

THE AGE OF THE CALIZA DE MONTAÑA IN THE EASTERN CANTABRIAN MOUNTAINS

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ABSTRACT

The find of goniatites, brachiopods and trilobites near Meré, in eastern Asturias (8 km S. of Posada de Llanes), has permitted the first accurate dating of the «Caliza de Montaña» in this part of the Cordillera Cantábrica. This fauna, collected from mudstones at 50 metres above the «Caliza de Montaña», has been dated as upper Namurian B. An historical review of the «Caliza de Montaña» shows that the various ages ascribed to this limestone formation are at least partly due to the confusion of different units of somewhat similar lithological aspect. Direct palaeontological information has also been rare.

RESUMEN

El hallazgo de una fauna variada de goniatítidos, braquiópodos, trilobites, etc. en lutitas margosas a 50 m encima de la Caliza de Montaña en la localidad de Meré (8 km al S. de Posada de Llanes) ha permitido la datación del techo de esta formación en la zona oriental de Asturias, como perteneciente al Namuriense B. La revisión histórica de las dataciones de muro y techo de la Caliza de Montaña indica la necesidad de revisar las edades atribuidas al techo de la misma mediante el estudio de las faunas señaladas en diversas ocasiones, ya que las diferencias de edad que se observan en la literatura parecen obedecer más bien a una diferencia de criterios utilizados en las determinaciones y a confusión de horizontes de parecidas características litológicas que a un diazonismo fuerte de la parte superior de la Caliza de Montaña. Se deduce que la Caliza de Montaña en la Cordillera Cantábrica está comprendida entre el Visense superior-Namuriense A medio y el Namuriense B-C a Westfaliense A inferior.

INTRODUCTION

The lower part of the Carboniferous in Northwest Spain contains an important limestone formation, several hundred metres thick, which has been generally recorded as «Caliza de Montaña» or «calcaire des cañons». The lower limit of this unit is determined by its position above nodular limestones of «griotte» facies, which contain cephalopod faunas dated throughout the Cantabrian Cordillera as Viséan and early Namurian. At the upper limit the evidence of fossils has been generally scarce and the

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dating has been based on a variety of faunas which range fairly widely through the Namurian and Westphalian.

The different lithological units present in the stratigraphic column of the Carboniferous of the Cantabrian Mountains have been the subject of general reviews in a number of recent publications (e. g. WAGNER 1962, 1970, VAN GINKEL 1965, JULIVERT 1967, WINKLER PRINS 1968). In the present paper the history of age determinations of the lower and upper part of the «Caliza de Montaña» (= «calcaire des cañons» of BARROIS 1882 and Escapa Formation of BROUWER & VAN GINKEL 1964) will be discussed only. The «Caliza de Montaña» consists of a thick limestone sequence, conformable with the underlying red nodular limestone known as «griotte» («marbre griotte» of BARROIS 1882), and overlain by a variable succession of mudstones, shales, sandstones and limestones. Sometimes, in the most southerly exposures of «Caliza de Montaña» in the Cantabrian Mountains, a shale/sandstone succession of variable thickness is found intercalated (WAGNER 1959, WAGNER *et al.* 1971). The limestones of the «Caliza de Montaña» are typically dark grey, fine-grained and fetid, and are thinly bedded. The upper part has a lighter appearance and is richer in organic remains (Valdeteja Formation of WINKLER PRINS 1971). There is a variable proportion of black chert as nodules or bands in the «Caliza de Montaña».

HISTORICAL REVIEW

The name «Caliza de Montaña» appears in the earliest publications on the Cordillera Cantábrica (e. g. EZQUERRA DEL BAYO 1844). SCHULZ (1858) referred to it as «Caliza carbonífera», and BARROIS (1882) as «calcaire des cañons». Caliza de Montaña may be a translation of the Mountain Limestone of Great Britain, and this name is well applied in the case of the Picos de Europa, where the limestones reach an altitude of 2600 metres. Also the name «calcaire des cañons» is well chosen, since a number of spectacular gorges cut into the «Canyon Limestone».

BARROIS (1881, 1882) clearly distinguished between the «calcaire des cañons» and the underlying «marbre griotte», but referred both to the Lower Carboniferous. Besides columnals of *Poteriocrinus* and Productid brachiopods, he did not find any fossils in the «calcaire des cañons» which relied for its dating on the animal remains found in the underlying «griotte» and the overlying «Assise de Lena», a terrigenous unit with limestone bands. BARROIS described a number of localities of «calcaire des cañons» (gorge of the Río Trubia, Sierra de Escapa, Río Ponga, Sierra de Sobrescobio, upper reaches of the Río Nalón, Entrellusa, Olloniego, Posada, Meré, Covadonga, Valdelamesa, coastal cliffs of Ribadesella, Llanes), but did not name a specific type area for this unit.

The griotte limestone at the base of the Caliza de Montaña has been studied by several authors for its fossil contents. BARROIS (1879, 1882) proved its Carboniferous age and studied faunas (mainly cephalopods) from Pola de Gordón and Puente de Alba in the province of León (where the griotte was first noted by DE VERNEUIL and compared with the Devonian griotte of the Pyrenees), and Estrellusa, Meré, Naranco,

Punta Ballota, Candás and Margolles in Asturias. DELÉPINE (1943) investigated the «marbre griotte» in various localities of Asturias and dated this deposit as Upper Viséan. WAGNER-GENTIS (*in* WAGNER 1955, 1957) determined goniatite faunas from Barruelo and Sta Olaja de la Varga (respectively, Palencia and León) and was the first to mention Lower Namurian cephalopods from the griotte. SCHINDEWOLF & KULLMANN (1958) described localities at Posada de Valdeón, Oseja de Sajambre and Aguasalio (León) which dated the griotte as ranging from Lower to Upper Viséan. They also determined a fauna collected by RADIG in Perlora (Asturias) as belonging to Namurian A. LLOPIS LLADÓ (1960) collected Viséan goniatites in Las Xanas and Trubia (Asturias). WAGNER-GENTIS (1960) described some goniatites of Middle and Upper Viséan ages from Puente de Alba and Olleros de Alba (León) and from Barruelo (Palencia), and revised some of BARROIS' material from Puente de Alba. KULLMANN (1961, 1962, 1963) described Lower and Upper Viséan as well as Lower Namurian cephalopods from Barruelo and Santibáñez de Resoba (Palencia), Sta. Marina de Valdeón, Oseja de Sajambre, Aguasalio, Sta Olaja de la Varga, Camplongo, Tolibia de Abajo, Villarasil, Neoncito (province of León), the Naranco, Carranques, Entrago near Teverga (Asturias). WAGNER-GENTIS (1963) studied the cephalopod faunas of the nodular «griotte» limestones of Lower Namurian age at Venta de Getino, Santa Olaja de la Varga (León), Barruelo, Verbios (Palencia) and Entrago (Asturias). WAGNER (1963) mentioned several goniatite faunas from the region between the rivers Porma and Bernesga (León), which were determined by WAGNER-GENTIS from Viséan and Lower Namurian strata. HIGGINS (1962) recorded conodont faunas from Viséan and Lower Namurian localities in León and Palencia, and HIGGINS, WAGNER-GENTIS & WAGNER (1964) described conodonts and goniatites from various Lower Carboniferous localities in northern León. VAN ADRICHEM BOOGAERT (*in* VAN ADRICHEM BOOGAERT *et al.* 1963 and VAN ADRICHEM BOOGAERT 1965, 1967) determined conodonts from the griotte limestone of Palencia and León as being of Lower to Upper Viséan age.

There is a gradual passage from «griotte» to «Caliza de Montaña», and the lower boundary of the latter obviously lies within Namurian A.

The sequence of alternating shales (mudstones), sandstones and limestones lying above the «Caliza de Montaña» is less accurately dated. Some of the uncertainty surrounding the age of the top of the Caliza de Montaña is due to confusion with regard to some thick limestone bands within the terrigenous sequence. Before the stratigraphic succession was established in reasonable detail, these massive limestones were mistaken for the top of the Caliza de Montaña; and this led to the assumption of a fairly late Moscovian age (*i. e.* Podolskian) for the upper part of Caliza de Montaña (DELÉPINE 1943, DELÉPINE & LLOPIS 1956, LYS & SERRE 1958). The later limestone was clearly separated from the Caliza de Montaña by JULIVERT (1957, 1961), who recorded it as the «caliza masiva». VAN GINKEL (1965), apart from renaming the «caliza masiva» as the Escalada Formation (*loc. cit.*, p. 191), recorded fusulinid faunas dating this limestone as either late Kashirian or early Podolskian.

BARROIS (1882) mentioned the almost total absence of fossils from the Caliza de Montaña (= «calcaire des cañons»), but described several faunas of fusulinid

foraminifera, sponges, corals, brachiopods, cephalopods, trilobites, gastropods, lamelibranchs, ostracods, crinoids, etc. from the overlying «Assise de Lena» which he also attributed to the Lower Carboniferous. ZEILLER (1882) described a Namurian flora from the Cordal de Lena (Asturias). DELÉPINE (1943) attributed a Lower Moscovian age to the top of the Caliza de Montaña, but based the dating mainly on faunas from the «caliza masiva», at a higher level in the local stratigraphic succession. Between Entrago and Teverga (Asturias) he recorded a brachiopod fauna at the top of the local Caliza de Montaña, which he assigned a Lower Moscovian age. However, WINKLER PRINS (1968, p. 66), commenting on this fauna, believes it to be Lower Bashkirian.

P. HERNÁNDEZ-SAMPELAYO (1944) described a Namurian cephalopod fauna from the La Camocha mine (near Gijón, Asturias), and H. SCHMIDT (1955) also figured and described probable Namurian cephalopods from this mine. The sequence in this mine is unusual in that paralic coal-measures are developed here from the upper Namurian A onwards (NEVES 1964). An exploratory cross-cut was halted in this part of the sequence, and the Caliza de Montaña, if present at all, would be reduced to a small part of Namurian A only (WAGNER, personal communication). It should be noted that NEVES' recent dating of the La Camocha succession tends to put all the cephalopods figured by SAMPELAYO and SCHMIDT in the Lower Westphalian.

In the province of Palencia, KANIS (1956, 1960) found Namurian lamelibranchs and plants (see also WAGNER 1962) in shales which may be a terrigenous equivalent of the Caliza de Montaña.

GARCÍA FUENTE (1959), in the explanation of Sheet 77 (La Plaza de Teverga) of the Geological Map of Spain, presented a compilation of data from MADARIAGA (1928, 1933), GÓMEZ DE LLARENA & RODRÍGUEZ ARANGO (1948) and GARCÍA FUENTE (1952) as well as from DELÉPINE (1943) and LYS & SERRE (1958), of brachiopods and other marine fauna recovered mainly from a paralic coal-measure sequence with limestone bands which were supposed to follow onto Caliza de Montaña and which were assigned a Namurian age. These are probably all subject to revision.

The same beds in Teverga (Asturias) and their continuation in San Emiliano (León) yielded floras to JONCMANS (*in* WAGNER 1959) which indicated either Namurian C or Westphalian A. These strata are regarded as later than the Caliza de Montaña which also crops out in this area. STOCKMANS & WILLIÈRE (1966) figured a florule from the San Emiliano region which they assign a Westphalian A age, and VAN GINKEL (1965) identified Bashkirian foraminifera from the same succession. Probably the same succession at Quirós (Asturias) yielded a Namurian C or Westphalian A flora to JULIVERT (1960), who collected from the Xagarín mine (identifications by WAGNER).

KULLMANN (1962) determined a goniatite fauna collected by RADIG in Cabo Peñas (Asturias) as belonging to Namurian B. The find was made in calcareous shales above the Caliza de Montaña. Also BOUROS (1962) recorded a Namurian B goniatite from a terrigenous flysch succession in sequence with a reduced development of Caliza de Montaña on the Playa de San Pedro (Asturias), in the same general area.

VAN GINKEL (1965, p. 209) mentioned the presence of goniatites of the *Reticuloceras* Zone (as identified by KULLMANN) at the top of the Caliza de Montaña

(which he called the Escapa Formation) near Vegamián (León). VAN GINKEL (*loc. cit.*) also described a Bashkirian fusulinid fauna from the Caliza de Montaña near Ruesga (Palencia), and recorded a Lower Bashkirian fauna from the Mudá Limestone in Palencia which is regarded as equivalent to the Caliza de Montaña.

WINKLER PRINS (1968) reviewed the evidence for the age of the Caliza de Montaña in the Cordillera Cantábrica and concluded upon a Bashkirian age.

Finally, MOORE, NEVES, WAGNER & WAGNER-GENTIS (1971) provided evidence of a late Namurian B age for the top of the lower part of the Caliza de Montaña (= Barcaliente Formation of WAGNER, WINKLER PRINS & RIDING 1971), and a basal Westphalian A age for the top of the upper part (= Valdeteja Formation of WINKLER PRINS 1968, 1971) in the Villamanín area of northern León. The upper Namurian B in the locality discussed by MOORE *et al.* is also characterized by the basal Morrowan goniatite *Retites semiretia* McCALEB, and this provides the link with a locality near Meré (eastern Asturias) which will be discussed in the following chapter.

All the localities discussed above, with a bearing on the age of the Caliza de Montaña, were, outside the region between the central Asturian coalfield, the Picos de Europa, and the eastern boundary of the Asturian Massif as determined by unconformable Mesozoic strata. The only assemblage cited from the top of the Caliza de Montaña in this area is that found by MARTÍNEZ-GARCÍA, CORRALES & CARBALLEIRA (1971) in the vicinity of Pendueles (Asturias). It consists of fusulinids, identified by RAMÍREZ DEL POZO, and probably has to be assigned a Namurian age.

THE FAUNA OF MERE

A marine fauna has recently been collected near the top of the Caliza de Montaña in the locality of Meré, at kilometre post 8 of the road from Posada de Llanes to Ortiguero, N. E. Asturias (see text-fig. 1). The assemblage was found at 50 metres above the Caliza de Montaña, in the basal beds of a flysch sequence (see text-fig. 2) similar to that described at Pendueles, 15 km to the north-east (MARTÍNEZ-GARCÍA, CORRALES & CARBALLEIRA 1971). It consists of a varied association of goniatites, nautiloids, algae, brachiopods, trilobites, gastropods, lamellibranchs, bryozoa, etc. The only accurate age determination of this fauna has been provided by the goniatites, which were studied by C. H. T. WAGNER-GENTIS (*in* MOORE *et al.* 1971) and which point to basal Morrowan and, by implication, upper Namurian B. These goniatites are:

Retites semiretia McCALEB.

Retites merensis WAGNER-GENTIS.

A provisional list of brachiopods found in association with these goniatites has been given by Dr. C. F. WINKLER PRINS (Rijksmuseum van Geologie en Mineralogie, Leiden), who is presently studying this fauna (*pers. comm.*):

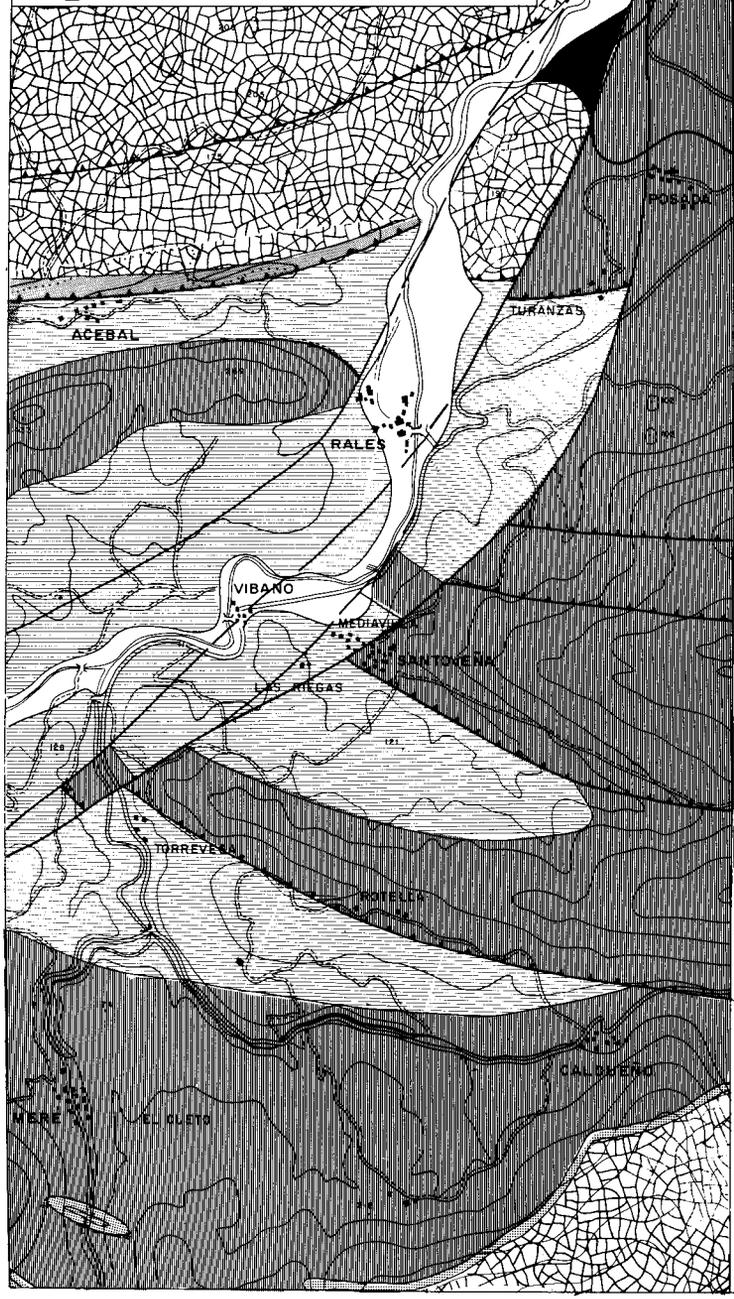
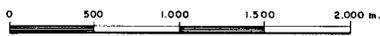
Schizophoria sp.

Rugosochonetes sp.

Tornquistia polita McCoy.

Schuchertella aff. *paeckelmanni* GALL.

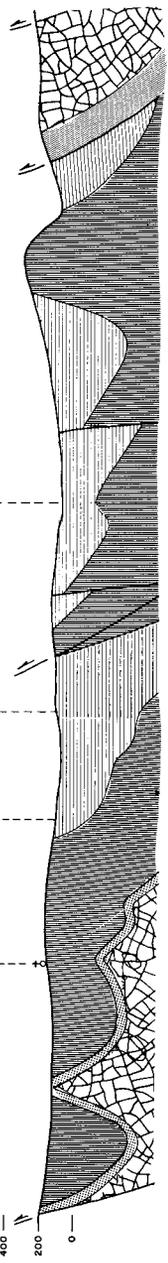
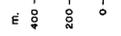
**GEOLOGICAL MAP OF THE
MERE AREA (EASTERN ASTURIAS)**
E. MARTINEZ - GARCIA
1.970



GEOLOGICAL CROSS SECTION

RIO LAS CARRAS

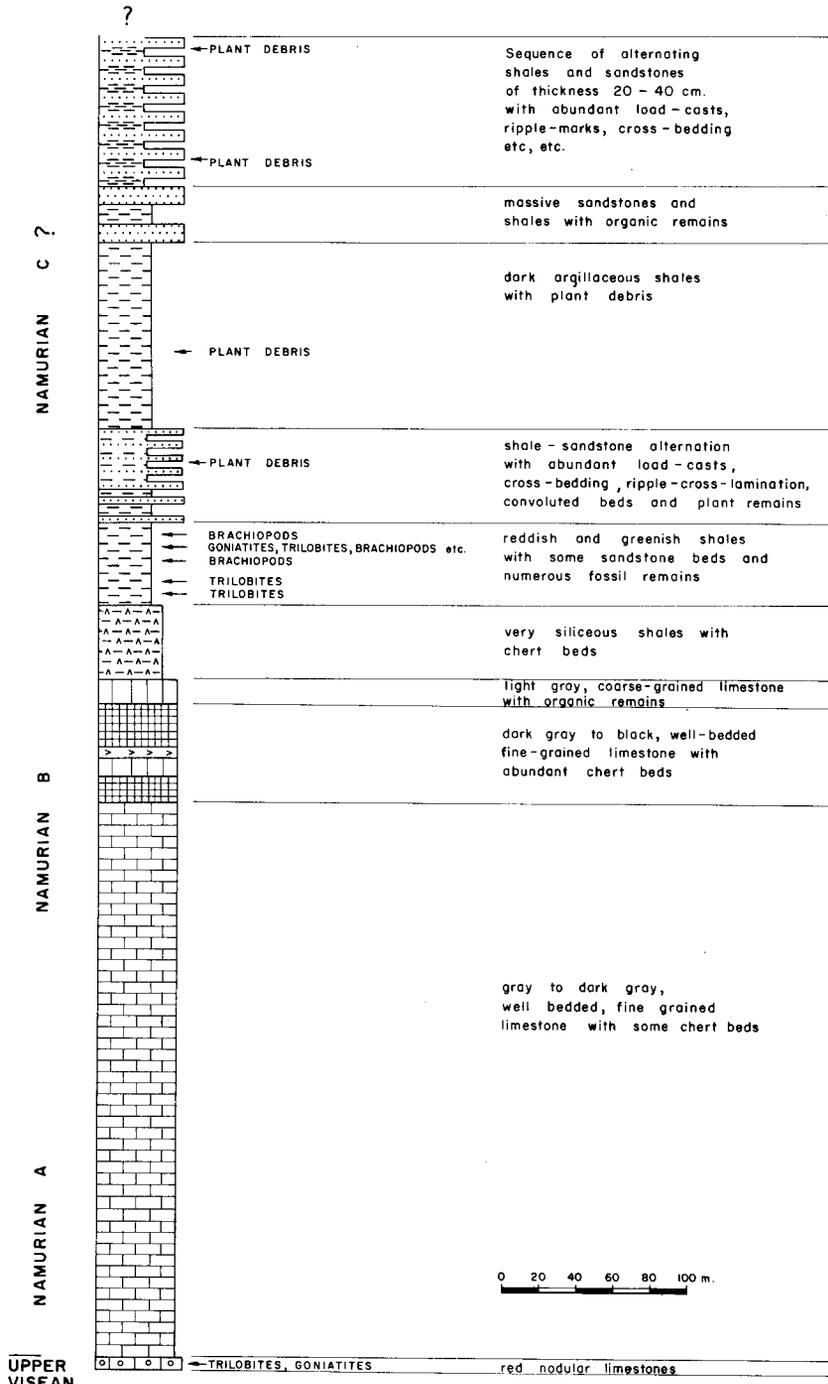
MERE



- Shales and sandstones (POTSDAMIAN)
- Armoric quartzite (ORDOVICIAN)
- Griotte limestone (VISEAN)
- Caliza de montaña (NAMURIAN)
- Shales and sandstones (NAMURIAN)
- Sandstones and conglomerates (STEPHANIAN)
- Alluvial

Text-fig. 1

STRATIGRAPHIC COLUMN OF THE CARBONIFEROUS AT MERE (EASTERN ASTURIAS)



Text-fig. 2.

Chonetipustula sp. nov.

Martinia sp.

Crurithyris sp.

The provisional age of this assemblage is given as Namurian.

The trilobites are presently being studied by Dr. J. GANDL (Universität Würzburg), who has kindly provided the following list of provisional identifications:

Archegonus (Macrobole) sp. nov. (ex. gr. *brevispina* OMÓLSKA).

Archegonus (Phillibole) sp. nov. (ex. gr. *aprathensis* RUD. & E. RICHTER).

Coignouina sp. nov. (Fam. Otarionidae).

which have thus far been recorded only from the Lower Carboniferous.

CONCLUSIONS

The Caliza de Montaña has almost invariably been dated as Namurian, with the age of the upper part varying from Namurian B to Namurian C (and basal Westphalian A - MOORE *et al.* 1971). This depends, most likely, on the presence or absence of the wedging top part of the limestone (i. e. the Valdeteja Formation of WINKLER PRINS). At Meré only the basal part, some 400 m thick, appears to be present, and the age of the Caliza de Montaña here does not reach beyond Namurian B. In the region of the Picos de Europa, south of Meré, the thickness of the Caliza de Montaña seems to be greater, and it remains to be established whether limestone development in that area continued into the higher Namurian. The presence of later limestone deposits in this area, of Kashirian/Podolskian age (limestone with *Fusulinella bocki* var. *delepinei* GÜBLER of DELÉPINE 1943), and of marine limestone deposits of lower Stephanian age (MARTÍNEZ-GARCÍA & WAGNER 1971) complicate matters, particularly where thrust faults parallel to the strike give anomalous contacts.

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