East European (Russian) Craton

By

Ritesh Purohit

East European (Russian) Craton

- Comprises the large **Baltic (Fennoscandian) Shield** and smaller Ukrainian Shield, the slightly buried Voronezh Uplift and Volga-Kama Anteclise to the east,
- Intervening aulacogen-induced troughs, and the deeply buried interior basement including the Moscow (-Baltic) and Caspian syneclises.
- The small Scottish Shield Fragment, a rifted piece of the pre-drift North Atlantic Craton, occupies parts of Scotland and Ireland; related Precambrian crust underlies much of central-southern England.
- At least 10 Precambrian median massifs are contained in the Variscan-Hercynian fold belts including Armorican, Central, Bohemian, Vosges-Black Forest, Iberian and Uralian massifs.
- Substantial but presently ill-defined, buried Precambrian crust lies in the neighbouring West Arctic Shelf.

Shields and Inliers

- Precambrian composite cratons, shields, blocks, belts:
- (1) Baltic Shield, (2) Ukrainian Shield, (3) Voronezh Uplift, (4) Timan-Pechora Extension, (5) Volga-Kama Anteclise, (6) Caspian Syneclise, (7) Moscow (**Baltic**) Syneclise
- Neighbouring median massifs, inliers by continent.
- (a) Uralian Inliers, Variscan massifs including (b) Armorican Massif, (c) Massif Central, (d) Bohemian Massif, (e) British Precambrian including Scottish Shield Fragment, (f) West Arctic Shelf

Orogenies

- Three principal orogenies recorded in the northwestern part *(Baltic Shield)* of this composite craton, namely Lopian (Karelian), Svecofennian and Aikalian, provide a threefold division into Archean Eon and early and late Proterozoic Eras.
- The late Proterozoic era itself is punctuated by the Hallandian (-Gothian) and Sveconorwegian events.

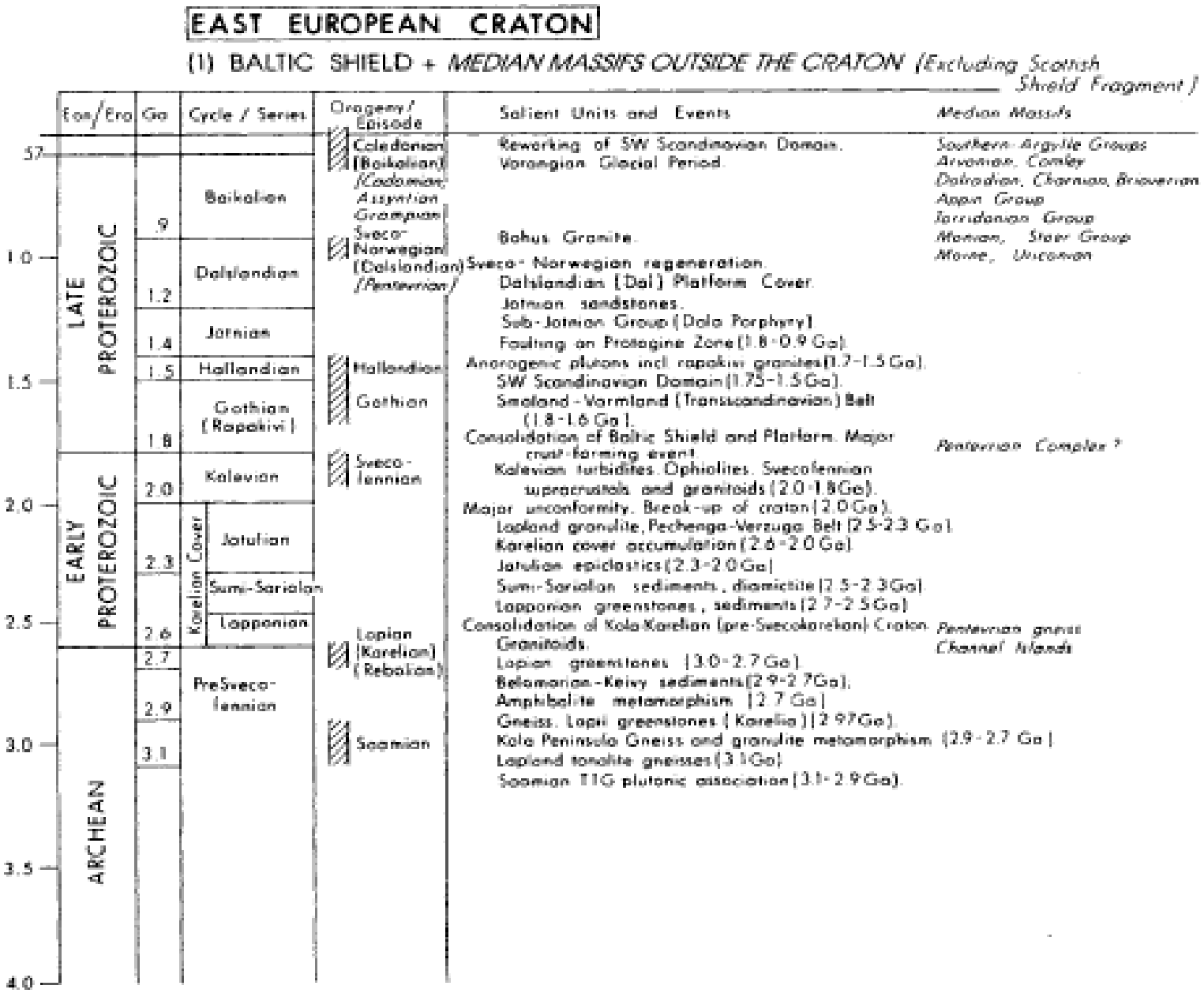

Fig. 1-3c(I). Summary chrono-stratigraphic development of Precambrian crust of the East European Craton—Baltic Shield and median massifs outside the craton. Salient crustal units and events are arranged in relation to internal orogenies and resulting tectonic cycles.

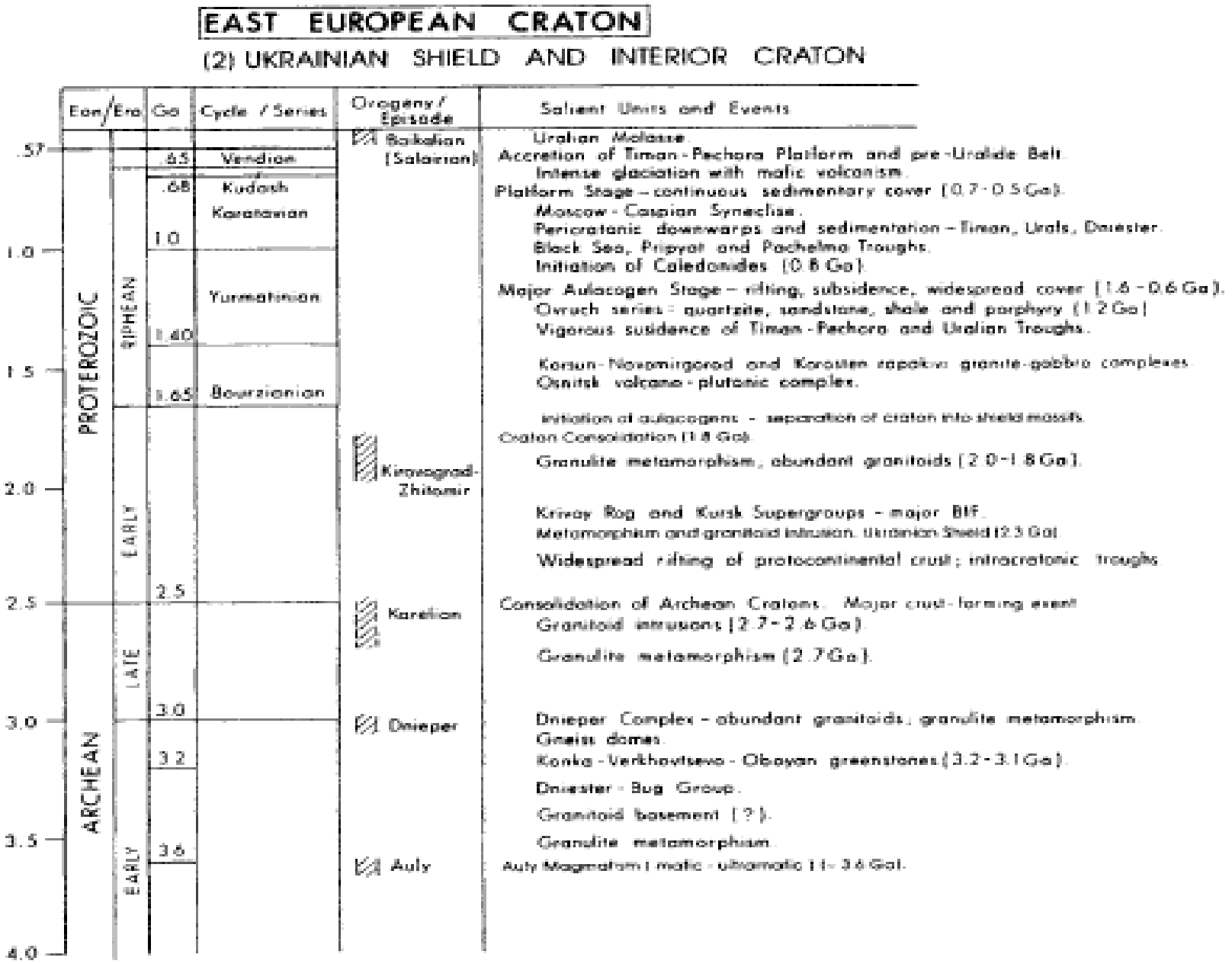

Fig. 1-3c(ii). Summary chrono-stratigraphic development of Precambrian crust of the East European Craton—Ukrainian Shield and interior platform. Salient crustal units and events are arranged in relation to internal orogenies and resulting tectonic cycles.

Geologic Setting

- The East European (Russian) Craton (Fenno- Sarmatia) occupies much of European Russia (i.e.west of the Ural Mountains) and Scandinavia.
- The fault bounded Craton forms an iregular pentagon 2500-3000 km across and 5350000 km^2 in area.
- The craton includes two prominent shields: the larger, rectangular **Baltic** (Fennoscandian) Shield in the northwest, and the smaller, curvilinear Ukrainian Shield in the southwest.
- Additional positive elements include, in the east, the slightly buried Voronezh Anteclise (Uplift), and in the west, the Belorussian (Byellorussian) Anteclise.
- Elsewhere, the Riphean-Vendian-Phanerozoic cover is generally 2--4 km thick, but locally attains 20 km thick.

Baltic Shield

- The Baltic Shield, which includes practically the entire Scandinavian Peninsula, the Finnish-Russian border zone of Karelia, and the Kola Peninsula, forms a rectangle about 2000 km long (northeast to southwest) by 1600 km wide, or 2.2 x 106 km2 in area.
- The Baltic Shield is tectonically divided into six major, westward younging major provinces:

(1) *Kola Peninsula Province*, in the northeast, is underlain mainly by complexly deformed, highgrade Archean gneiss and amphibolites with local fault-bounded slivers of early Proterozoic metasupracrustal cover.

(2) The adjoining narrow, sinuous *Belomorian Province* and on-strike *Lapland Granulite Belt* are variably composed of Archean medium to high grade metapelites, amphibolites, BIF and granitoid gneiss-charnockites, disposed in complexly deformed, W-verging nappes.

(3) To the west, the 400 kin-wide rectangular *Karelian Province* comprises Archean granitoid-greenstone basement with considerable early Proterozoic Karelian- Kalevian cover, locally pierced by mantled gneiss domes.

Baltic Shield Continued

- (4) Incorporating the uppermost Kalevian strata and transitional westward across an E-verging overthrust fault zone, which incorporates the Outokumpu suture, lies the broad (up to 1000 km) early Proterozoic *Suecofennian Province* (Domain). Svecofennian rocks are characterized by extensively granitized arc-type felsic metavolcanics-flysch assemblages and unusually large calc-alkalic granitoid intrusions.
- (5) To the west, the N-trending, 20-150 km-wide *Trans-scandinavian Belt* is composed mainly of 1.75 Ga granitoid plutons.
- (6) It is succeeded westward by the *Southwest Scandinavian Domain* (Sveconorwegian Province), a 500km wide, unusually complex metasupracrustal-granitoid assemble of diverse ages but dominated by 1.75-1.50 Ga Gothian rocks variably reworked during the Hallandian (1.5-1.4 Ga), Dalslandian (Grenvillian, Sveconorwegian) (1.25-0.9 Ga), and Caledonian (0.6-0.4 Ga) orogenies.

Main geologic outline and divisions of the East European Craton--Main craton divisions, Baltic Shield subdivisions, and Uralian inliers (based on Khain 1985, Fig. 2, Ga&l and Gorbatschev 1987, Fig. 2, and Shatzki and Bogdanoff 1959, Fig. 1).