

# SPEOLOGICAL EXPEDITIONS TO THE SHAN PLATEAU IN MYANMAR (BURMA)

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Myanmar Cave Documentation Project

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The extensive and virtually untouched karst of the Shan plateau is well known from literature. Access is very difficult due to common regional unrest causing travel restrictions in combination with a very limited road network. Few investigations have been carried out since independence in 1948, notably those by Dunkley (1988), Mouret (1995-98), Bence (1998) and La Venta (2004-05). This series could be continued by four expeditions from 2010-12 within the Myanmar Cave Documentation Project in cooperation with Myanmar authorities. Caving areas near Hopon, Ywangan and Pinlaung were visited confirming the presence of larger river cave systems. In total 44 caves with an overall length of 16.9 km were documented and new longest and deepest caves of the country discovered. These are Khau Khaung (Ywangan) with 2355 m length and Mai Lone Kho (Pinlaung) with -160m depth.

## 1. Introduction

Only a few regions on Earth are more unknown than Myanmar with regard to their speleological potential. This is due to the long chosen international isolation of the country, the absence of local speleologists and the difficult access to the mostly remote karst areas. First knowledge about caves originates from British colonial times where caves were used for weekend outings. Kusch, 1987 provides a very good summary based on literature from this period. A significant step was the discovery of prehistoric paintings and excavations in Pindaya (also Pindah-Lin) cave in 1960 by geologist U Khin Maung Kyaw.

The first modern investigations were by small teams in reconnaissance style and took place from 1988 onwards: Dunkley succeeded to use a window of opportunity for a five day visit (Dunkley, 1989) before the country closed again. Mouret did intensive scouting while living in Yangon in 1995 and Bence followed up by a systematic expedition focusing on the Shan plateau (Bence, 1998). Afterwards visits by bat researches from the Bates institute in the UK enhanced the knowledge about the extent of karst in Myanmar. These contacts were later used for two expeditions of the Italian La Venta team to the Shan plateau in 2004 and 2005, but these stopped afterwards since permission could not be regained. The findings of these groups were encouraging and indicated that Myanmar possesses potential for long and deep caves comparable to its neighbouring countries.

The slow opening up of Myanmar with the intention to promote tourism has created a favourable situation and lead to a first contact at the International Tourist Fair in Berlin in 2008. A personal introduction of a cave documentation project followed in September by J. Dreybrodt based on the experiences of the Northern Lao – European Cave Project in the neighboring country Laos. This triggered the first speleological reece to Hpa-An in Kayin state project a few month later in January 2009.

Afterwards several expeditions lead by the authors focused on to the largest karst area of Myanmar – the Shan plateau. The Myanmar Cave Documentation project was then formed in its current state to guarantee well documented expedition results as base for future research activities of other groups and institutions.

The table below gives an overview of the ten longest caves of Myanmar. It shows that only few caves of significant length are known despite the addition of several new caves over the last years.

No.	Cave	Location	Length(m)	Surveyed
1	Khau Khaung	Ywangan	2355	2012
2	Mondowa Gu	Taunggyi	1770	1998
3	Hopon Spring Cave	Hopon	1655	2011
4	White water Buffalo and Tiger Cave	Hopon	1343	2010
5	Happy Monk Cave	Hopon	975	2010
6	Leikte Gu (active)	Kalaw	960	1998
7	Maung Nyunt Sinkhole	Pinlaung	900	2005
8	Naung See cave 2	Kutkai	859	2011
9	Sadan Gu	Hpa-An	800	2009 (1995)
10	Barefoot Cave	Hopon	718	2011

*Table 1: Longest caves of Myanmar with year of survey.*

The objective of this article is to summarize previous findings and report the results of speleological expeditions to the Shan Plateau from 2010-2012. A geological overview is followed by descriptions of the major caving areas and conclusions with an outlook on the further caving potential.

## 2. Geography and Geology

The Shan Plateau, in the east of Myanmar, is approximately 600 x 500 km, and has the most extensive area of karst in the country (Fig. 1). It consists of a complex series of mountain chains and plateaus with an

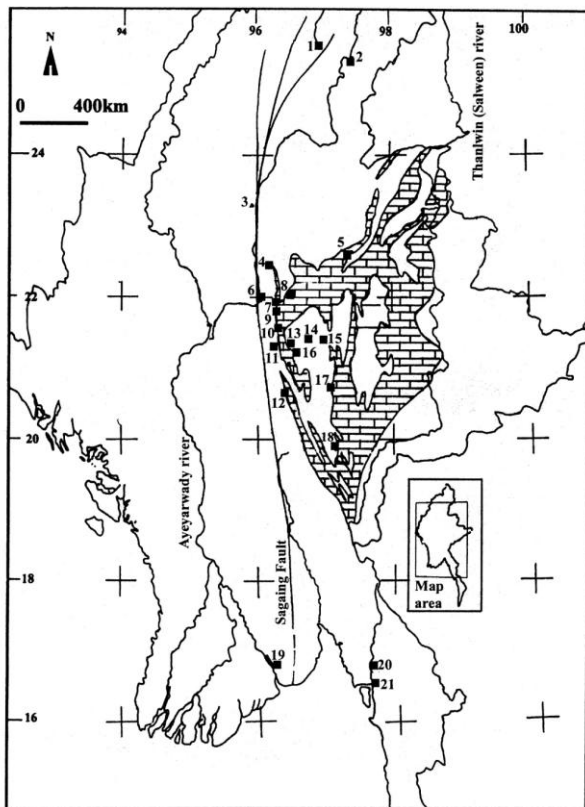


Figure 1: Limestone area of Shan States in Myanmar

average height of 900 - 1200 m. It rises abruptly from the central Myanmar plain and comprises granite and gneiss with limestones, clays and alluvium covering the bedrock. The limestone, often called "Plateau Limestone" or the "Shan Dolomite Group" has a thickness of more than 2000 m in places. It is mostly from the Carboniferous to Lower Triassic period, with some earlier Ordovician elements and has underlying Devonian strata. Recently, a more detailed stratigraphic assessment has been made (Oo et al. 2002), which divides the carbonates into two main units: the Thitsipin Limestone Formation (with five main sub-facies) passing transitionally upwards into the Nwabangyi Dolomite Formation (with four sub-facies). The presence of these abundant carbonate beds has a major impact on the scenery in the Southern Shan States, leading to "dramatic scarp and ridge scenery and with spectacular karstic features" (Fig. 2). It is characterised by a series of rounded ridges, N-S oriented along the dominant structural trend, which separate different basins flowing southward. The ridges are made up mainly of carbonate rocks where a well-developed karst landscape occurs.

The Shan plateau shows many of the typical geomorphic features of tropical countries. Topography is controlled mainly by lithology: where clastic rocks outcrop, the landscape consists of rounded hills, with a thick cover of soil, conversely, in the carbonate areas the relief displays abrupt ridges, conical hills and large closed depressions. The carbonates that form the Shan Plateau also form a natural geographic break between the elevated and cooler plateau states and the hotter lowlands to the east. The Salween river limits the area to the east though it is not proven if further areas of lime stone are present. British expeditions to the Myanmar border in Yunnan confirmed

the presence of regional well developed lime stone areas with large river caves and Tiankengs (Talling, 2012).



Figure 2: Karst landscape east of Taunggyi with N-S facing ridges visible on the horizon.

### 3. Karst Areas

Access to the vast area of the Shan plateau is one of the limiting factors in obtaining an overview of the potential for caves. Few roads cross the plateau, mainly linking major cities like Mandalay or Taunggyi with important Myanmar-China border crossings for intensive trade. These roads are only partially tarred and road works are common. Side roads are dust roads and travel speed can be very low; taking considerable time (measured in hours) for only few 10's of km. In addition overnight stays are permitted only in foreigner licensed accommodation, which are scarce in remote caving regions and therefore special permits are required.

The Shan region is divided in three administrative states: Northern Shan with the capital Lashio, Eastern Shan with Kentung and Southern Shan with Taunggyi. These are again divided in town ships that were historical ruled by local leaders called Saopha. This local hierarchical structure persists until today and large areas are self administered and restricted for foreigners. Accessible are the roads from Mandalay to Lashio and Taunggyi and the tourist area around Inle lake. Most of South and East Shan state areas require special permissions. The following sections give an overview of visited areas, their regional settings and presence of caves (Fig. 3). These areas are:

- Kalaw, the most visited caving area
- Pinlaung, 40 km south of Kalaw in the same ridge (restricted).
- Nyaungshwe, east of the Inle lake
- Hopon, 25 km east of Taunggyi (restricted)
- Ywangan, north of the famous Pindaya caves (partial restricted)
- Lashio and Kutkai (restricted)



Figure 3: Geographical map of the Shan states. Visited caving areas are marked by black circles: 1 Kalaw, 2 Pinlaung, 3 Nyaungshwe, 4 Hopon, 5 Ywangan, 6 Lashio, 7 Kutkai.

### 3.1. Kalaw

The significance of the area comes from its relatively easy access for the first expeditions of Mouret, Bence and La Venta. Historically it is a well known British hill top town for escaping the hot summers in the plain. The town sits at 1300 m altitude on the northern end of a large limestone ridge with scenic hills and deep valleys in the south and west. Several small caves are located in easy reach of town and were the first visited (Leikte Gu ie.). They vary from fossil caves with conglomerate ceilings to sink holes with active streams. Several river caves were found mostly south and west of the town by the La Venta expeditions which require steep descents of about 400 m down to the valleys (Fig. 4). Due to the difficult access by road and trail the caves are not fully surveyed, mostly the entrances have been recorded and the first hundred metres checked.



Figure 4: Hiking west of Kalaw down to the river cave Twin ii Gu. The next N-S facing ridge is clearly visible.

Two caves were revisited near Pinwon 12 km south east of Kalaw close to the rail way tracks in 2012. The Twin ii Gu fossil & river cave were surveyed to a length of 282 m and 490 m stopping in a wide open river passage with wind. A train ride confirmed the assumed further potential for caves especially near Sindaung station about 10 km south of Kalaw.

### 3.2. Pinlaung

A large sinkhole was seen during the domestic Yangon to Heho flight by the 2005 La Venta expedition. This seems to be the same sink hole already mentioned by Dunkley (1998) near Pinlaung. It was immediately visited by a sub-team. Geologically the area is in the same N-S ridge as Kalaw. The city of Pinlaung is nestles nicely in a karst valley and offers a convenient base for exploration (Fig. 5). It is known for its cold weather at 1400m altitude. Large river caves were found near the village of Phinton partially traversing one of the ridges (The Shwe Cave). The main sinkhole is reached by few hours walk and the disappearance of a major river confirmed. However the 50 m pitch with a waterfall and porous walls could not be descended and remains a challenge.



Figure 5: View over Pinlaung towards the main lime stone ridges in the west.

The 2012 team focused on the immediate surroundings of Pinlaung. Six caves of a few hundred meters length were surveyed. These are the caves 5 km north-west of town near the village Minbu: Nanpa Gu (322 m), Bilu Chaung Ye Hwut Gu (340 m) and Kyan Lin Gu (277 m). The visit to the eastern hills with a communication station on top proved also successful. A large entrance of 40 m height and 80 m width was spotted from its top and visited (Fig. 6). A large day light chamber slopes down followed by two pitches until the cave ends in a lake at -160 m. With all side passages Mai Lone Kho Cave is 545 m long and is now the deepest cave of Myanmar (Fig 7). Similarly Zee Yauk cave is just close by along the same ridge with a depth of -110 m. The nearby village Hti Hwali has two other cave entrances with immediate pitches which were not descended.

The whole area requires a more systematic investigation, including exploration of known open leads.





Figure 6: Descending to the large entrance of Mai Lone Kho.

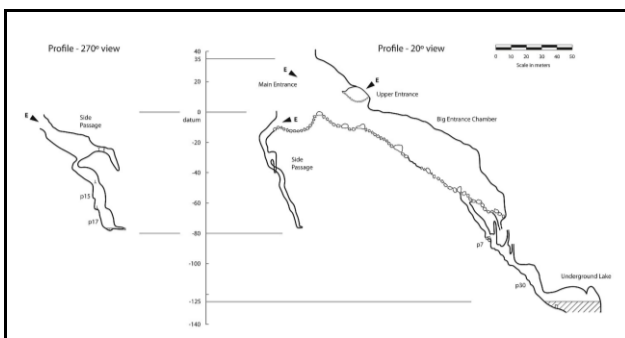


Figure 7: Map of Mai Lone Kho

### 3.3 Nyaungshwe

Nyaungshwe is the main tourist town on Inle lake. The caves are commonly known and used by monasteries for religious purposes. The area is on the border to the self-administered restricted Pa-O area where other caves are mentioned by local guides. In 2012 six caves 10 km east of Nyaungshwe were surveyed with the longest being Hta Ein Gu (260 m) and Ye Htout (235 m).

### 3.4 Hopon

The project became aware of this area by a travel related article in a domestic in-flight magazine. The impressive pictures of large well decorated halls triggered two expeditions in 2010 and 2011. It is the most systematic investigated and best documented region in the Shan states. The reason is a mystic cave called Tham Sam that is converted into a buddhist shrine of the Pa-O tribe about 35 km east of Taunggyi near Hopon.

Two areas are distinguished: a.) the Parpant area 8 km north east of Hopon and b.) the Htam Sam area 15 km along the main road. The Parpant area is at 1200 m on the plateau and consists of round shaped hills with fields in the plain (Fig. 8). The well decorated passages form through caves limited by the extension of the hill. The longest are White Water Buffalo and Tiger cave (1343 m), Happy Monk Cave (975 m), Htam Kong Kiamg (654 m) and Hopon Spring Cave (1655 m). Hopon Spring Cave is well known from its resurgence near the main road and public bathing and washing place. A larger portal of 30 m width and 10 m height opens up after a steep climb of 10 minutes. At the bottom of the entrance chamber is a river passage that has to be swum for 120 m until a dry water

fall is reached. After a technical climb of 5 m the main passage of about 10 m width with strong wind is reached. It has a cascading active stream which had in January a discharge of 2.4 cbm/s. After about 1 km a surface shaft of 45m depth connects. The passage becomes narrower and sumps after 600 m.



Figure 8: Approaching the karst hills near Parpant.

Tham Sam cave is located in a valley close to the main road to Tachilek. It is made accessible by a new side road directly in front of the entrance providing access to the Buddhist pilgrims who come to pray at the cave (Fig.9). The cave is surveyed to a length of 584 m until an artificial lake.

The further passage is blocked by a brick wall and access is restricted (Fig. 10). It is said the cave continues beneath the mountain for few more hours. The floors and walls have been extensively modified and levelled to accommodate Buddha Statues and mystic animals. Nearby is beautiful decorated Kyauk Sa Gu (Stone Scripture Cave, 313 m) which has its name from sinter columns appearing through a sky light like frozen stone slabs. Barefoot cave on the opposite side of the valley is an active river cave of 718 m length with two entrances. The resurging river enters into Tham Sam Cave after a short distance.

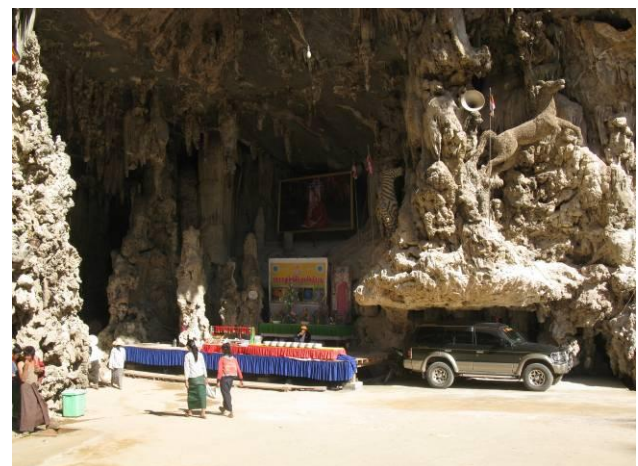


Figure 9: The entrance of Tham Sam in 2011.

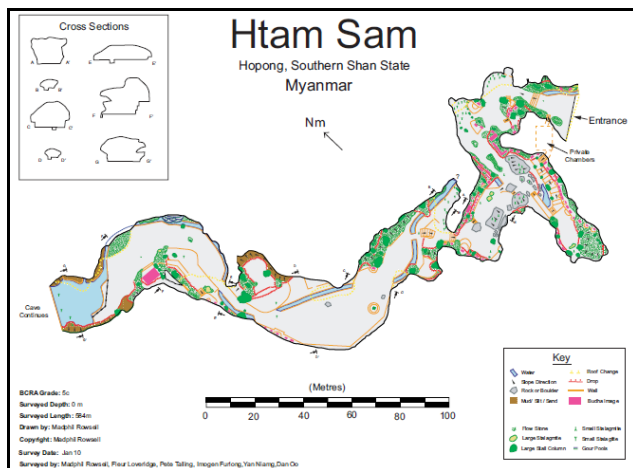


Figure 10: Map of Tham Sam with the end lake on the left.

### 3.5 Ywangan

The Project first visited this area when on route to Lashio from Taunggyi in 2011. Views from the expedition vehicle suggested the region was karstic, which was substantiated by subsequent geological research (Garson et al, 1976). As a result this became the main focus of an expedition in 2011/2012. Fifteen entrances were located during the trip, the highlight of which was Kyauk Khang (Fig. 11), currently the longest known cave in the country at 2355 m.

Ywangan is situated near a seasonal lake. This is reported to fill up following the rainy season but with a slight lag. This is interpreted to be a feature similar to the Irish term “turlough”, being a karstic seasonal lake. However, it is possible that there are superficial quaternary sediments in the fertile basin around Ywangan which complicate the local hydrogeology. Apart from the lake there are few surface water features. In a number of small caves a shallow local water table was encountered with the appearance of cave adapted fish species. These areas do not appear to have extensive large cave passage development, although underlying rock is karstic.

The main cave explored during the expedition, Kyauk Khaung, is a river sink in the Thitsipin limestone. Strangely, the flow of water gradually reduces through the cave. It is also not known where the water from the cave resurges, although a closed basin of 5 km to the north is one possibility. Kyauk Khaung contains extensive, large and well decorated fossil galleries (Fig. 12). There are a number of locations at which the cave is ongoing.

The majority of the other caves explored around Ywangan appear to be within the Ordovician Doktoye Limestone formation and are not so well developed.

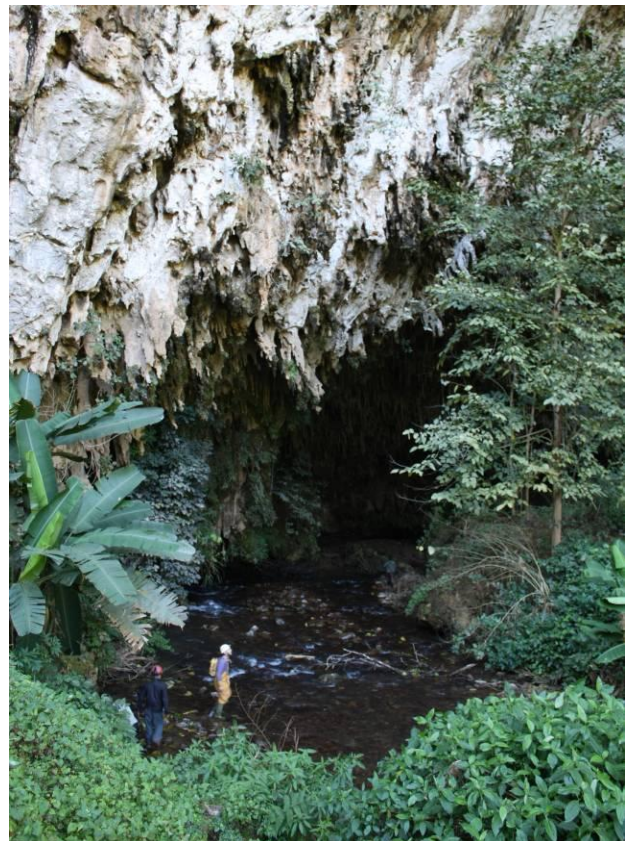


Figure 11. The entrance to Kyauk Khang cave.

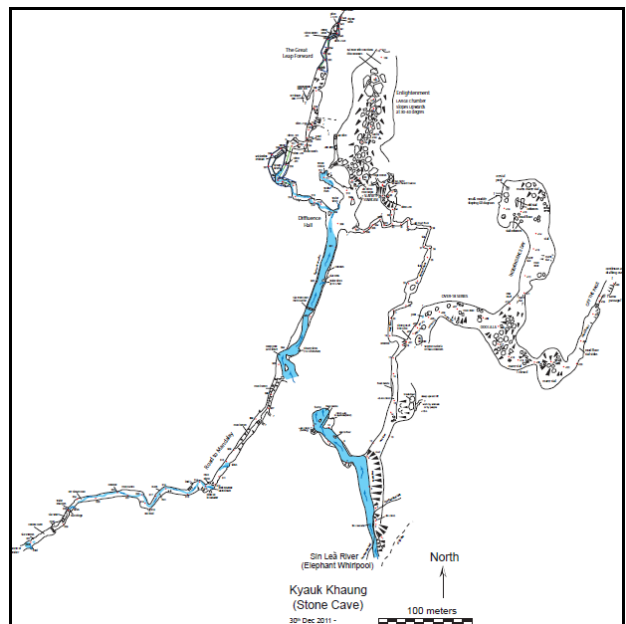


Figure 12. The map of Kyauk Khang cave.

### 3.6 Lashio

The area around Lashio was briefly visited in 2011 and 2012. It takes considerably time to reach it and is one long day travel from Mandalay. In 2011 a significant resurgence cave called Htam Nam Lay was identified near the village of E-nai, approximately 15km north and west of Lashio. Study of satellite photography suggests this river cave could be a through trip across one of the significant N-S trending limestones ridges. However, it was soon determined that access to Htam Nam Lay was practical only by motorbike, which given the limited time meant the cave could not be explored. The intention was



to complete these tasks the following year. However, regional instability prevented a return in January 2012.

The 2012 team instead mapped a few small caves immediately to the south of Lashio, some 5 km from the city centre. Three caves near the village of Khaung Ka are located in an isolated limestone hill and comprise complex interconnected passageways giving a high overall passage density. The maximum cave length is 207 m. Nearby a small river cave, Lim Nho was mapped to 589 m length. However, there does not appear to be significant carbonate deposits in the areas immediately around the city. All the caves visited to the south of Lashio are of spiritual significance.

### 3.6 Kutkai

In 2011 a reconnaissance was made in the area around the town of Kutkai. The small town is an important staging post on the trade route to the border with China at Muse. Access to the area is restricted and it was not possible to visit all the target areas around the town. The presence of carbonate rocks both to the north and southeast of the area was confirmed.

Approximately 2 km to the north of Kutkai is an area of closed depressions within low relief. Here Naung See 2 cave was mapped to 859 m in length. The cave is a complex mix of dry fossil galleries and small active streamways. The cave clearly contains a substantial volume of flood water in the monsoon period. Several kilometres further north a number of draughting entrances were located, however time and access restrictions prevented their exploration.

10 km to the south of Kutkai the limestone bedrock is of considerable depth, but appears to be formed into major river gorges rather than into caves.

## 5. Conclusions & Outlook

The findings of the 2010-2012 expedition teams confirm further the potential of the limestone plateau of the Shan States for large cave systems. Two new areas were systematically investigated resulting in the discovery of Khaung Kuang with a length of 2355m in Ywangan and an interesting cave cluster near Hopon with river caves and the pilgrim cave Tham Sam. Other areas like Pinlaung and Kalaw were revisited and work from previous expeditions continued. Most significant discovery was Mai Lone Kho as deepest cave of Myanmar (-160 m). In total 44 caves were surveyed with a overall length of 16.9 km. These findings should not mislead to the impression that the Shan plateau is slowly understood for its presence of karst and caves. In contrary only a tiny area has been investigated. Access is the key for further exploration as areas are restricted, the road network limited and accommodation scarce.

The most comprehensive summary of caves in Myanmar is found in the BHB Vol. 39 after an intense literature research done by Laumanns (2010). A Shan edition is in preparation for release in 2013.

The project is open for cooperation in order to provide a knowledge base for further interdisciplinary research.

## Team overview

Hopon 2010: F Loveridge, P Rowsell, P Talling, I Furlong (co-ordinator)

Hopon/Lashio 2011: C Densham, J Dreybrodt, F Loveridge, P Rowsell, P Talling, I. Furlong (co-ordinator)

Ywangan/Lashio 2012: C Densham, T Guilford, L Hong, F Loveridge, L Maurice, P Talling (co-ordinator)

Kalaw/Pinlaung 2012: J Dreybrodt (co-ordinator), U Etter, M Olliphant, N Pistole, A Romeo, H Steiner

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