zinnerz-Lagerstätten in Spanien und Portugal: *Metall u. Erz.*, vol. 30 (1), pp. 6-10, Jan. 1933. Abstract in *Annotated Bibliography of Econ. Geology*, 6, 1, 325. Duparc, L., and Gysin, M., Notices minéralogiques les minéraux de la pegmatites de Mangualde: *Schweiz. Min. Petr. Mitt.*, vol. 7, pp. 32-34, 1927. Abstract in *Mineral. Abstracts*, 4, 7, p. 328.

SPAIN. Two pegmatite districts: (1) The Paleozoic granite area of western Spain (east of the Portuguese boundary), and (2) the provinces of Pontevedra and southern Coruna in northwestern Spain north of the Portuguese boundary. Types of pegmatite: Granite simple and complex. Latter have a beryllium phase in northwestern Spain, a tin, tungsten and lithium phase near Caceres and elsewhere in western Spain, and a lithium phase at Lalin, Pontevedra.

REFERENCES: Gibson, W. B., A new occurrence of spodumene: *Rocks and Minerals*, vol. 7, no. 1, p. 23, 1932. Krusch, P., Die Beziehungen der Wolframit- und Bleierzlagerstätten Westspaniens zu Graniten und zur Tektonik: *Zeit. Deut. Geol. Ges.*, Monatsb., vol. 80 (1-2), pp. 34-46, April 10, 1928. Abstract in *Annotated Bibliography of Econ. Geology*, no. 210, 1928.

ITALY. Principal localities: The Italian Alps, adjacent to the Swiss and Austrian boundaries, and on the island of Elba. Types of pegmatites: Granite simple and complex. A beryllium phase occurs at a number of localities, including Mount Velan in northwestern Piedmont, Lake Maggiore district, northern Lombardy, the Sarntaler Alps near Meran in Trentino, and S. Pietro and S. Ilario on the island of Elba. Rare earth minerals occur in pegmatites in northern Piedmont and Lombardy. A prominent gem tourmaline phase occurs on Elba.

REFERENCES: Cornelius, H. P., Ueber Auftreten und Mineralführung der Pegmatite in Veltlin und seinen Nachbartälern: *Centr. f. Min.*, Abt. A., pp. 281-287, 1928. Abstract in *Annotated Bibliography of Econ. Geology*, 2, 2, p. 224. Dittler, E., Neue Beryllaufschlüsse in der Mosullschlucht, Südtirol: *Tschermak Min. Petr. Mitt.* vol. 40, pp. 188-189, 1930.

SWITZERLAND. Simple granite pegmatites occur at several localities north of the Italian boundary in the provinces of Tessin and Grison.

AUSTRIA. Pegmatites are fairly numerous in the Tyrolean and Eastern Alps extending from western Austria through Carinthia and western Styria to central Styria. Also on the southern edge of the Bohemian massif in northern (Upper) Austria. Types of pegmatite: Granite simple and complex. Beryllium phase present

at Habachthal (western Austria) and elsewhere in the Tyrol, Zissingdorf near Freistadt (northern Austria), and in the vicinities of Köflach and Graz in Styria. Lithium phase also present near Graz. Pegmatites with a sulphide ore mineral phase occur on the boundary between Carinthia and Styria.

REFERENCES: Angel, Franz, Spodumen und Beryll aus dem Pegmatiten von St. Radegund bei Graz: *Tschermak Min. Petr. Mitt.*, vol. **43**, pp. 441-446, 1933. Abstract in *Mineral. Abstracts*, **5**, no. 6, p. 288. Friedrich, O., Eine alte pegmatitische Erzlagerstätte der Ostalpen: *Neues Jahrb., Beil.-Bd.* vol. **65**, Abt. A, (3), pp. 479-508, 1932. Abstract in *Annotated Bibliography of Econ. Geology*, **5**, (2), no. 251. Tornquist, A., Alpine Berylliumerzlagerstätten: *Metall. u. Erz.*, vol. **27**, no. 7, pp. 177-179, 1930. Abstract in *Annotated Bibliography of Econ. Geology*, **3**, 1, 631.

CZECHOSLOVAKIA. Principal districts: Pegmatites are widely scattered over Bohemia and western Moravia. Also found in Czech Silesia and Middle Slovakia. Types of pegmatite: Granite simple and complex. A lithium phase is found on the Bohemian side of the Erzgebirge (near Zinnwald, Saxony), at Schüttenhofen (south-western Bohemia), and at Rozna, Puklice (with beryl, cassiterite, and tungsten minerals) and elsewhere in western Moravia. A beryllium phase is present at a number of localities, including Pisek in Bohemia, Budislav (with sulphide ore minerals) in western Moravia, and in the Zjargebirge of Middle Slovakia. Pegmatites with a phosphate phase occur near Marienbad and Ronsberg, western Bohemia, and Pribyslavice in eastern Bohemia. Rare earth minerals occur near Pisek, Horky (eastern Bohemia), and Friedeberg in Czech Silesia.

REFERENCES: Fiala, Fr., Einige mineralogische Funde aus dem Gebirge von Zjar: Abstract in *Neues Jahrb.*, Ref. 1, **6 Heft**, p. 519, 1932. Jarös, Zdeněk, New locality for lepidolite and associated minerals in western Moravia; The minerals of pegmatite boulders from Puklice near Jihlava. Abstracts in *Mineral. Abstracts*, **3**, pp. 547-548. Kratochvil, Fr., *Mineralogische Beiträge*: Abstract in *Neues Jahrb.*, Ref. 1, **6 Heft**, p. 519, 1932. Kratochvil, J., Supplement to the topographic mineralogy of Bohemia for the years 1930-31: Abstract in *Mineral. Abstracts*, **5**, no. 6, p. 271-2. Nováček, R., Minerals of the pegmatites and surrounding rocks from Budislav in eastern Bohemia: Abstract in *Mineral. Abstracts*, **4**, no. 1, p. 41. Sekanina, Josef, The Minerals of the Moravian pegmatites: Abstract in *Mineral. Abstracts*, **4**, no. 1, p. 42; L'exursion mineralogique a Nedvedice et Rozna en Moravie occidentale: Abstract in *Rev. de Geologie*, **12**, fascicle 1, p. 30. Sellner, Fritz., Die Pegmatite der Umgebung von Marienbad: *Zeit. Kryst.*, vol. **59**, pp. 504-512, 1924; vol. **60**, pp. 275-277, 1924. Abstract in *Mineral. Abstracts*, no. **2**, p. 472. Ulrich, Frantisek, Two new finds of orthite from Czech countries: Abstract in *Mineral. Abstracts*, **5**, no. 6, p. 271.

HUNGARY. Basic pegmatites occur in a gabbroidal mass at Szarvoska in the Bükk Mts.

REFERENCE: Szentpétery, S. V., Oligoklasgesteine der Gegend von Szarvasko: *Mat. Term-tud. Ertesitő, Budapest*, vol. 47, pp. 466-467, 1930. Abstract in *Mineral Abstracts*, no. 4, p. 510.

YUGOSLAVIA. Muscovite pegmatites occur among the crystalline rocks of the Rhodope massif in the vicinity of Vranje, south Serbia.

RUMANIA. Pegmatites occur in the Transylvanian Alps in south-central and southwestern Rumania. A beryllium phase is present at Teregova in Banat.

REFERENCES: Rotman, D., *Bull. Sect. Sci. Acad. Româniă*, vol. 7, (for 1920-21), pp. 90-96, 1921. Abstract in *Mineral Abstracts*, no. 2, p. 130. Dittler, E., and Kirnbauer, F., Ueber das neue Beryllvorkommen von Teregova in Rumanien: *Z. prakt. Geol.*, vol. 39 (4), pp. 49-56, 1931. Abstract in *Annotated Bibliography of Econ. Geology*, 4, 1, 517.

TURKEY-IN-EUROPE. Uraninite occurs in a pegmatite near Adrianople.

AFRICA

ABYSSINIA. Muscovite pegmatites occur in the Harrar district of eastern Abyssinia.

REFERENCE: Bordeaux, Albert, Gisements de Mica en Ethiopie: *Mines Carrieres*, vol. 9, pp. C97-105, Sept. 1930. Abstract in *Annotated Bibliography of Econ. Geology*, 3, 2, p. 575.

BRITISH SOMALILAND. Muscovite pegmatites have been found on the Mirsa Plateau and in the Golis range, west-central British Somaliland. A beryllium phase is present in deposits on the Mirsa Plateau.

KENYA COLONY. Mica has been mined from granite pegmatites found on the slopes of Mount Kenya in central Kenya and from the vicinity of Sultan Hamud in the south-central part of the Colony.

UGANDA. Pegmatites common in the pre-Cambrian rocks of this province, especially west and north of Lake Victoria. Types: Granite simple and complex, with tin, beryllium, and lithium phases. Tin and beryllium phases best developed in Ankole district of southwestern Uganda, extending into the northeast corner of Belgian Ruanda, and the northwest corner of Tanganyika.

REFERENCES: Combe, A. D., The geology of southwestern Ankole and adjacent territories with special reference to the tin deposits: *Uganda Geol. Survey, Mem.* 2,

pp. 1-236, 1932. Prior G. T., Contributions to the petrology of British East Africa: *Mineral. Mag.*, vol. 13, pp. 228-263, 1903. Stheeman, H. A., The geology of south-western Uganda, with special reference to the stanniferous deposits, *The Hague*, pp. 1-144, 1932. Abstract in *Annotated Bibliography of Econ. Geology*, 5, 1, no. 406.

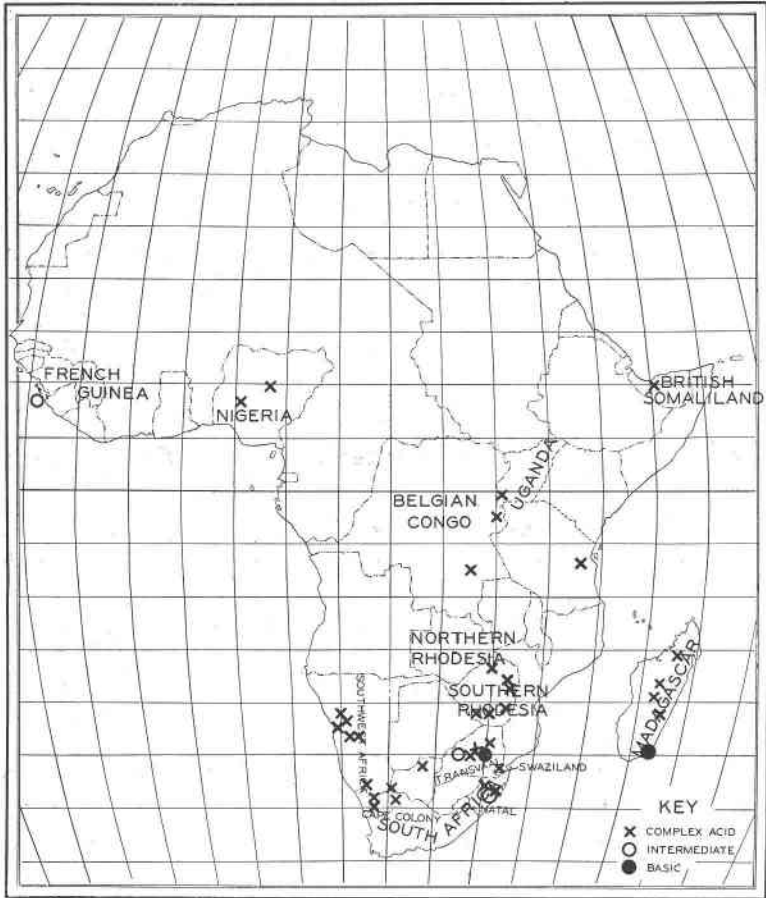


PLATE IV. Distribution of complex acidic, intermediate and basic pegmatites in Africa.

BELGIAN CONGO. Granite pegmatites occur in the north-south belt of pre-Cambrian rocks which lies between the upper Congo (and its tributary Lualaba River) and Urandi-Ruanda and Lake Tanganyika. A tin phase is present in Urandi-Ruanda and at Manono, which lies 53 km. east of the river Lualaba.

REFERENCES: Aubel, René von, Sur quelques minéraux du Congo Belge: *Soc. Géol. Belgique, Ann. Publ. rel. Congo Belge*, vol. 53 (2), pp. C77-79, 1931. Fontainas, Paul, and Ansotte, Max, Perspectives minières de la région comprise entre le Nil, le Lac Victoria et la Frontière Orientale du Congo Belge: *Inst. Royal Colonial Belge, Mem.* 1 (5), pp. 3-27, 1932. Abstract in *Annotated Bibliography of Econ. Geology*, 5, 1, no. 407. Scott, R. W., Katanga tin properties: *Mineral. Mag.*, vol. 46 (1), pp. 24-27, 1932.

TANGANYIKA. Muscovite pegmatites are fairly abundant in the crystalline rocks of east-central and northeastern Tanganyika, especially in the Uluguru and Nguru Mts. and in Westusambara. A rare earth mineral phase is developed in pegmatites in the Uluguru Mts. near Morogoro.

REFERENCE: Teale, E. O., Tanganyika territory; its geology and mineral resources: *Mineral. Mag.*, vol. 38, pp. 331-338, 1928; vol. 39, pp. 9-17, 75-82, 1928.

NYASSALAND. Mica pegmatites occur in the large granite exposure southwest of Lake Nyassa and in smaller areas of granite outcrop south of the lake, and near the northern end of the Protectorate.

NORTHERN RHODESIA. Mica pegmatites have been exploited in the Susoka district.

SOUTHERN RHODESIA. Pegmatites are widely scattered over the pre-Cambrian terrain which covers most of southern Rhodesia. Types: Granite simple and complex. A lithium phase is present in the Antelope gold belt south of Bulawayo, near Salisbury and Odzi (Umtali district) in the eastern part of the territory, in the Victoria tin field, and in the Belingwe district in the southern part of the territory. A beryllium phase is present in the Lomagundi mica district in northern Southern Rhodesia.

REFERENCES: Phaup, A. E., The geology of the Antelope gold belt; *Geol. Survey Southern Rhodesia, Bull.* 21, 119 pp., 1932. Tyndale-Biscoe, R., Report on the geology of part of the Salisbury gold belt: *Southern Rhodesia Geol. Survey, Bull.* 19, pp. 1-39, 1932.

MOZAMBIQUE. Simple granite pegmatites occur within the pre-Cambrian rocks of this territory.

REFERENCE: Holmes, Arthur, The pre-Cambrian and associated rocks of the district of Mozambique: *Quart. Jour. Geol. Soc. London*, vol. 74 (for 1918), pp. 31-98, 1919. Abstract in *Mineral. Abstracts*, no. 1, p. 92.

UNION OF SOUTH AFRICA. Four provinces in the Union contain pegmatites. These will be considered separately.

TRANSVAAL. Pegmatites are fairly abundant in the crystalline complexes of northern and eastern Transvaal. Types of pegmatite: Granite simple and complex, alkaline syenite, and basic complex. Complex granite pegmatites with a tin phase are well developed in the Waterberg tin fields, especially in the Bushveld complex northwest of Potgietersrust. A beryllium phase is present in pegmatites of the Leysdorp district. Platinum minerals occur at Tweefontein, and in basic pegmatite in the Lydenburg district. The Pilandsberg district contains syenite pegmatite with a rare alkaline mineral phase.

REFERENCES: Brouwer, H. A., On the geology of the alkaline rocks in the Transvaal: *Jour. Geology*, vol. 25, pp. 741-778, 1917. Hall, A. L., Mica in the Eastern Transvaal: *Union of S. Africa, Dept. of Mines and Industries, Geol. Survey, Mem.* 13, 1920. Hall, A. L., The Palabora plutonic complex of the Low Country and its relationship to the pegmatites of the Leydsdorp mica fields: *Trans. Geol. Soc. S. Africa*, vol. 15, pp. 4-17, 1913. Kynaston, H., The geology of the country north and northwest of Potgietersrust: *Prel. Ann. Rept. Geol. Survey Transvaal* for 1908, pp. 11-23, 1909. Kynaston, H., and Mellor, E. T., The geology of the Waterberg tin-fields: *Geol. Survey of Transvaal, Mem.* 4, 1909. Le Grange, J. M., The Barbara beryls, etc.: *Trans. Geol. Soc. S. Africa*, vol. 32 (for 1929), pp. 1-25, 1930. Wagner, P. A., The Potgietersrust cassiterite pipes: *S. A. Min. Eng. Jour.*, vol. 1839, pp. 473-474, 1926. Wagner, P. A., and Mellor, E. T., On platinum-bearing hortonolite dunite of the Lydenburg district: *Trans. Geol. Soc. S. Africa*, vol. 28, pp. 1-18, 1925. Wagner, P. A., and Reinecke, Leopold: *Mineral deposits of the Union of South Africa*, 282 pp., 1930.

SWAZILAND. Northern Swaziland contains a granite pegmatite dike with a tin phase.

REFERENCE: Bond, G. W., Notes on the mineralized belt of Jamestown series, Forbes Reef, northern Swaziland: *Trans. Geol. Soc. S. Africa*, vol. 32 (for 1929), pp. 177-186, 1930.

NATAL. Simple granite pegmatites are abundant in Zululand, especially in the Umfuli, Mvuzana, and Tirgela valleys. Complex granite pegmatites with a tin phase occur in the Umfuli Valley east of Melmoth, and a molybdenite phase is found in Buffalo Valley. A corundum-bearing pegmatite occurs near Krantz Kop.

REFERENCES: Hatch, F. H., *Report on the mines and mineral resources of Natal*, London, pp. 1-151, 1910. du Toit, A. L., Plumasite (corundum-aplite) rocks from Natal: *Trans. Geol. Soc. S. Africa*, vol. 21, pp. 53-62, 1918.

CAPE COLONY (and British Bechuanaland). The northwestern portion of this province is floored with pre-Cambrian crystalline rocks in which pegmatites are abundant. Districts: Namaqualand

and Kenhardt in Cape Colony proper; Gordonia and Mafeking (north of Vryberg) in British Bechuanaland. Types of pegmatite: Granite simple and complex. Jackals Water, northeast of Steinkopf in Namaqualand contains pegmatites exhibiting beryllium, lithium, and rare earth mineral phases. A rare earth mineral phase is also present in many pegmatites outcropping in the Kenhardt and Gordonia districts. An ore mineral phase is found in pegmatites in all four districts, including the pegmatites associated with the copper veins of Ookiep in Namaqualand.

REFERENCES: Behrend, Fritz, Uranerzführende Pegmatitgänge in Südafrika und ihre Geochemie: *Archiv. f. Lagerstättenforschung*, **H. 54**, pp. 1–36, 1933. Abstract in *Annotated Bibliography of Econ. Geology*, **6**, 1, 354. Kovaloff, P., Notes on beryl occurrences in Namaqualand: *Int. Geol. Cong. Comptes Rendu*, vol. **2**, pp. 439–443, 1929. Mountain, E. D., Pegmatites of the Cape Province: *Rec. Albany Mus., Grahamstown*, vol. **4**, pp. 122–144, 1931. Rogers, A. W., Notes on the occurrence of radioactive minerals in South Africa: *Trans. Geol. Soc. So. Africa*, vol. **18**, pp. 5–10, 1915; Report on a portion of Namaqualand: *Ann. Rept. So. Africa Geol. Survey*, pp. 127–151, 1912.

SOUTHWEST AFRICA. Pegmatites are exceptionally abundant (and exceptionally rich in accessory minerals) in the Erongo Mts.—Damaraland area, lying between Windhoek and the coast. They also occur to the south where Namaqualand extends into Southwest Africa. Types of pegmatite: Granite simple and complex. A tin phase is very well developed in the Erongo Mts. and adjacent territory. Ores of copper and tungsten occur in pegmatites at many localities in Damaraland and in the southern part of the Protectorate. A lithium phase is present in the Erongo district and a beryllium phase near Rössing station which lies a short distance northeast of Swakopmund on the coast. Several of the Damaraland pegmatites exhibit a phosphate phase, and a tourmaline phase is present in a few Damaraland and Erongo localities. Pegmatites with a rare earth mineral phase occur northwest of the Erongo Mts. and in Damaraland and Namaqualand.

REFERENCES: Frommurze, T. W., and Gevers, H. F., *Int. Geol. Cong. 15th Session (So. Africa), Guidebook Excursion C 21*, 1929. Gevers, T. W., and Frommurze, H. F., The tin-bearing pegmatites of the Erongo area, South-West Africa: *Trans. Geol. Soc. S. Africa*, vol. **32** (for 1929) pp. 111–149, 1930. Abstract in *Mineral Abstracts*, **4**, no. **9**, pp. 411–412, 1931. Heinke, C., Pegmatitgänge in ehemaligen Deutsch-Südwestafrika: *Ber. Freiberg Geol. Ges.*, vol. **14**, pp. 12–14, April, 1933. Abstract in *Annotated Bibliography of Econ. Geology*, **6**, 1, no. 146. Kaiser, E., Ein Neues Beryll (Aquamarine) Vorkommen in Deutsch Südwestafrika: *Centralbl. f. Mineral.*, pp. 385–390, 1912. Kock, W. P. de., The lepidolite deposits of South-

West Africa: *Trans. Geol. Soc. South Africa*, vol. 35, pp. 97-113, 1932 (1933). Reuning, E., Die Natasmine in Südwest-Afrika, eine pegmatisch-pneumatolytisch-hydrothermale Übergangslagerstätte mit Scheelite, Molybdänglanz, Kupfererzen und Gold: *Neues Jahrb. f. Mineralogie*, Bd. 52, pp. 192-264, 1925. Reuning, E., Pegmatites and pegmatite mineralien in Southwest Africa: *Zeit. Kryst.*, vol. 58, pp. 448-459, 1923. Abstract in *Mineral. Abstracts*, no. 2, p. 167. Rimann, E., Zur Kenntnis Südwestafrikaner Kupfererzorkommen: *Zeit. f. prak. Geol.*, vol. 22, pp. 223-225, 1914. Wagner, P. A., The geology and mineral industry of Southwest Africa: *Union of South Africa, Geol. Survey, Mem.* 7, pp. 111, 1916.

FRENCH EQUATORIAL AFRICA. Simple granite pegmatites occur in the Gabon and western Kamerun districts.

REFERENCE: Brajnikov, B., Contribution à l'Étude pétrographique du Mayombe Septentrional (Gabon): *Bull. Soc. Géol. Fr.*, ser. 5, t. II, pp. 379-392, 1932. Abstract in *Rev. Geology*, 13, no. 1305, 1932-1933.

NIGERIA. Granite pegmatites with a tin phase occur in the Nigerian tin fields in Ilorin and Nassarawa-Bauchi provinces.

FRENCH GUINEA. Sodalite-syenite on the island of Rouma contains syenite pegmatites with a rare alkaline mineral phase.

REFERENCE: Lacroix, A., Les pegmatites de la syénite sodalitique de l'île Rouma: *Compt. Rend. Acad. Sci. Paris*, vol. 192, pp. 189-194, 1931. Abstract in *Mineral. Abstracts*, 4 (11), p. 497.

MADAGASCAR. Pegmatites are abundant in the crystalline rocks which cover all of the island except that portion adjacent to the west coast. The more famous pegmatite localities are in the central part. Types: Granite simple and complex and basic complex. Pronounced lithium, beryllium, and tourmaline phases are present, and several other phases, such as rare earth minerals, are developed to a lesser extent in the complex granite pegmatites. Madagascar is noted for its pegmatite gem stones. Basic pegmatites with a phlogopite phase occur in the vicinity of Fort Dauphin in the extreme southeastern section of the island.

REFERENCES: Duclos, Aux Prospecteurs de Beryls: *Bull. Mines Madagascar*, no. 4, 76 pp., 1924. Abstract in *Rev. Geol.* 4, 628. LaCroix, Alfred, *Mineralogie de Madagascar*, Paris, 1922.

ASIA

ASIA MINOR. Simple granite pegmatites occur in the Batum-Artvin district of western Georgia, the Kulp district of central Armenia, and in the territory east of Suryma in Asiatic Turkey. Complex granite pegmatites with a beryllium phase occur in the

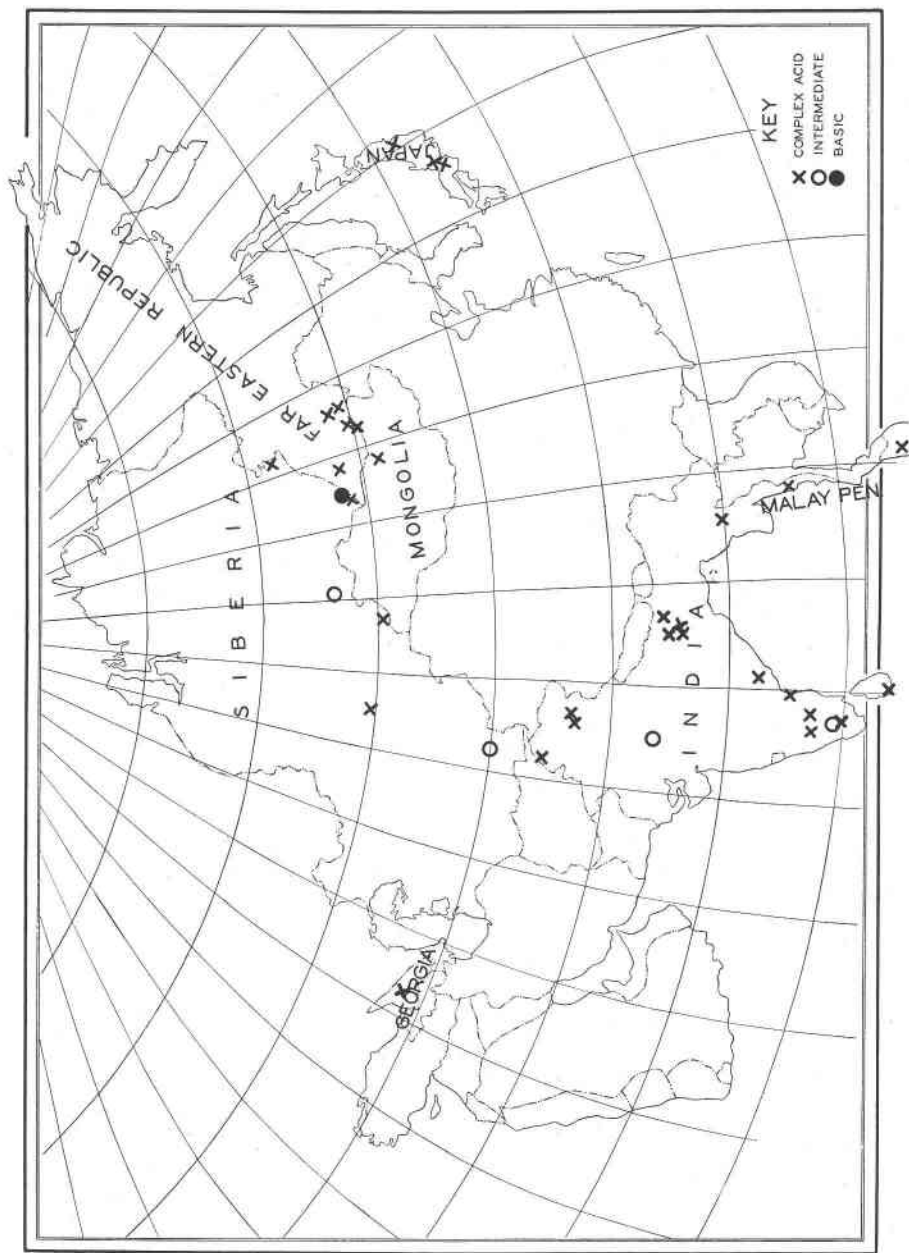


PLATE V. Distribution of complex acid, intermediate and basic pegmatites in Asia.

Dzirul Massif, between the headwaters of the Rion and Kura rivers, western Georgia.

REFERENCES: Ginzberg, A., To the petrography of Trans-Caucasia (Russian): *Mem. Radium Exped., Imp. Acad. Sci.*, no. 4, pp. 1-30, 1915. Abstract in *Mineral Abstracts*, no. 2, p. 115. Kusnezova, E., Materials for the study of pegmatite veins of the Dzirul Massif, Transcaucasia: *Bull. United Geol. and Prospecting Service, U.S.S.R.*, L. Fascicle 98, pp. 1-19, 1931.

SIBERIA AND THE FAR EASTERN REPUBLIC. A wide belt of crystalline rocks crosses southern Siberia and the Far Eastern Republic from west to east. Pegmatites occur at a number of localities along this belt, especially in Transbaikalia. Granite pegmatites are most abundant. These have a prominent tin phase at several localities in the Borschevochni Range (adjacent to the Mongolian border in Transbaikalia). Lithium, tourmaline and quartz vein phases are also present in this district. A beryllium phase occurs in pegmatites of the Altai Range, near the western boundary of Mongolia, and in the Adun-Chalon Range of eastern Siberia. Granodiorite pegmatites in the Vitun River area, north of Lake Baikal, contain beryllium and ore mineral phases, beside large reserves of muscovite mica. A fluorine phase is present in pegmatites in Kazakstan (northeastern outskirts of the Kirghiz Steppe). A rare earth mineral phase occurs in granite pegmatites in Irkutsk province near the southern end of Lake Baikal. In the same district are basic pegmatites with an apatite-phlogopite phase. Rare earth minerals also occur in syenite and nephelite syenite pegmatites in the vicinity of Minussinsk on the upper Jenissei. Simple nephelite syenite pegmatites are found in the Alai Range of Turkistan.

REFERENCES: Artemiev, B., Materials to the knowledge of the tin deposits of east Transbaikalia: *U.S.S.R. Geol. and Prospecting Service, Bull.* 49 (7), pp. 29-45, 1930 (English summary pp. 44-45). Assovski, A. N., Some data on tin occurrences in the Borschevochni Range (east Transbaikalia): *U.S.S.R. Geol. and Prospecting Service, Bull.* 49 (7), pp. 17-27, 1930 (Russian, English summary pp. 26-27). Fersman, A. E., Les résultats minéralogiques d'une expédition en Daourie en 1915: *Compt. Rend. Acad. Sci. Russie*, pp. 65-68, 1923. Abstract in *Mineral Abstracts*, no. 2, pp. 264-265. Holmov, George, Minerogenetic sketch of Duldurga tungsten deposit (Transbaikalia): *Trans. United Geol. and Prospecting Service of U.S.S.R.*, Fascicle 133, 1931, English summary pp. 35-36. Kassin, N. G., General geological map of the Kazakstan: *Trans. Geol. and Prospecting Service, U.S.S.R.*, Fascicle 110, pp. 1-260, 1931. Labasine, C., Sur les gisements de substances minérales radioactives dans l'arrondissement de Khakassk: *Trans. U.S.S.R. Geol. and Prospecting Service*, 19, pp. 1-56, 1930 (French summary pp. 55-56). Misharev, D. T., Mama-

Vitim-Chuisky deposits of mica: *Trans. United Geol. and Prospecting Service, U.S.S.R.*, Fascicle 154, pp. 1-89, 1932, Moskvin, A. V., On the mikrokline from the river Joury-Say: *Travaux-de L'Institut Petrographique de l'Académie des Sciences de l'U.S.S.R.*, no. 3, pp. 5-12, 1933. Wendland, C., microscopic study of pegmatites from the Mama mica district: *Trans. United Geol. and Prospecting Service, U.S.S.R.*, Fascicle 221, pp. 1-34, 1932 (English summary pp. 33-34).

MONGOLIA. Complex granite pegmatites occur near Urga in northern Mongolia on the Gorikho river. Fluorine and beryllium phases are present.

REFERENCE: Kryjanowsky, V., Sur les pegmatites des environs d'Urga en Mongolie: *Compt. Rend. Acad. Sci. Russie*, pp. 13-16, 1925. Abstract in *Mineral Abstracts*, 3, p. 439.

AFGHANISTAN. Muscovite pegmatites occur in southeastern Afghanistan.

INDIA. Pegmatites are abundant in the crystalline rocks of both peninsular and northern (Himalayan) India. The best known district lies in the provinces of Bihar and Orissa in Lower Bengal, northwest of Calcutta. Other important districts are northern India (especially Kashmir), east-central Rajputana, eastern Mysore, and the northern, central, and southern parts of Madras Presidency. Simple granite pegmatites predominate, but many complex granite pegmatites are present in the districts enumerated. A beryllium phase is developed at several localities in Lower Bengal, especially in the Kodarma district. Other pegmatites containing beryl occur near Nellore (north of Madras), at Bangalore (Mysore state), near Kishengarh in Rajputana, in the Coimbatore district of southern Madras, and in Chitral in northernmost India. A lithium phase is found in pegmatites in southern Kashmir and in the Hazaribagh district of Lower Bengal. Cassiterite accompanies the lithium minerals at Pihra, Lower Bengal. Granite pegmatites with a molybdenum phase occur in northern Madras near Kunaveram, in southern Madras west of Palni, and in the Kolar gold field of Mysore. Phosphate and rare earth mineral phases are developed near Kodarma and near Singar (Gaya district) in Lower Bengal. In addition rare earth minerals occur in the pegmatites of the Nellore (central Madras) and Bangalore (Mysore) districts. Syenite pegmatites with a corundum phase are found in the Coimbatore district of southern Madras and alkaline syenite pegmatites with a molybdenum phase occur near Kishengarh in Rajputana.

REFERENCES: Criper, W. R., The mica deposits of India: *Mem. Geol. Survey India*, vol. 34, pp. 131, 1902. Fox, C. S., Quinquennial review of the mineral production of India for the years 1924-1928: *Geol. Survey India*, vol. 64, 1930. Holland, Thomas H., The Sivamalai series of elaeolite-syenites and corundum syenites in the Coimbatore district Madras Presidency: *Mem. Geol. Survey India*, vol. 30, pt. 3, pp. 169-217, 1901. Mallet, F. R., On the occurrence of amblygonite in Kashmir: *Rec. Geol. Survey India*, vol. 32, pp. 228-229, 1905. Smith, Mervyn A., Mica mining in Bengal, India: *Mineral Industry*, vol. 7, p. 512, 1899. Tipper, G. H., Quinquennial review of the mineral production of India, 1914-18: *Rec. Geol. Survey India*, vol. 52, pp. 305-306, 1921. Wadia, D. N., *Geology of India, London, 1919*.

CEYLON. Simple granite pegmatites are common in the gneisses and associated crystalline rocks of Ceylon. Complex granite pegmatites with a rare earth mineral phase occur at Gampola and Hini-duma Pattu and a molybdenite phase is present near Kegalla.

REFERENCES: Adams, Frank D., The geology of Ceylon: *Can. Jour. of Research*, vol. 9, pp. 425-511, 1929. Rastall, R. H., Molybdenum ores: *Mono. Imp. Inst.*, pp. 1-86, 1920. Spencer, E., A contribution to the study of moonstone, etc.: *Mineral. Mag.*, vol. 22 (130), pp. 291-367, 1930.

BURMA. Pegmatites occur in Upper Burma in the crystalline rocks which lie north and northeast of Mandalay, especially in the Mogok district, and south of Mandalay in the vicinity of Yamethin. The Tavoy district of Lower Burma likewise contains pegmatites. Types: Granite simple and complex. Latter exhibit tungsten and beryllium phases at Yamethin and tungsten and tin phases at Tavoy.

REFERENCES: Brown, J. Coggin, Ruby mining in Upper Burma: *Mineral. Mag.*, vol. 48 (6), pp. 329-340, June, 1933. Campbell, J. Morrow, The ore minerals of Tavoy: *Mineral. Mag.*, vol. 20, pp. 76-89, 1919. Turner, H. W., Literature on the tungsten deposits of Burma: *Econ. Geology*, vol. 14, pp. 625-639, 1919.

MALAYA. Granite pegmatites are fairly common in the Malayan tin belt, especially in the Kinta Valley. Tin and tungsten phases predominate, but lithium, sulphide ore mineral, and fluorine phases are also present.

REFERENCES: Scrivenor, J. B., *The geology of the Malayan ore deposits, London, 1928*. Willbourn, E. S., and Ingham, F. T., Scheelite at Kramat Pulai (Malaya): *Mineral. Mag.*, vol. 48 (1), pp. 60-61, 1933.

CHINA. Simple granite pegmatites are found in a number of widely scattered localities in China. They have been reported as occurring in southern Manchuria, in the coastal provinces of Chekiang and Kwangtung, and in several interior provinces, especially Szechwan where muscovite mica has been mined.

REFERENCES: Ho, T. L., The anorthoclase perthite from Chu-Chietsien island near Putochan, Chekiang: *Contrib. Nat. Research Inst. Geol. Acad. Sinica*, no. 4, pp. 31-40, 1933. Ogura, Tsutomu, Some dyke rocks in South Manchuria: *Mem. Ryojun College of Eng. (Manchuria)*, vol. VI, no. 9, pp. 155-174, 1933. Sen-Shing, Yoh, and Wen-Kwang, Yao: Preliminary report on the geology and mineral resources of Han Chiang region, eastern Kwangtung: *Geol. Survey Kwangtung and Kwangsi, Ann. Rept.* 4, no. 1, pp. 19-28, 1931-32. Tien-Chen, Lee, and Chen-Ping, Wang: The geology of Ch'anghsing, Wuhsing, Wuk'ang, Teht'sing, and Yü-hang districts: (Abstract) *Geol. Survey Kwangtung and Kwangsi, Ann. Rept.* 3, no. 2, pp. 27-64, 1929-1930.

KOREA. The greater part of Korea is underlain by granite and gneiss in which simple granite pegmatites occur.

REFERENCE: Ichimura, T., Notes on the titaniferous magnetite deposits of Shô-Enpé-Tô, Chôsen (Korea): *Mem. of Faculty of Sci. and Agric., Taihoku Imp. Univ.*, vol. 3, no. 3 (Geol., no. 1), pp. 249-266, Dec., 1931.

JAPAN. Granite pegmatites occur at a number of localities on the island of Honshu. These are complex with rare earth mineral and beryllium phases at Ishikawa, Iwaki province, and near Naegi, Mino province. Pegmatites with a fluorine phase occur in Mino and Omo provinces.

REFERENCES: Iimori, Satoyasu, et al., A new radioactive mineral found in Japan: *Inst. Phys. and Chem. Res. Tokyo, Sci. Papers* 15 (285), pp. 83-88, 1931. Iimori, S., Yoshimura, J., and Hata, S., A new radioactive mineral found in Japan: *Chem. News. London*, vol. 142, pp. 209-211, 1931. Abstract in *Mineral. Abstracts*, 4 (11), p. 500. Kimura, K., and Miyake, Y., On enalite, a new variety of uranothorite, found in Naegi, Gifu prefecture: *Jour. Chem. Soc. Japan*, vol. 53, pp. 93-100, 1932. In Japanese. Abstract in *Am. Mineral.*, 1933, p. 223, and *Mineral. Abstracts*, 5, p. 293. Uemura, Taku, Analysis of beryl from Ishikawa, Iwaki Province: *Japan Jour. Chem.*, vol. 2, pp. 117-121, 1923-1925. Analyses of columbite, monazite, samarskite, and ishikawaite (a new mineral) of Ishikawa, Iwaki Province: *Japan Jour. Chem.*, vol. 2, pp. 13-20, 1923.

AUSTRALIA AND ADJACENT ISLANDS

EAST INDIES. Pre-Cambrian rocks form the backbone of several East Indian islands, especially New Guinea. Simple granite pegmatites are present within the crystalline rock areas. Amphibole pegmatites occur on Obi Island in the Molucca group.

REFERENCES: Brouwer, H. A., Bijdrage tot de geologie der Obieilanden: *Jaarboek von het Mijnuwesen in Nederlandsch Oost-Indie*, vol. 52 (for 1923), pp. 3-62, 1924. Abstract in *Mineral. Abstracts*, 3, 1, 37-38. Ijzermann, R., Outline of the geology and petrology of Surinam, Dutch Guiana: *La Haye*, 519 pp., 1931. Abstract in *Rev. Geol.* vol. 13, no. 1391, 1932-1933.

WESTERN AUSTRALIA. Crystalline rocks, in which occur both simple and complex granite pegmatites, cover all of Western Australia except the western coast. The principal complex pegmatite districts are Pilbara and Wodgina in the northern part of the territory, Murchison and Lake Moore in west-central Western Australia,

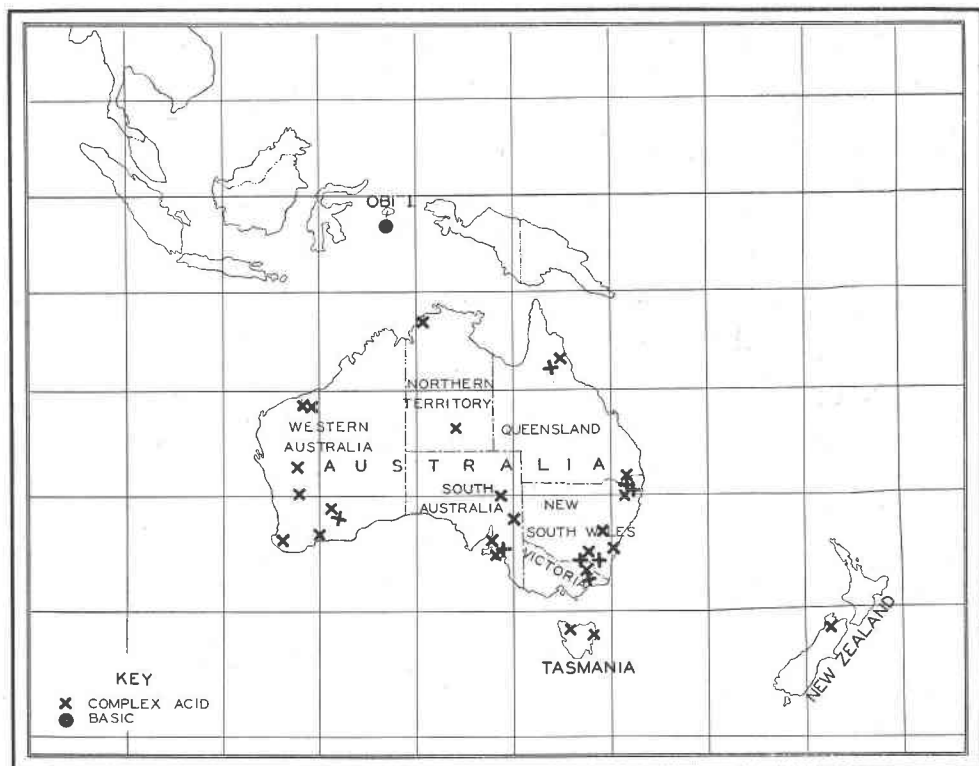


PLATE VI. Distribution of complex acidic and basic pegmatites in Australia.

and the Coolgardie, Dundas, Phillips River, and Greenbushes fields in the southern part of the territory. A rare earth phase is present in pegmatites at Coolegong and Woodstock, Pilbara district, at Wodgina and vicinity (Green's Well and Mt. Francisco), and at Lake Moore. A lithium phase is found at Wodgina, Poonah (Murchison district), at Grosmont, Londonderry, and Ubini in the Coolgardie district, Norseman (Dundas district), at Ravens-thorpe and Coconarup in the Phillips River district, and at Green-

bushes. The pegmatites of the Wodgina district also contain a tin phase. A beryllium phase is present at Poonah, Ravensthorpe, and at Balingup, near Greenbushes. Basic pegmatites have been described (E. S. Simpson) at Nevoria (Central Division) and Bullsbrook (Southwestern Division).

REFERENCES: Blatchford, T., Mineral resources of the Northwest Division (Pilbara gold field): *Geol. Survey W. Australia*, Bull. 52, pp. 68, 69, 73, 1913. Blatchford, T., Geological investigations in the area embracing the Burbanks and London-derry mining centers: *Geol. Survey W. Australia*, Bull. 53, 1913. Farquharson, R. A., Petrographical notes on some specimens from Greenbushes: *Geol. Survey W. Australia*, Bull. 59, pp. 168-175, 1914. Maitland, A. G., Third report on the geological features and mineral resources of the Pilbara gold field: *Geol. Survey W. Australia*, Bull. 23, pp. 49, 1906 (reprinted Bull. 40, 1908). Simpson, E. S., Contributions to the mineralogy of Western Australia, Series VII: *Jour. Roy. Soc. W. Australia*, vol. 18, pp. 61-74, 1931-1932. Simpson, E. S., Contributions to the mineralogy of Western Australia, Series VI: *Jour. Roy. Soc. W. Australia*, vol. 17, 1930-1931. Simpson, E. S., The rare minerals and their distribution in Western Australia: *Geol. Survey W. Australia*, Bull. 59 (Miscel. Repts. 35), pp. 35-37, 1914. Simpson, E. S., Famous mineral localities: Wodgina, northwest Australia: *Am. Mineral.*, vol. 13, no. 9, pp. 457-468, 1928. Simpson, E. S., and Glanert, L., Description of the crystalline rocks of the Phillips river district: *Geol. Survey W. Australia*, Bull. 35, 47 pp., 1909.

NORTHERN TERRITORY. Complex granite pegmatites with a lithium (amblygonite) phase occur near Bynoe Harbour in the northwestern part of the territory. Simple granite pegmatites are abundant in the Hart and Macdonnell Ranges in southern Northern Territory. A beryllium phase is developed in pegmatites in the latter range.

SOUTH AUSTRALIA. Granite pegmatites occur in a belt which extends northward from the coast southeast of Adelaide to the northern extremity of Flinders Range. These are complex with a rare earth phase on Mount Painter (Flinders Range), Radium Hill (near Olary), and at Normanville, south of Adelaide. Ore mineral phases are present in the mining districts of Wallaroo and Moonta. Beryl is present in pegmatites in the Adelaide district at Williamstown and in the Olary district at Bimbowrie and Boolcoomata.

REFERENCE: Jack, R. L., The geology of Moonta and Wallaroo mining districts: *South Australia Geol. Survey*, Bull. 6, pp. 1-135, 1917.

QUEENSLAND. Pegmatites are most numerous in the crystalline rock belt of northern Queensland.¹ They also occur in southeastern Queensland (adjacent to New South Wales) and in isolated crys-

talline rock outcrops in the northwestern portion of the territory. Types of pegmatite: Granite simple and complex. Latter have a molybdenum phase at Stanthorpe, southeastern Queensland, a tungsten phase at Bamford, and ore mineral and beryllium phases at Mount Carbine. Both Bamford and Mount Carbine lie in the gold fields of north Queensland.

REFERENCES: Ball, Lionel C., The wolframite, molybdenite, and bismuth mines of Bamford, N. Queensland: *Queensland Geol. Survey*, Pub. 248, 1915, Rastall, R. H., Genesis of wolfram ores: *Geol. Mag.*, vol. 5, pp. 193 et seq., 1918.

NEW SOUTH WALES. Granite pegmatites are fairly numerous within a 200 mile wide belt which borders on the Pacific Ocean. They are especially abundant in the New England district of northeastern New South Wales. Simple pegmatites also occur in the Broken Hill mining district of western New South Wales. Complex granite pegmatites with a beryllium phase occur near Elsnore, Deepwater (Torrington), Emmaville, and Tingha in the New England district, at Ophir in east-central New South Wales, and near Bungonia, Albury, and Kiandra in the southeastern part of the province. Ore mineral (especially tin, tungsten, molybdenum, and bismuth) phases are present in pegmatites at or near Elsnore, Torrington, Emmaville, and Guyra, all in the New England district. Lithium minerals have been found in New England at Black Swamp and in County Wynyard near Wagga Wagga.

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VICTORIA. Tin-bearing pegmatites traverse metamorphosed sedimentary rocks in the Koetong, Cudgewa, and Glen Wills districts of northeastern Victoria. Pegmatites with a gold-quartz vein phase occur at Dargo and Omeo in eastern Victoria.

REFERENCES: Dunn, E. J., Tin ore at Glen Wills: *Records Geol. Survey Victoria*, vol. 2, pt. 2, pp. 104-105, 1907. Tolman, Carl, Quartz dikes: *Am. Mineral.*, vol. 16, no. 7, pp. 278-299, 1931.

TASMANIA. Pegmatites with a high temperature ore mineral phase occur in the Avoca district of eastern Tasmania and in the Forth River valley in the northwestern part of the island. Beryl is also present at the latter locality.

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NEW ZEALAND. Simple granite pegmatites occur along the west coast of South Island and on Great Barrier Island. A sulphide ore mineral phase is found in complex granite pegmatites of the Mount Radiant district on South Island.

REFERENCES: Bartrum, J. A., Notes on the geology of Great Barrier Island, New Zealand: *Trans. New Zealand Inst.*, vol. 53, pp. 115-127, 1921. Webb, E. J. H., The geology of Mt. Radiant Subdivision, Westport Division: *New Zealand Geol. Survey, n. s.*, Bull. 11, pp. 1-46, 1910.

ANTARCTICA. Simple granite pegmatites have been noted on the mainland of South Victoria Land and on Scott's Nunataks in King Edward VII Land.

REFERENCES: Mawson, D., Petrology of rock collections from the mainland of South Victoria Land: *Brit. Antarctic Exped., 1907-9, Rept. Sci. Invest., Geol.*, vol. 2, pp. 201-234, 1916. Schetelig, J., Report on rock specimens collected on Roald Amundsen's South Pole expedition: *Videnskapselsk. Skrifter, I Mat.-Naturv.*, no. 4, pp. 1-32, 1915. Abstract in *Mineral. Abstracts*, 2, pp. 77-78.