

A palynomorph and graptolite biostratigraphy of the Central Precordillera Silurian Basin, Argentina

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ABSTRACT – This work integrates palynological and graptolite studies of the Silurian La Chilca and Los Espejos formations for correlation purposes within the Central Precordillera Basin. Palynomorphs from these two formations have been grouped into five assemblages. In the *Normalograptus persculptus* graptolite Zone (Hirnantian), acritarchs are scarce, poorly preserved, and have no stratigraphic value. This stratigraphic interval is dominated by short-spined acritarchs. The upper *Stimulograptus sedgwickii*-lower *Spirograptus turriculatus* Zones (upper Aeronian-lower Telychian) contain acritarchs, prasinophytes and less abundant cryptospores. *Tylotopalla caelameniculis* and *Tylotopalla digitifera* appear to be potentially useful for regional correlations of the middle-upper Llandovery boundary. The lower portion of the Los Espejos Formation yielded a highly diversified and well-preserved assemblage of acritarchs, prasinophytes, cryptospores and miospores, but unfortunately no reliable graptolite data are available. The upper third of this formation, referred to as the *Neodiversograptus nilssoni*-*Lobograptus scanicus* Zones (Gorstian), contains a single diversified palynological assemblage of typical Ludlovian age.

RIASSUNTO – [Biostratigrafia a palinomorfi e graptoliti del Bacino Siluriano della Precordigliera Centrale, Argentina] – Associazioni palinologiche provenienti da sezioni graptolitifere delle formazioni siluriane di La Chilca e Los Espejos, sono state studiate allo scopo di integrare dati su palinomorfi e graptoliti per correlazioni all'interno del Bacino Siluriano della Precordillera Centrale. I palinomorfi provenienti da queste due formazioni sono stati raggruppati in cinque associazioni. Nella Zona a graptoliti *Normalograptus persculptus* (Hirnantiano) l'associazione palinologica è dominata da acritarchi a corte spine; tuttavia, gli acritarchi in generale sono scarsi, mal conservati e privi di significato stratigrafico. L'intervallo corrispondente alla parte superiore della Zona *Stimulograptus sedgwickii*-parte inferiore della Zona *Spirograptus turriculatus* (Aeroniano superiore e Telychiano inferiore) contiene acritarchi, prasinofite e meno abbondanti criptospore. *Tylotopalla caelameniculis* e *Tylotopalla digitifera* sembrano essere potenzialmente utili per le correlazioni regionali del limite Llandovery medio-Llandovery superiore. La parte più bassa della Formazione di Los Espejos ha fornito una associazione ad alta diversità e buona conservazione, contenente acritarchi, prasinofite, criptospore e miospore, ma sfortunatamente mancano dati attendibili sui graptoliti. Il terzo superiore di questa formazione, riferito all'intervallo *Neodiversograptus nilssoni*-*Lobograptus scanicus* (Gorstiano), contiene una unica associazione palinologica, ben diversificata e di età tipicamente Ludloviana.

INTRODUCTION AND AIM OF THIS PAPER

The Argentine Precordillera is a mountain chain characterized by a thick Palaeozoic sedimentary succession of Cambrian to Devonian marine rocks. This succession is overlaid by Carboniferous to Triassic continental strata. The Ordovician deposition culminates with late Ashgill glacial diamictites, followed by fossiliferous transgressive mudstones. A local erosional unconformity between early-middle Ordovician and Silurian strata is referred to as the "Ocoyic orogeny". Silurian and Devonian sedimentary rocks overlie the Ordovician succession in this area. The Silurian sequences of the Central Precordillera Ranges extend more than 180 km in north-south sub parallel belts, in San Juan Province, Western Argentina (Text-fig. 1).

The aim of this paper is to provide elements for an integrated biostratigraphy of the Silurian Basin of the Central Precordillera, based on both acritarchs and graptolites.

The palynological slides made for this study are deposited in the Paleopalynoteque of the Unit of

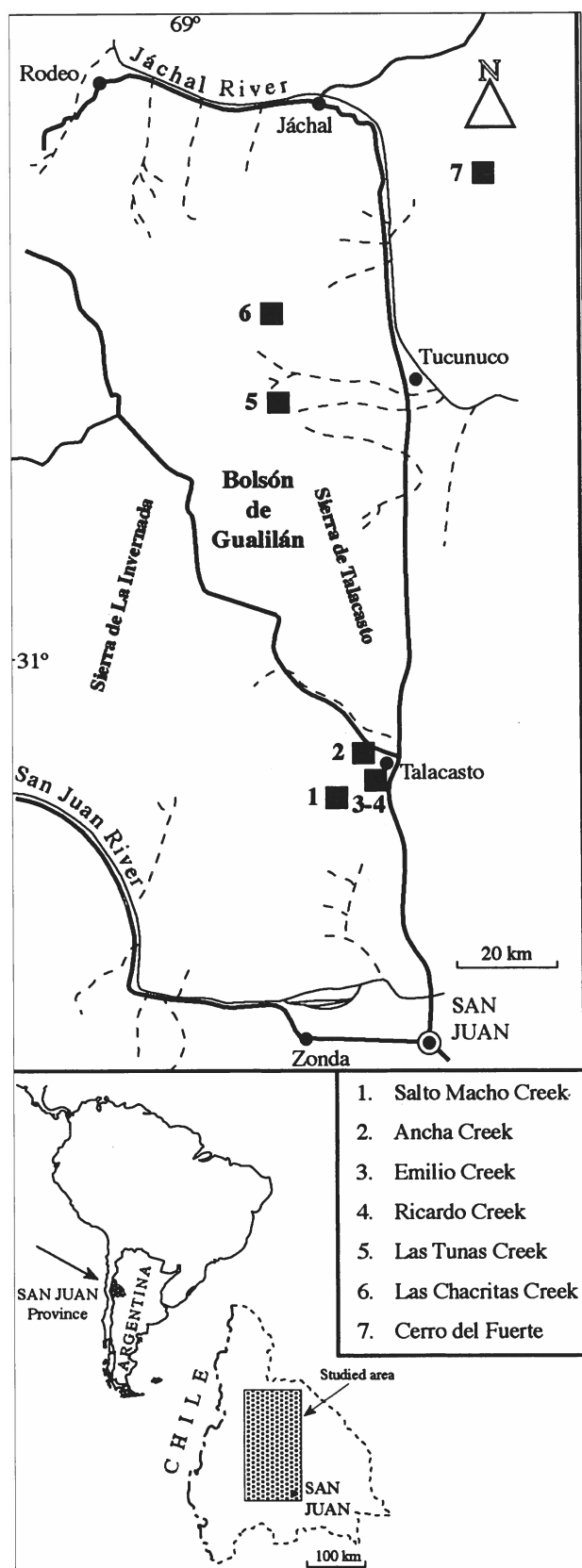
Paleopalynology, IANIGLA, CRICYT, Mendoza, and prefixed LPPM (Laboratorio de Paleopalinología Mendoza).

THE SILURIAN BASIN OF THE CENTRAL PRECORDILLERA

STRATIGRAPHY

The Silurian Basin of the Precordillera has been largely studied from a variety of perspectives, including stratigraphy, biostratigraphy, paleontology, paleoecology, lithofacies, taphonomy, structural, and basinal analysis. Palynological assemblages from different sections and localities within the Argentine Precordillera have been reported in the literature (Pöthe de Baldi, 1975a, 1975b, 1981, 1987, 1997; Rubinstein, 1992, 1993, 1995, 1997, and others) while late Ordovician and Silurian graptolites have been recorded by Cuerda (1969), Peralta (1986), Brussa (1987), Toro (1987), Cuerda *et al.* (1988), Rickards *et al.* (1996), and others.

The Silurian units of the Precordillera are consid-



Text-fig. 1 - Location map of the Precordillera showing the localities studied herein.

ered typical storm-dominated shallow-marine siliciclastics, composed mainly of intercalated pelites and sandstones. The La Chilca Formation (late Hirnantian-Llandovery/Wenlock?) is preserved in the central and northern region of the Silurian Basin with coarser and thicker sections toward the northeast, whereas the Los Espejos Formation (Wenlock to Pridoli, locally Lochkov in Cerro del Fuerte, in the extreme northeast) and its condensed equivalent to the south, the Tambolar Formation, are present in the entire region and also show more proximal trends towards the north-northeast.

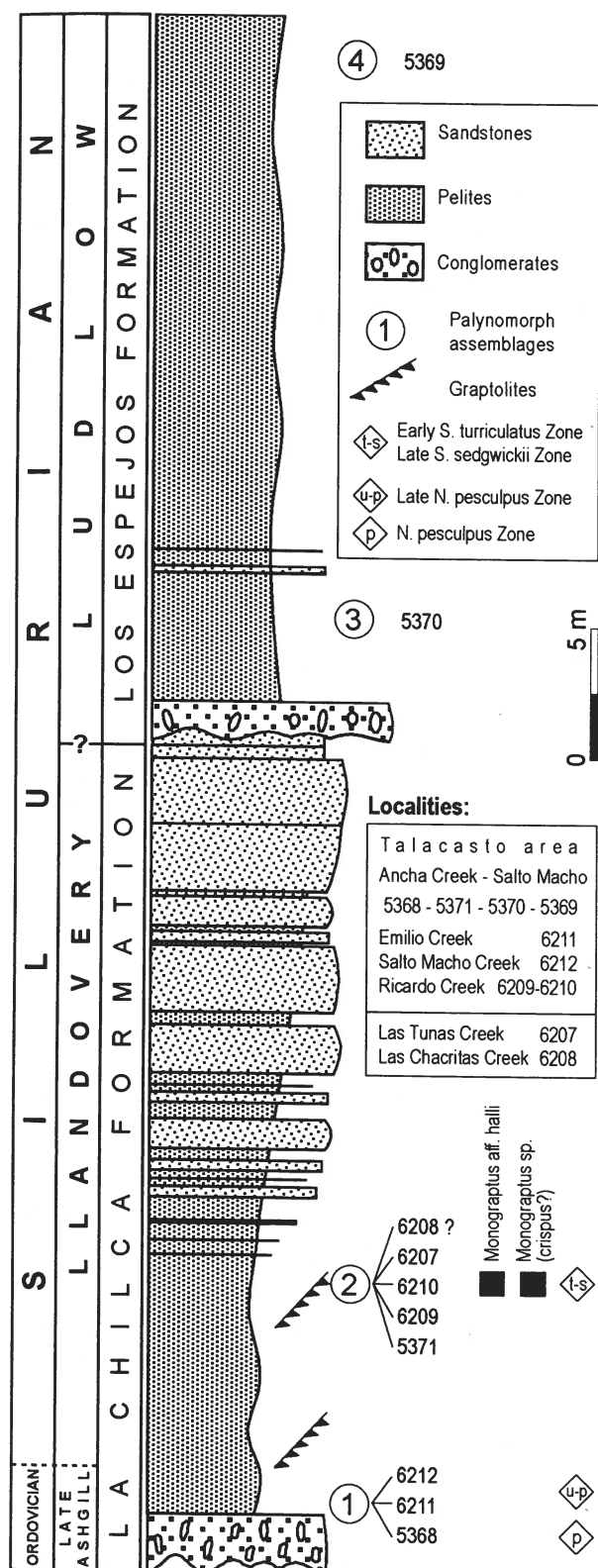
A transgressive to high sea-level stand history can be tracked for both the La Chilca and the Los Espejos formations based on the presence of a thin iron veneer and phosphate-rich chert conglomerates at their base, succeeded by shaly intervals with a gradual upward thickening and coarsening. The internal cyclic stacking patterns, particularly evident in the Los Espejos Formation, are considered to be generated by forced regressions. Some of them, located in the upper third of the Los Espejos Formation, show evidence of subaerial exposures in their tops. Major exposure and erosional unconformities developed at the top of both units, together with the north-south diachronic boundary at the base of the Silurian succession, is interpreted as a forebulging in a partitioned foreland basin located between the Gondwana continent and the Precordillera terrane (Astini & Maretti, 1996).

GRAPTOLITES

The late Ordovician-early Silurian age of the La Chilca Formation is based on graptolites. The lower third of the formation has graptolites of Hirnantian to Rhuddanian age (Brussa, 1987; Cuerdo *et al.*, 1988; Rickards *et al.*, 1996). In this part of the formation, the following zones were recognized: *Normalograptus persculptus*, probable *Parakidograptus acuminatus* and possible *Atavograptus atavus* Zones. The upper third of the formation has graptolites dated as late Llandovery-early Wenlock (Kerleñevich & Cuerdo, 1986), while brachiopods indicate an unquestionable Llandovery age for the middle and upper parts of this formation (Benedetto, 1995).

Graptolites have only been recovered from the upper third of the Los Espejos Formation, and thus were of no help in establishing the overall age of the formation. Therefore, the age of this formation is based on the contained brachiopod and conodont faunas, as well as the recovered palynomorphs (Benedetto *et al.*, 1992; Rickards *et al.*, 1996).

Despite the abundance of biostratigraphic information, there are still many inaccuracies, caused mainly by the extent and variability of the Silurian deposits of the Central Precordillera. Unfortunately, graptolites in the Precordillera are rare, and not very diverse. The lower part of the Los Espejos Formation suggests a Wenlock age based on the occurrence of



Text-fig. 2 - Composite section of the La Chilca and Los Espejos formations, based on six localities in the Talacasto and Las Tunas-Las Chacritas areas, showing the location of palynomorph assemblages.

Monograptus priodon (Bronn, 1835) at the top of La Chilca Formation. The graptolites from the upper third of the Los Espejos Formation might be referable to the *Neodiversograptus nilssoni-Lobograptus scanicus* Zones (Rickards *et al.*, 1996).

It is important to note that Silurian graptolites from South America are not as diverse or as abundant as elsewhere. This can best be explained because of the paleolatitudinal position of the continent during Silurian time.

PALYNOLOGICAL ASSEMBLAGES AND GRAPTOLITE ASSOCIATIONS

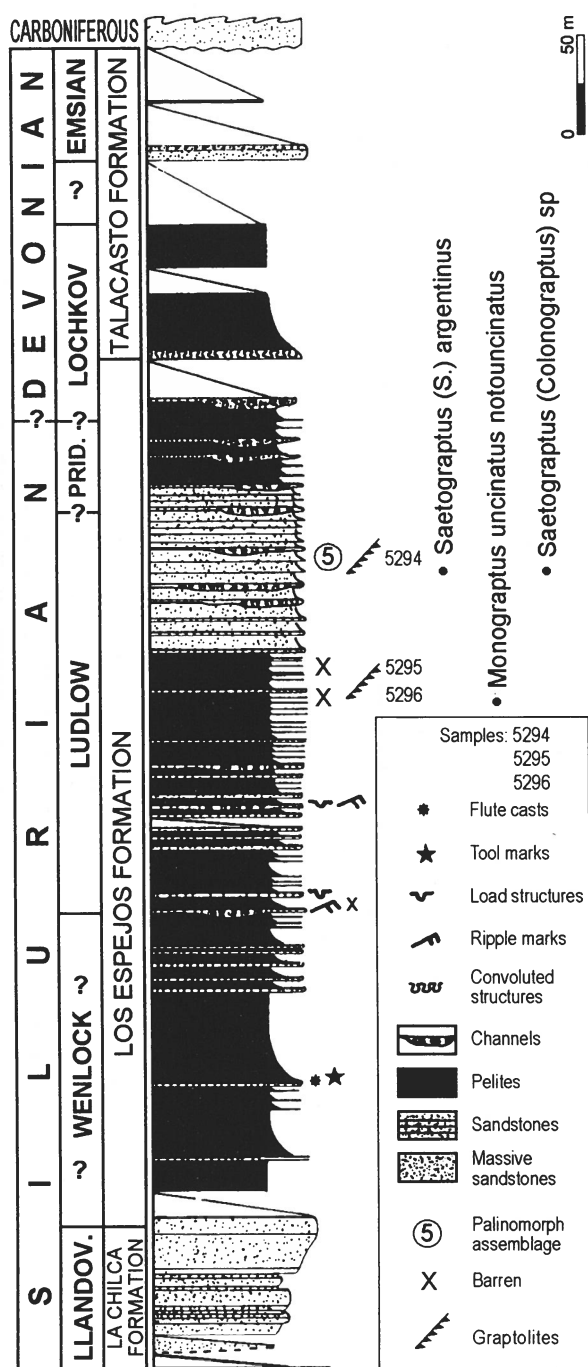
Eleven palynological samples from the La Chilca and the Los Espejos formations were collected at seven different localities from the Talacasto area in the south (Text-fig. 2), to Cerro del Fuerte in the north (Text-fig. 3). These samples come from levels where well-preserved graptolites were recovered, except for the Las Tunas and the Las Chacritas sections (Text-fig. 2). Graptolites from the Las Tunas section are poorly preserved and scarce. Similar associations have been observed in the Las Chacritas section. Recently, Peralta & Pöthe de Baldi (1998) suggested the presence of the *P. acuminatus-A. atavus* Zones in the lower levels of the La Chilca Formation for the last locality. In the Las Tunas and the Las Chacritas sections, correlations with the upper *Stimulograptus sedgwickii*-lower *Spirograptus turriculatus* Zones (upper Aeronian-lower Telychian) were inferred from lithostratigraphical and palynological studies, in strata located five metres above the possible *atavus* association.

Because of the lack of graptolites, the age of the basal levels of the Los Espejos Formation in Ancha Creek-Salto Macho is based on palynomorphs. The palynological assemblages contain acritarchs, prasinophytes, and associated miospores and cryptospores exhibiting variable degrees of preservation and diversity.

The palynomorphs recovered are grouped into five assemblages (Text-fig. 4): Assemblage 1 (A1) from the La Chilca Formation in the Talacasto area (Ancha Creek, Salto Macho and Emilio Creek localities); Assemblage 2 (A2) from the La Chilca Formation in the Talacasto area (Ancha Creek and Ricardo Creek localities), Las Tunas Creek and Las Chacritas Creek with doubts; Assemblage 3 (A3) and Assemblage 4 (A4) from the lower part of the Los Espejos Formation in the Talacasto area (Ancha Creek locality) (Text-fig. 2), and Assemblage 5 (A5) from the upper third of the Los Espejos Formation in Cerro del Fuerte Section (Text-fig. 3).

ASSEMBLAGE 1

This assemblage corresponds to the *Norma-lograptus persculptus* Zone (Hirnantian, uppermost Ordovician). It is dominated by simple spheroidal and short-spined acritarch taxa, none of which have



Text-fig. 3 - The Cerro del Fuerte section, showing the location of palynomorph assemblage.

any stratigraphic value. Genera include *Leiosphaeridia* Eisenack, 1958 emend. Downie & Sarjeant, 1963, *Michrystroidium* Deflandre, 1937 emend. Downie & Sarjeant, 1963 and *Veryhachium* Deunff, 1954 ex Downie, 1959 emend. Downie & Sarjeant, 1963. Graptolites recorded are *Normalograptus persculptus* (Salter, 1865), *Climacograptus angustus* Perner, 1895, *Climacograptus* sp. cf. *C. medius* Törnquist, 1897,

Normalograptus normalis (Lapworth, 1977) and *Pseudoclimacograptus robustus* Cuerda, Rickards & Cingolani, 1988. This graptolite association is similar to the one from the Los Baños de Talacasto locality (Cuerda *et al.*, 1988).

ASSEMBLAGE 2

This assemblage would correspond to the upper *Stimulograptus sedgwickii*–lower *Spirograptus turriculatus* Zones (upper Aeronian – lower Telychian). A single fragmentary specimen referred to *Monograptus* sp. aff. *M. halli* Barrande, 1850 was recorded 10,65 m above the base of the La Chilca Formation in the Ricardo Section in the Ancha Creek. This specimen is associated with fragments of *Monograptus* sp. that resembles *M. crispus* Lapworth, 1876. The assemblage contains the acritarchs *Costatolobus traumaticum* (Cramer, 1964) Playford, 1977, *Dactylofusa cabottii* (Cramer ex Eisenack, Cramer & Díez, 1976) Fensome *et al.*, 1990, *Dictyotidium* sp. cf. *D. perlucidum* Le Hérisse, 1989, *Evittia denticulata denticulata* (Cramer, 1970) Le Hérisse, 1989, *Evittia robustispinosa* (Downie, 1959) Lister, 1970, *E. sanpetrensis* (Cramer, 1966) Lister, 1970, *E. spp.*, *Domasia trispinosa* Downie, 1960, *Helosphaeridium clavispinulosum* Lister, 1970, *Leiofusa berneseae* Cramer, 1964, *Multiplicisphaeridium* sp. cf. *M. ramusculosum* (Deflandre, 1945) Lister, 1970, *M. spp.*, *Salopidium granuliferum* (Downie, 1959) Dorning, 1981, *Tylotopalla caelamenicutis* Loeblich, 1970, *T. digitifera* Loeblich, 1970, *Veryhachium europaeum* Stockmans & Williè, 1960 and *V. trispinosum* (Eisenack, 1938) Stockmans & Williè, 1962. Regularly preserved cryptospores occur in this assemblage, including ?*Cheilotetras* sp. ?*Laevolancis divellomedium* (Chibrikova, 1959) Burgess & Richardson, 1991, ?*Rimosotetras problematica* Burgess, 1991 and *Tetrahedraletes medinensis* (Strother & Traverse, 1979) emend. Wellman & Richardson, 1993.

Las Tunas Creek, far from the Talacasto area, has poorly preserved graptolites. However, Las Tunas palynomorphs are included in Assemblage 2 based on the presence of *Tylotopalla caelamenicutis* and *T. digitifera*.

Palynomorphs from the Las Chacritas Creek Section, close to the Las Tunas Section are dominated by *Leiosphaeridia* spp. and cryptospores. Lithostratigraphical correlation between the Talacasto area, Las Tunas and Las Chacritas sections leads one to provisionally include Las Chacritas palynomorphs in Assemblage 2. However, the presence of *Hispanaedis verrucatus* Cramer emend. Burgess & Richardson, 1991 and *Laevolancis divellomedium* indicates a younger age (Wenlock?).

ASSEMBLAGE 3

No graptolites were found in the lower part of the Los Espejos Formation anywhere within the basin.

LATE SILURIAN	LUDLOW	LUDFORDIAN	GENERALISED GRAPTOLITE ZONES	SILURIAN PRECORDILLERA GRAPTOLITE ZONES	PALYNOMORPH ASSEMBLAGES	FIRST APPEARANCE OF SELECTED PALYNOMORPHS													
			<i>Saetograptus leintwardinensis</i>																
EARLY SILURIAN	GORSTIAN		<i>Lobograptus scanicus</i>	<i>Lobograptus scanicus</i> /	A5														
			<i>Neodiversograptus nilssoni</i>	<i>Neodiversograptus nilssoni</i>	A4 ? *														
	WENLOCK	HOMERIAN	<i>Monograptus ludensis</i>		A3 ? *														
			<i>Monograptus praedeubeli</i> - <i>M. deubeli</i>																
			<i>Monograptus parvus</i> - <i>Gothograptus nassa</i>																
			<i>Cyrtograptus lundgreni</i>																
			<i>Cyrtograptus rigidus</i> to <i>C. perneri</i>																
	SHEINWOODIAN		<i>Monograptus riccartonensis</i> - <i>M. belophorus</i>																
			<i>Cyrtograptus centrifugus</i> - <i>C. murchisoni</i>																
			<i>Cyrtograptus lapworthi</i> - <i>C. insectus</i>																
	LLANDOVERY	TELYCHIAN	<i>Monograptus spiralis</i>																
			<i>Monoclimacis griestoniensis</i> - <i>M. crenulata</i>																
			<i>Spirograptus turriculatus</i> - <i>Monograptus crispus</i>	<i>Spirograptus turriculatus</i> /															
			<i>Spirograptus guerichi</i>		A2														
			<i>Stimulograptus sedgwickii</i>	<i>Stimulograptus sedgwickii</i>															
	AERONIAN		<i>Demirastrites convolutus</i>																
			<i>Monograptus argenteus</i>																
			<i>Demirastrites triangulatus</i> - <i>D. pectinatus</i>	<i>Demirastrites triangulatus</i> ?															
	RHUDDANIAN		<i>Coronograptus cyphus</i>																
			<i>Coronograptus vesiculosus</i>	<i>Atavograptus atavus</i>															
			<i>Parakidograptus acuminatus</i>	<i>Parakidograptus acuminatus</i> ?															
ORDOVICIAN	ASHGILL	HIRNANTIAN	<i>Normalograptus persculptus</i>	<i>Normalograptus persculptus</i>	A1														

Tylopalia caelamenicutis
Tylopalia digitifera
Costatolobus traumaticum
Evittia robustispinosa
Evittia saripetrensis
Helosphaeridium clavispinosum
Hispanaedisca verrucatus
Ozotobranchion dactylos
Eupoikilofusa tenuistriata
Carminella maplewoodensis
Stellinium rabians
Emphanisporites rotatus
Polyedryxium pharaone
Fimbriacmerella divisa
Triangulina alargada
Onondagaella asymmetrica

Text-fig. 4 - Palynomorph assemblages and first appearance of selected palynomorph taxa, and correlation with graptolite biozones. Stratigraphic location of A3* and A4* is only based on palynomorphs.

However, a rich, diverse, and well-preserved assemblage of palynomorphs was recovered. This assemblage includes *Carminella maplewoodensis* Cramer, 1968, *Cymatiosphaera* sp. cf. *C. octoplana* Downie, 1959, *Deunffia monospinosa* Downie, 1960, *Duvernaysphaera aranaides* Cramer, 1964, *Eupoikilofusa tenuistriata* (Pöthe de Baldi, 1975) Pöthe de Baldi, 1981, *Geron guerrillerus* Cramer, 1966 ex Cramer, 1969, *Leiofusa fusiformis* (Eisenack, 1934) Eisenack, 1938, *Oppilatala insolita* (Cramer & Díez de Cramer, 1972) Dörning, 1981, *Ozotobranchion dactylos* Loeblich & Drugg, 1968, *Ozotobranchion triangular* Pöthe de Baldi, 1981, *Pterospermella hermosa* (Cramer, 1964) Fensome *et al.*, 1990, *Quadraditum fantasticum* Cramer, 1964, *Q. incisum* Cramer, 1964 and *Stellinium rabians*

(Cramer, 1964) Eisenack, Cramer & Díez, 1976.

Additionally, many cryptospores and miospores are recorded including representatives of *Amicosporites* sp., *Emphanisporites rotatus* McGregor, 1961 emend. McGregor, 1973 and *Laevolancis divellomedium*.

ASSEMBLAGE 4

This assemblage, located 20 m. above A3, in the same section does not show any differences from the lower one. Species first recovered in this assemblage are *Ammonidium* sp. cf. *A. microcladum* (Downie, 1963) Lister, 1970, *Comasphaeridium* sp. cf. *C. hirtum* Le Hérisse, 1989, *Cymatiosphaera mirabilis* Deunff, 1959, *C. sp.* cf. *C. hermosa* Cramer & Díez,

1976, *Domasia bispinosa* Downie, 1960, *Fimbriaglomerella divisa* Loeblich & Drugg, 1968, *Polyedryxium pharaone* Deunff, 1961, *Pterospermella martinii* (Cramer, 1966) Eisenack, Cramer & Díez, 1973, *Schimatospaeridium* sp. Miospores are represented by *Morphon Ambitisporites avitus-dilutus* (in Steemans *et al.*, 1996) and *Emphanisporites rotatus*.

ASSEMBLAGE 5

This assemblage comes from the upper third of the Los Espejos Formation, in the Cerro del Fuerte section where graptolites were recovered and are related to the *Neodiversograptus nilsoni-Lobograptus scanicus* Zones (Gorstian). Acritarchs and prasinophytes from this section are well-preserved, but sparse in both diversity and abundance.

A5 contains the first appearance of *Multiplisphaeridium forquillum* (Cramer & Díez de Cramer, 1972) Eisenack, Cramer & Díez, 1973, *Onondagaella asymmetrica* (Deunff, 1954) Cramer, 1966 and *Triangulina alargada* Cramer, 1964. The graptolite association contains *Monograptus uncinatus notouncinatus* Cuerda, 1971, *Saetograptus* (?*Colonograptus*) *roemeri* (Barrande, 1850), and *Saetograptus* (?*Colonograptus*) *argentinus* (Cuerda, 1971). The presence of *S.* (?*C.*) *roemeri* along with *S.* (?*C.*) *argentinus* confirms an early Ludlow age (Rickards *et al.*, 1996).

DISCUSSION

Assemblage 1 from the base of the La Chilca Formation corresponds to the *N. persculptus* Zone of Hirnantian age. Palynomorphs are sparse and poorly preserved and have no biostratigraphic value. The acritarchs *Tylotopalla caelamenicutis* and *T. digitifera* which first occur in Assemblage A2 appear to be useful for regional correlation of middle-Llandovery assemblages because of their presence and abundance in the upper *S. sedgwickii*-lower *S. turriculatus* Zones

(upper Aeronian-lower Telychian) in the Silurian of the Central Precordillera.

Tylotopalla caelamenicutis was described by Pöthe de Baldi (1997) from the middle section of the La Chilca Formation, in the Talacasto area. She provisionally assigned the middle portion of the formation to the *Atavograptus atavus* Zone, based on the presence of fragmentary and poorly preserved graptolites. The *A. atavus* Zone in the Precordillera has been considered lower to middle Llandovery (Rhuddanian-Aeronian) (Cuerda *et al.*, 1988; Kerleñevich & Curda, 1986).

In the lower part of the Los Espejos Formation, there were no graptolites or other macrofossils of stratigraphic value. Thus, its age is based only on palynomorphs. Despite the doubtful assignment of these strata to the Wenlock, Assemblages A3 and A4 would have an age no older than late Homerian or early Gorstian because of the presence of the miospore *Emphanisporites* that first appears at that stratigraphic horizon. The acritarch *Ozotobrachion* first appears in Assemblage A3 and the first record of *Fimbriaglomerella divisa* is in Assemblage A4. It must be noted that these taxa have never been recovered below Ludlovian strata.

Assemblage A5, corresponding to the *N. nilsoni-L. scanicus* Zones of Gorstian age, occurs in the upper section of the Los Espejos Formation. This assemblage contains only a few microplankton taxa, most notably, *Triangulina alargada*, a typical Ludlovian acritarch. The coarse and thick shallower beds in the upper part of the Los Espejos Formation yield few palynomorphs and above Assemblage A5, in Cerro del Fuerte section, palynomorphs are extremely rare.

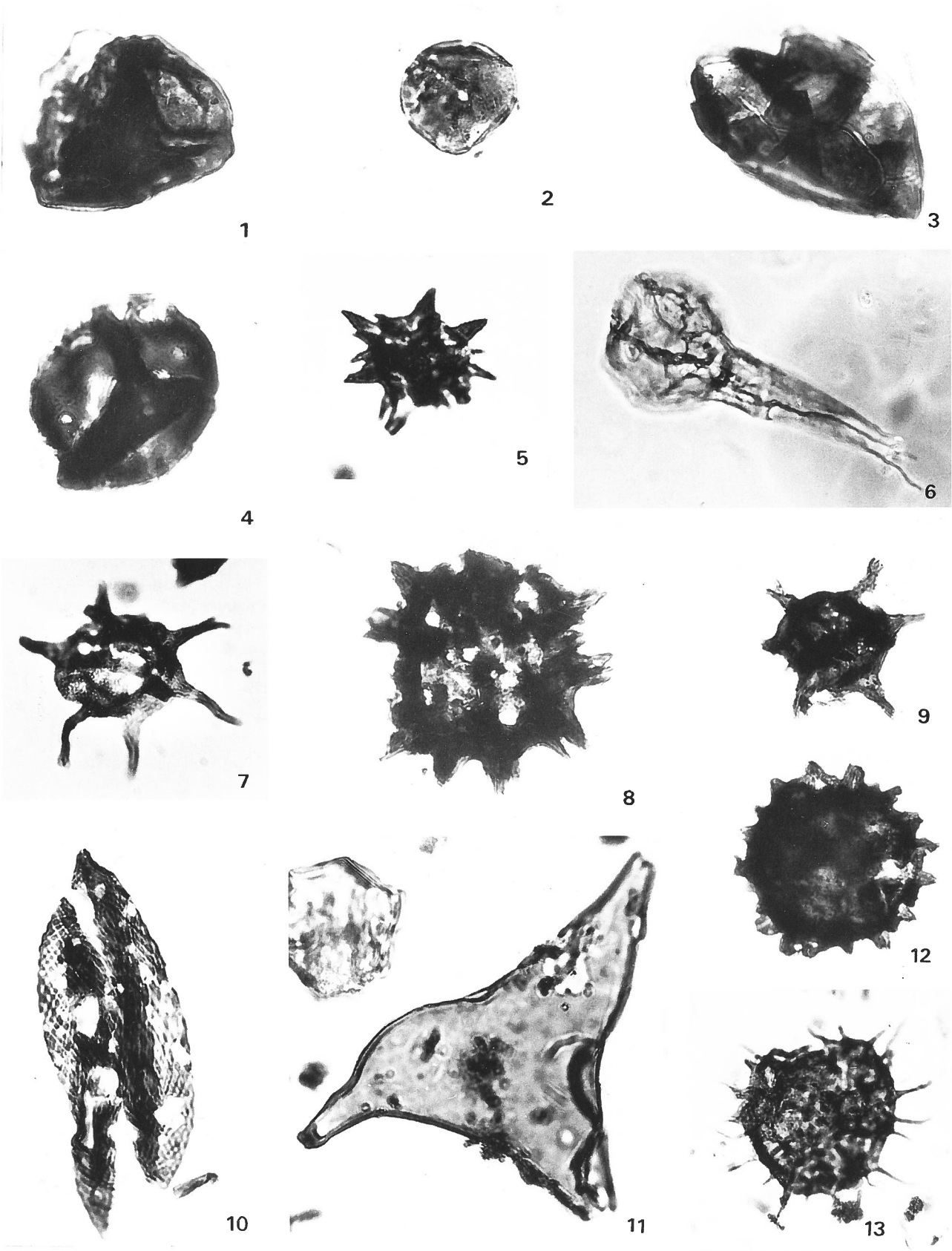
CONCLUSIONS

Five palynologic assemblages from the Central Precordillera Silurian deposits have been provisionally described. Even though some data are premature, it seems evident that palynological assemblages can pro-

EXPLANATION OF PLATE 1

- Fig. 1 - ?*Rimosotetras problematica* Burgess, 1991. La Chacritas, LPPM 6208f, L33/2.
- Fig. 2 - *Schimatospaeridium* sp. Ancha Creek, LPPM 5369d, W31/0.
- Fig. 3 - *Tetrahedraletes medinensis* (Strother & Traverse) emend. Wellman & Richardson, 1993. La Chacritas, LPPM 6208f, L20/0.
- Fig. 4 - ?*Cheilotetras* sp. Ricardo Creek, LPPM 6209a, B37/0.
- Fig. 5 - *Evittia robustispinosa* (Downie) Lister, 1970. Ricardo Creek, LPPM 6209a, W34/0.
- Fig. 6 - *Geron guerrillerus* Cramer, 1966 ex Cramer, 1969. Ancha Creek, LPPM 5370f, L49/0.
- Fig. 7 - *Costatolobus traumaticum* (Cramer) Playford, 1977. Ricardo Creek, LPPM 6209a, E21/0.
- Fig. 8 - *Tylotopalla digitifera* Loeblich, 1970. Ricardo Creek, LPPM 6209a, H23/0.
- Fig. 9 - *Evittia sanpetrensis* (Cramer) Lister, 1970. Ricardo Creek, LPPM 6210b, W31/0.
- Fig. 10 - *Dactylofusa cabottii* (Cramer ex Eisenack, Cramer & Díez) Fensome *et al.*, 1990. Ancha Creek, LPPM 5371d, T28/0.
- Fig. 11 - *Onondagaella asymmetrica* (Deunff) Cramer, 1966. Cerro del Fuerte, LPPM 5294b, G45/0.
- Fig. 12 - *Tylotopalla caelamenicutis* Loeblich, 1970. Ricardo Creek, LPPM 6209a, O39/4.
- Fig. 13 - *Salopidium granuliferum* (Downie) Dorning, 1981. Ancha Creek, LPPM 5369d, L24/4.

All figures × 1000.



vide a useful tool for regional stratigraphic correlation in the Precordillera Basin. However, further investigations of new sections will be necessary to construct an accurate biostratigraphic scheme.

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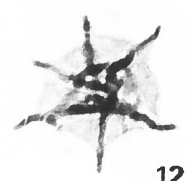
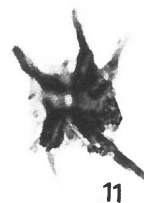
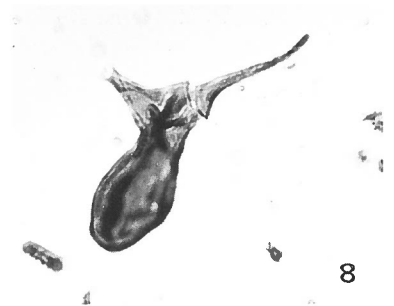
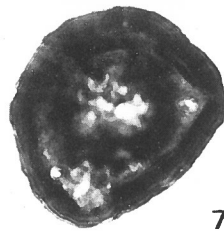
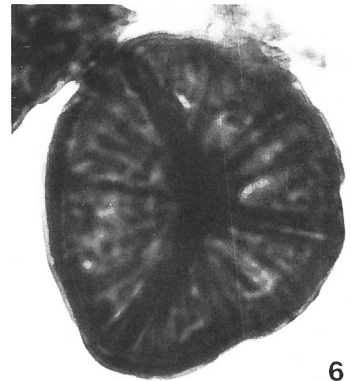
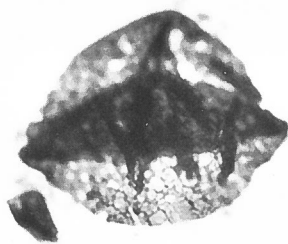
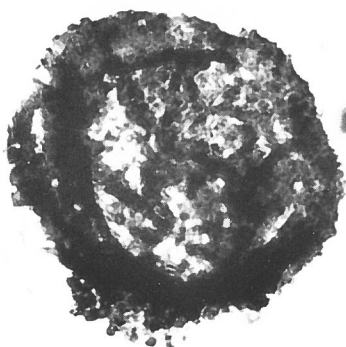
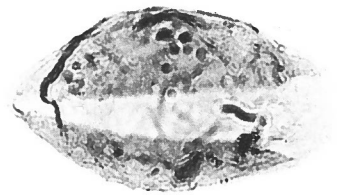
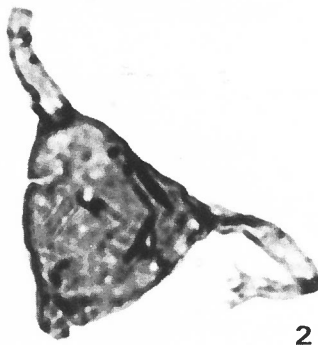
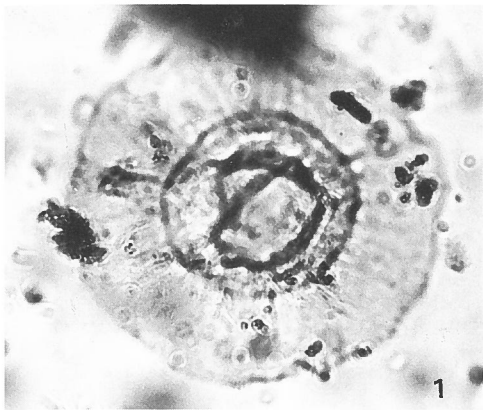
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EXPLANATION OF PLATE 2

- Fig. 1 - *Pterospermella martinii* (Cramer) Eisenack *et al.*, 1973. Ancha Creek, LPPM 5369d, R26/1.
- Fig. 2 - *Ozotobranchion dactylos* Loeblich & Drugg, 1968. Ancha Creek, LPPM 5370f, R46/0.
- Fig. 3 - *Laevolancis divellomedium* (Chibrikova) Burgess & Richardson, 1991. Ancha Creek, LPPM 5370f, M36/3.
- Fig. 4 - *Helosphaeridium clavispinulosum* Lister, 1970. Ricardo Creek, LPPM 6210a, W21/0.
- Fig. 5 - *Dictyotidium* sp. cf. *D. perlucidum* Le Hérisse, 1989. Ancha Creek, LPPM 5371d, B31/0.
- Fig. 6 - *Emphanisporites rotatus* McGregor 1961 emend. McGregor, 1973. Ancha Creek, LPPM 5370f, L34/0.
- Fig. 7 - *Amicosporites* sp. Ancha Creek, LPPM 5370f, E38/4.
- Fig. 8 - *Domasia bispinosa* Downie, 1960. Ancha Creek, LPPM 5369d, E19/4.
- Fig. 9 - *Triangulina alargada* Cramer, 1964. Cerro del Fuerte, LPPM 5294a, Q22/0.
- Fig. 10 - *Domasia trispinosa* Downie, 1960. Ancha Creek, LPPM 5370f, L34/0.
- Fig. 11 - *Polyedryxium pharaone* Deunff, 1961. Ancha Creek, LPPM 5369d, Y30/2.
- Fig. 12 - *Stellinium rabians* (Cramer) Eisenack *et al.*, 1976. Ancha Creek, LPPM 5370f, L35/1.
- Fig. 13 - *Hispanaediscus verrucatus* Cramer emend. Burgess & Richardson, 1991. Las Chacritas, LPPM 6208f, C24/4.
- Fig. 14 - *Eupoikilofusa tenuistriata* (Pöthe de Baldi) Pöthe de Baldi, 1981. Ancha Creek, LPPM 5369d, O26/4.

All figures × 1000.



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