their interpretation has long been uncertain. To better characterize the time of metamorphism of these terranes we have obtained six new Ar/Ar mineral dates from this area. A single muscovite separate from the northern terrane yielded a Caledonian plateau age of 432±7 Ma, similar to numerous K/Ar, Ar/Ar, and Rb/Sr mineral dates obtained throughout western Spitsbergen. The southern terrane yielded significantly older Ar/Ar ages with three muscovite plateau dates of 581±9 Ma, 575±14 Ma, and 460±10 Ma, a 484±5 Ma biotite plateau date, and a 616±16 Ma hornblende plateau date. The oldest dates correlate well with a latest Proterozoic eclogitic metamorphism recognized within Caledonian complexes of northwestern Spitsbergen (Peucat and others, 1989, *Lithos*), suggesting that the amphibolite metamorphism of the WJL might be latest Proterozoic in age. This interpretation is also consistent with field evidence for a major Late Proterozoic tectonic event in southwestern Spitsbergen (Bjørnerud and others, 1990, *Precambrian Res.*). Alternatively, the dates may simply reflect the time of lower or middle crustal cooling/uplift long after an older (Grenvillian?) metamorphic event. The younger pre-Caledonian muscovite and biotite dates and 350-430 Ma low temperature increments from the hornblende separate suggest that Caledonian greenschist facies overprinting of the southern terrane was of variable intensity.

BTH 48 Meert, Joseph G.

PALEOMAGNETIC INVESTIGATION OF THE NEOPROTEROZOIC FEN CARBONATITE COMPLEX, S. NORWAY: CONSTRAINTS ON NEOPROTEROZOIC RIFTING BETWEEN LAURENTIA AND BALTICA.

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The timing of continental breakup between the various tectonic elements adjacent to the eastern margin of Laurentia (present-day coordinates) during the Neoproterozoic rifting of Rodinia is generally placed between 600-550 Ma. Well-dated paleomagnetic poles from these elements can provide critical tests for the timing of Iapetus Ocean formation and the final breakup of Rodinia. Several authors (Dalziel, 1992; Young, 1995; Powell, 1995) have suggested that a short-lived supercontinent, called Panottia existed near the Precambrian- Cambrian boundary. Panottia consists of Gondwana +/- Baltica juxtaposed against eastern Laurentia. The existence of Pannotia is based on the observation that the rift-to-drift transition in eastern Laurentia post-dates Gondwana formation. Previous paleomagnetic tests of Baltica-Laurentia coherence (Torsvik et al., 1996) indicate that Baltica had separated from eastern Laurentia by 580 Ma although the exact timing was equivocal due to a lack of well-defined coeval poles from both continents.

The Fen Carbonatite complex and satellite dikes (S. Norway) are now well-dated to 570-580 Ma (Dahlgren, 1994) and therefore is of the same age as several igneous provinces in North America that have well-defined paleomagnetic poles. Therefore, a paleomagnetic pole from the Fen Complex will allow for direct comparisons to be made between Baltica and Laurentia. Previous paleomagnetic studies of the Fen (Poorter, 1972; Piper, 1988) suggest that Baltica had already rifted from Laurentia but some of the paleomagnetic data from the Fen Complex resembled Permian directions. Our investigation targeted numerous satellite dikes associated with the Fen intrusion that have been directly dated. We are also performing 40Ar-39Ar dating of these dikes in conjunction with the paleomagnetic investigation. We present preliminary results from the Fen Complex and discuss the tectonic implications of these data.

BTH 49 Campbell, Lisa M.

Nd AND Pb ISOTOPIC CHARACTERISTICS OF EARLY PROTEROZOIC INTRUSIVES IN THE TORNGAT OROGEN, N. LABRADOR: IMPLICATIONS FOR TECTONIC ASSEMBLY OF N.E. LAURENTIA

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Early Proterozoic intrusive rocks from the northernmost segment of the ca. 1.9-1.7 Ga Torngat orogen have been analyzed for Nd and Pb isotopic compositions in order to constrain the history of convergence and collision in northern Labrador, Canada during this orogenic event. The Torngat Orogen is a N-S striking belt of deformed amphibolite to granulite facies rocks which formed in response to transpressional collision at ca. 1.9-1.7 Ga between two Archean cratons; the Nain Province to the east and the Rae Province to the west. In the northern-most part of the orogen, the Burwell domain occurs as a poorly understood crustal block to the west of the Nain Province and to the north of the Rae Province. In this part of the orogen, 1.91-1.86 Ga intrusive rocks can be divided into two groups based on field, metamorphic and isotopic characteristics. In the east, intrusives are at amphibolite facies and commonly preserve intrusive contacts with Nain Province gneisses. Those in the west are typically at granulite facies, and show mainly tectonic contacts with strongly reworked Archean gneisses and supracrustal assemblages of the Burwell domain. The $\varepsilon Nd_{(t)}$ values for the eastern intrusives vary between +1.45 to +3.78; those in the west range from +3.58 to -12.56, suggesting strong (but variable) involvement of Archean crust in formation of the western group, but little to none in the eastern group. The $\varepsilon Nd_{(1.91)}$ values for adjacent Nain and Rae Province crust range from -6.9 to -16.2 and -12.8 to -14.3 respectively, suggesting that either could be involved in formation of the western intrusive rocks. Pb isotopic compositions for the Proterozoic intrusive rocks also vary from east and west, where the eastern intrusives are strongly radiogenic, ($^{206/204}$Pb = 15.9-18.2); relative to the western intrusives ($^{206/204}$Pb= 14.4-17.1). The cause of this variation is not yet clear, but could indicate exposure of different crustal levels.

Current models for the development of the Torngat orogen suggest that magmatism developed in the Nain crust above an eastward directed subduction zone. However in Phanerozoic continental margin convergent zones, the crustal component in subduction-related magmas increases inland. If analogous to the Phanerozoic, then subduction beneath the Burwell and Nain must have been west-directed to account for the east to west increase in crustal component observed in End values of the Proterozoic intrusives. If eastward subduction did occur, then the Burwell domain must either represent a deeper crustal level than the Nain Province in the west or it must represent a previously independent crustal block accreted against the western margin of the Nain craton.

BTH 50 Helper, Mark A.

COMPARISON OF PROTEROZOIC BASEMENT PROVINCES OF THE SOUTHWESTERN US AND THE EAST ANTARCTIC CRATON; IMPLICATIONS FOR NEOPROTEROZOIC PLATE RECONSTRUCTIONS

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Neoproterozoic plate reconstructions of the Rodinia supercontinent predict that the Meso- and Paleoproterozoic basement provinces of the southwestern US may have counterparts in the East Antarctic craton. Specifically, the S.W.E.A.T. reconstruction of Dalziel (1991) suggests that basement rocks of the Shackleton Range in Antarctica were once contiguous with the Mazatzal and Yavapai Provinces of southern Laurentia. We report results of U-Pb zircon, Pb, and Nd-Sm isotopic analyses from the Shackleton Range that indicate different Proterozoic crustal histories for the two cratons.

U-Pb zircon analyses of granitoids and orthogneisses in the Read Mountains of the Shackleton Range indicate that a period of granulite to upper amphibolite facies metamorphism, deformation and plutonism at ca. 1.78 Ga affected protoliths that are likely as old as 2.4 Ga. Orthogneisses of the northern Read Mountains are characterized by high initial 207Pb/204Pb and depleted mantle model Nd ages of 2.5 to 3.0 Ga, indicative of an Archean crustal component. In contrast, late- to post-kinematic granitoids of the southern Read Mountains have initial Pb ratios at 1.8 Ga that resemble average crust and depleted mantle model Nd ages that are only slightly older than their U-Pb crystallization ages. Thorogenic Pb indicates long term Th/U ratios of 1 to 10 and shows no systematic variation within or between the two suites. 1.4 Ga intrusive rocks are conspicuously absent from the Read Mountain basement assemblage.

Paleoproterozoic crystallization ages, Archean Pb and Nd crustal components, and an absence of 1.4 Ga magmatism in the Shackleton Range indicate different Paleo- and Mesoproterozoic crustal evolutionary histories for southern Laurentia and this portion of the East Antarctic craton. These data thus do not support earlier suggestions of a continuation of southwest US basement provinces into East Antarctica but do not preclude assembly of Rodinia in Grenvillian or younger time.

BTH 51 Unrug, Raphael

GEODYNAMIC MAP OF GONDWANA SUPERCONTINENT ASSEMBLY

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The Geodynamic Map of Gondwana Supercontinent Assembly is the main scientific result of IGCP 288: "Gondwanaland Sutures and Fold Belts. The map, co-authored by 67 contributors, was produced jointly by IGCP 288 - database generation, Council for Geoscience (South Africa) - GIS and digital cartography, and Bureau de Recherches Géologiques et Minières (France) - printing. A unique legend developed for the map focuses on Mesoproterozoic, Neoproterozoic and Paleozoic mobile belts. Details shown include age, lithology and tectonic position of sedimentary basin fill sequences, metamorphic facies, magmatism, tectonics, and structural trends. Archean-Paleoproterozoic cratons and post-Triassic cover are generalized. The map offers a synoptic visualization of continuity of Neoproterozoic Pan African and Brasiliano mobile belts suturing older cratons, intracontinental mobile belts, and the web of continental-scale shear zones developed in late stages of collision and tectonic escape in Gondwanaland.

Cartoons show selected phases of Gondwanaland assembly: the breakup of the preceding Rodinia supercontinent at 725 Ma and early events in the Gondwanaland Neoproterozoic-Paleozoic supercontinent cycle, followed by rearrangement of constituent Archean-Paleoproterozoic cratons. Earliest rifting events, passive margin basins and magmatic arcs in Gondwanaland cycle are dated at 1000-870 Ma, and earliest ophiolites are dated at 880 Ma. In the time slice 700-500 Ma oceans of various size closed and the assembly of Gondwanaland was completed. Collages of lithotectonic terranes are recognized in better known suturing mobile belts. A widespread magmatic event occurred at 560-480 Ma inside Gondwanaland, along its Paleo-Pacific margin, and in the north of greater India. Accretionary events continued along the Paleo-Pacific margin during the Paleozoic. The Cape-Ventana mobile belt marks the onset of shearing that resulted in the Mesozoic breakup of Gondwanaland.

BTH 52 Van Schmus, W. R.

PRECAMBRIAN TECTONIC FRAMEWORK OF BORBOREMA PROVINCE, NE BRAZIL: STUDIES ON PRE-ASSEMBLY HISTORY OF WEST GONDWANA

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The Borborema Province (BP) of NE Brazil is part of a Pan-African/Brasiliano belt formed during late Neoproterozoic assembly of West Gondwana. Geochronologic results from BP demonstrate tectonic history from >3.4 Ga to <0.6 Ga. The BP has a northern tectonic domain (NTD) north of Patos shear zone, a central tectonic domain (CTD) between Patos and Pernambuco shear zones, and a southern tectonic domain (STD) between Pernambuco shear zone and São Francisco craton (SFC). Brasiliano granites occur in all domains. The oldest rocks occur as Archean nucleii (2.6 to >3.4 Ga) in Caldas Brandão Massif (CBM) in eastern NTD. These are separated by Transamazonian (TA, 2.1 Ga) gneisses; the CBM was amalgamated about 2.1 Ga during the TA orogeny. TA gneisses consitute Rio Piranhas Massif in central NTD and basement of Ceará State in western NTD. TA gneisses also occur as blocks in CTD and basement inliers of SFC in southern STD. Following TA orogeny, intracratonic supracrustal rocks were deposited 1.8 to 1.7 Ga. On SFC these are moderately deformed; in BP they were strongly deformed during the Brasiliano orogeny. About 1.1 Ga, continental crust of BP and SFC underwent extension, forming sedimentary-volcanic basins. This was followed by the Cariris Velhos orogeny (continental margin arc?) within CTD and STD about 1.0 Ga; very little, if any, 1.0 Ga juvenile crust was formed. Intracratonic sedimentation and magmatism about 0.8 to 0.7 Ga resulted in small flood basalt sequences in CTD and STD, flysch-like sedimentation in NTD, and molasse-like sedimentation on southern STD basement. The BP contains no Neoproterozoic juvenile terranes, as found elsewhere in West Gondwana.