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David Skevington (*).—GRAPTOLITE FAUNAS FROM CENTRAL AND NORTHWESTERN SPAIN.

Graptolite faunas collected from fourteen localities have been examined, three of them from Central Spain (VOE-3, VOE-4 y VOE-5) and the others from the León region (Northwestern Spain). The stratigraphic position and precise situation of the localities can be seen in two papers by PÉREZ-ESTAÚN (1974) and JULIVERT & TRUYOLS (1974). Apart from post-mortem flattening, all specimens have suffered some degree of tectonic distortion and, in many cases, the extent of this is such as to preclude positive identification at the specific level. Occasionally, even the generic affinity is in doubt.

A further difficulty in regard to identification stems from the fact that the bulk of the graptolite material provided by twelve of the fourteen localities (FS 101-108; F-14, F-75; VOE-3, VOE-4) belongs in the pendent (tuning-fork) group of the genus *Didymograptus*. The forms included within this group have never been subjected to a rigorous population study and hence the allowable ranges of morphological variation for each species have yet to be defined. Referral of individual specimens to one or other of the several described pendent species of *Didymograptus* is thus, at best, subjective, and the task is rendered all the more speculative when specimens have suffered tectonic distortion.

Nevertheless, it is worthy of note that the form of the graptolite rhabdosome alone can be a useful guide to age, and, by way of illustration, the presence of abundant

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tuning-fork graptolites at the localities listed above is a firm indication that all twelve are Llanvirn in age.

Of the two remaining localities, one (VOE-5) provided fragmentary graptolites with no indication of age, and the other (F-11) yielded a badly sheared, though identifiable, fauna of Early Silurian (Llandovery) age.

The Llanvirn (Lower Ordovician) fauna.—The species list given below is a compilation of the faunal characteristics of all twelve Llanvirn localities. No one locality includes all the species which are listed; nevertheless, the similarities are such that, in all probability, all twelve collections were made at or about the same stratigraphic horizon. Certainly, no facts of any significance have been disguised in the presentation of a composite faunal list:

Didymograptus acutus Ekström.

D. amplus Elles & Wood.

D. artus Elles & Wood.

D. bifidus (Hall) ?

D. geminus (Hisinger).

D. geminus latus Ekström?

D. ex gr. indentus.

D. miserabilis Bulman.

D. murchisoni (Beck) s. l.

D. nanus Lapworth.

D. pandus Bulman?

D. stabilis Elles & Wood?

Amplexograptus sp.

?*Phyllograptus* sp.

With the exception of rare fragments of an *Amplexograptus* from localities VOE-4 and FS-105 and a possible *Phyllograptus* from locality VOE-3, the entire Llanvirn graptolite fauna, totalling several hundred specimens, is comprised solely of pendent forms of *Didymograptus*. Precisely how much of the dimensional and morphological variation evidenced by these pendent forms should be attributed to tectonic effects is difficult to quantify; however, a consideration of those specimens which are amenable to precise identification reveals a not inconsiderable degree of original variation. Thus, at one extreme, a few diminutive, slender-stiped rhabdosomes are attributable to *D. miserabilis*, while, at the other, several robust proximal ends and distal stipe fragments belong in *D. amplus*. Specimens with intermediate dimensional

PLATE I.—Graptolites from Northwest Spain.

All Figures × 5

Fig. 1.—*Raphidograptus ?toernquisti* (Elles & Wood); loc. F11.

Fig. 2.—*Didymograptus ?nanus* Lapworth; loc. FS106.

Fig. 3.—*Didymograptus ?geminus* (Hisinger); loc. FS105.

Fig. 4.—*Climacograptus ?rectangularis* (McCoy); loc. F11.

Fig. 5.—*Didymograptus murchisoni* (Beck) s. l., loc. FS102.

Fig. 6.—*Raphidograptus toernquisti* (Elles & Wood); loc. F11.

Fig. 7.—*Didymograptus artus* Elles & Wood; loc. FS107.

Figs 2, 3, 5 and 7: *murchisoni* Zone (Llanvirn); Ordovician.

Figs. 1, 4 and 6: *triangulatus* Zone (Llandovery); Silurian.

