subductionrelated) post–collisional high heat–flow regime (Vavra 1989).

Southward subduction of oceanic domains in the northern Variscan realm was probably responsible for the formation of some **volcanic–arc–type plutons in the Saxothuringian** (e.g. Odenwald - Liew and Hofmann 1988, Henes–Klaiber and Altherr 1991). These plutons intruded between ca. 360 and 330 Ma (Kirsch et al. 1988) and are older than the intra–Alpine I–type granitoids. Late Devonian to early Carboniferous diorites/tonalites/granodiorites in the northern Vosges (Holl and Altherr 1987) and in central Bohemia (Košler and Aftalion 1992) may be combined with the Odenwald to a northern, pre– or early–collisional subduction related plutonic belt.

The **post–collisional batholiths of the Moldanubian zone** consist mainly of granites and granodiorites, that range chemically from I–type to S–type. The abundant S–type granitoids may be explained in terms of melting of metasedimentary Moldanubian crust at low to moderate pressures (Liew et al.1989, Clemens and Finger 1994).

The Moldanubian I–type granitoids are mostly significantly lower in CaO and higher in K_2O than I–type granitoids of active continental margins (Liew et al. 1989). Some of them, e.g. the Weinsberg granite of the Southern Bohemian Batholith, originated from dry melting of lower crust due to breakdown reactions of biotite (Clemens and Vielzeuf 1987, Clemens and Finger 1994). Others, e.g. the "Schlierengranite" of the Southern Bohemian Batholith (Finger 1985, Frasl and Finger 1991), were probably produced by water–present anatexis of orthogneisses at mid crustal levels (Clemens and Finger 1994). Minor volumes of Moldanubian I–type granitoids (e.g. the "Durbachites") might be derived from basaltic magmas contaminated in the lower crust by an AFC process (Propach 1977, Holub 1991, Wenzel et al. 1991).

The extended late Visean crustal anatexis in the Moldanubian unit most likely requires mantle magmatism (magmatic underplating) as a heat source. This mantle magmatism may be related to subduction of oceanic crust from the south (Finger and Steyrer 1991) combined with decompressional mantle melting due to the post–collisional collapse of the Variscan orogen.

A–type granites, i.e. leucocratic granites high in HFSE, which commonly mark the transition from orogenic to anorogenic environments, are rarely found in the Moldanubian unit (e. g. Homolka type in Czechia - Matějka and Klečka 1992), but seem to be quite abundant in the intra–Alpine domain, where they form small Permian intrusions within the Carboniferous I–type granitoid complexes (Vavra 1989, Haunschmid et al. 1991). This suggests A–type granite formation by high–temperature melting of restitic I–type sources (Collins et al. 1982, Clemens 1986). Permian A–type granites also occur in some places in the northern half of the Variscan fold belt (Harz, Erzgebirge - see e.g. Liew and Hofmann 1988).

THE VARISCAN OROGEN IN CENTRAL EUROPE: STILL MORE QUESTIONS THAN ANSWERS

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The Variscan belt of Europe is a terrane collage of Gondwana–derived microplates, set between Laurentia–Baltica to the north and the Gondwana mainland to the south. These microplates became separated from each other during an important rifting episode in CambroOrdovician time. The resulting areas of oceanic and/or thinned continental crust were consumed by subduction during a Silurian to Carboniferous period of plate convergence, which produced a number of individual thrust belts and sutures. Subduction was directed to the south on the northern flank (Rheno–Hercynian and Saxo–Thuringian belts), and to the north on the southern flank (Moldanubian belt). During and after the collision, the sutures were overprinted by dextral wrench faulting, and the internal parts of the collage were welded together by lowpressure/high–temperature metamorphism, followed by moderate post–orogenic extension and magmatism in the Permo–Carboniferous. So far so good, **BUT:**

The **plate–kinematic framework** is far from being completely understood. This is partly due to different methods and scales of observation. For example, palaeogmagnetism and biogeography suggest an Ordovician ("Rheic") ocean separating Avalonia from Armorica represented by a suture between the Rhenohercynian belt and the Mid–German Crystalline High, but field evidence is meagre: scraps of Silurian calc–alkaline rocks in the Northern Phyllite Zone and the Mid–German Crystalline High possibly represent an island arc relating to the closure of the Rheic. On the other hand, the "large-scale" methods (palaeo-magnetism, palaeo-biogeography and palaeo-climate) fail to recognize the Saxo-Thuringian and Moldanubian basins, which are clearly documented in the tectono-metamorphic record: larger oceanic separation is not a pre-requisite of orogeny.

Similar big question marks concern the **correlation of the central European with the peri-Mediterranean realms** (Alps, Iberia etc.). In the crystalline basement of the Alps, there are indications of Ordovician subduction/collision (instead of the rifting which is so well documented in the areas further north). This might be regarded as a simple case of different processes in different areas - but the same **ambiguity (rift or island arc?)** also exists within some of the extra-alpine areas (Massif Central, Saxo-Thuringian belt, Sudetes). We are dealing here with a methodological problem: is it safe to deduce **a tectonic setting only from the geochemistry of metamorphic rocks?** This problem also pertains to the "calc-alkaline" signature of many Permo-Carboniferous volcanic rocks and granitoids.

Similarly, we have to question the **significance of isotopic "ages"**. We have learned to mistrust Rb-Sr whole rock data, but we find in an increasing number of cases, that even U-Pb and Sm-Nd results are at variance with geological observations (examples will be presented). This is not surprising, since rocks from the central-Variscan crystallines may have gone through at least two, and partly three, orogenic cycles (Variscan, Cadomian, and a hitherto nameless 2 Ga event). We have to accept that our reconstructions of these areas will remain - at best - incomplete. Still, meticulous isotopic analysis of the crystalline core regions remains one of the most important tasks, and all isotopic ratios need careful geochemical and petrological back-up to help us understand their meaning.

The poly-orogenic nature of the European crust and upper mantle should also be borne in mind for the **interpretation of seismic sections**. Identification of Variscan structures is only possible in areas where the basement is exposed, and only in the upper crust. The crust/mantle boundary, the lower crust, and also parts of the middle crust have been reequilibrated during the Permo-Carboniferous and Cenozoic extensional episodes. New seismic lines should concentrate upon areas, where overprinting is less complex.

It is now widely accepted that the **exhumation of the high-grade metamorphic rocks** occurs mainly by **large-scale extension**, either due to asthenospheric convection, or else to gravitational collapse of the orogenic belt. Our understanding of these processes in the Variscides is only in its beginnings. Where high grade rocks occur as tectonic klippen (e.g., the Münchberg and related Saxo-Thuringian allochthons, and the Moldanubian nappes), orogenic collapse is plausible enough, but the postulated extensional features remain to be identified in the field. Where extension is well documented, such as in the metamorphic domes of the eastern Erzgebirge or the Saxonian Granulites, the mode and timing of stacking and extension are being debated - it is possible that the high grade rocks were already exhumed by preVariscan thrusting and subsequent collapse, so that only moderate Variscan extension was needed to remove the early Palaeozoic cover sequences.

The **late stage** of the Variscan convergence is characterized by a **high-temperature regime**, documented in low-pressure/high-temperature metamorphism and late- to posttectonic granites. Subsequent extension in intra-montane basins and bimodal volcanism are probably related to the same cause (? delamination of lithospheric mantle and ascent of asthenosphere), but affect a much wider area. This high-temperature epilogue to the Variscan story is a peculiarity which deserves more attention.

What to do? All essays of a geodynamic interpretation have to be interdisciplinary. Tectonic models based (e.g.) solely upon isotopic ratios and trace element spectra are - at best - premature. However, at a rate of approx.1000 geoscientific publications per year on the European Variscides, any synthesis attempted by a single person is doomed to be a failure. Coordination of efforts in interdisciplinary workshops is badly needed. **Lastly**: keywords like "terrane", "collapse", or "pull-apart" are nothing but qualitative tectonic concepts, which need careful testing and adaptation in any single case. This requires quantification of all relevant parameters, and attempts of numerical simulation.