

SCIENCE AND CIVILISATION IN CHINA

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formerly written *chen*¹ and now meaning a seam, originally meant to caulk the seams of a boat, since we see indeed a boat accompanied by two hands holding something, presumably the caulking chisel.² So common a word as *shou*,² to receive, was also once written in such a way as to depict a boat-like object and two hands (K 1085), but this was more probably a weaving shuttle; if so, the pictogram does not indicate, as some have thought, the loading and unloading of boats. People of the Chinese culture-area were always surprised when they saw the sharp-ended boats and ships of other civilisations. For example, the Chin Tartar Wukusun Chung-Tuan,³ who had been on diplomatic missions for his country, wrote in his travel notes about +1220 of the Islamic lands of the West (Yin-Tu Hui-Ho⁴): 'Their boats resemble a shuttle.'⁵ And in +1259, when Chhang Tê⁵ crossed the Syr Daria River on his embassy from Mangu Khan to Hülägu Khan, he was much surprised to find that the boat 'resembled a Chinese woman's pointed and crescent-shaped shoe'.⁶



K 1085

(1) FROM ANTIQUITY TO THE THANG

There seems to be nothing very revealing among the mentions of boats in the *Shih Ching* or other classics, and the *Tso Chuan*'s accounts of naval battles do not help much. Nevertheless, there is no reason to doubt the historicity of the fleet which was sent northwards by the State of Wu,⁴ under the admiral Hsü Chhêng,⁶ to attack the State of Chhi in -486. What he probably commanded was a number of large paddled canoes, some perhaps large enough to carry deck-castles for archers, and they certainly kept close in-shore.⁶ We have already had occasion to mention the great fleet of sailing-rafts

^a Later the word came to be written with the moon radical in place of the boat; this was a corruption. Eventually it was used as a personal pronoun appropriated to the emperor (the 'imperial We'), and its origins were forgotten. In the *Chou Li* it occurs in connection with sewing the seams of armour, an interesting point in view of the prevalence of sewn boats in some parts of the world (Hornell (1), many refs.).

^b Cf. Bretschneider (8), p. 105, translating his *Pei Shih Chi*.⁷ Cf. Vol. 3, p. 522.

^c Cf. Bretschneider (2), vol. 1, p. 130, translating his *Hsi Shih Chi*.⁸ Cf. Vol. 3, p. 523.

^d *Tso Chuan*, Duke Ai, 10th year (Couvreur (1), vol. 3, p. 659). Hsü Chhêng's amphibious operation met with failure, however; comments in Hsü Chung-Shu (3). There had been a long background to this naval activity of the State of Wu. For example: Duke Hsiang, 24th year (-548), Chhu fought afloat against Wu, unsuccessfully (Couvreur (1), vol. 2, p. 412); Duke Chao, 17th year (-524), the indecisive battle of Chhang-an⁹ between Wu and Chhu, in which the Wu forces lost and later recovered their 'flagship', the 'Yü-Huang',¹⁰ in a famous feat of derring-do (Couvreur (1), vol. 3, pp. 282 ff.); Duke Ting, 6th year (-503), Wu destroyed the Chhu fleet at last (Couvreur (1), vol. 3, p. 530). According to tradition (see p. 678 below), the naval importance of Wu was due to the organising powers of the minister Wu Tzu-Hsü¹¹ (fl. -530, d. -484, already often met with, cf. e.g. Vol. 3, pp. 485 ff., Vol. 4, pt. 1, p. 269). He would of course have built upon the age-old expertise with boats of the 'proto-thai' fraction of the Chinese people.

The Chhu and Wu fleets were the precursors of the Yüeh navy, which by the time of king Kou Chien (r. -496 to -470) consisted of 300 fighting-ships (lit. halberd boats, *ko chhuan*¹²) manned by 8,000 men and a fleet of decked (or deck-castle) ships (*lou chhuan*) manned by more than 3,000 men (*Wu Yüeh Chhun Chhü*, ch. 10).

^e I say this because later texts, even some purporting to be of the Later Han, such as *Yüeh Chhüeh Shu* (cf. p. 679 below), attribute 120-ft. long sailing-ships to the Warring States period, and this, in my view, is unlikely on general developmental grounds. Sailing-ships of substantial size may have been occasion-

¹ 桴² 受³ 烏古孫仲端⁴ 印都回紇⁵ 常德⁶ 徐承⁷ 北使記⁸ 西使記⁹ 長岸¹⁰ 餘糧¹¹ 伍子胥¹² 戈船

(p. 390) built by the King of Yüeh, another southern State, in -472. The vessels of the Warring States period, however, were not all naval, and we can be sure that there were trading expeditions at least along the coasts of Siberia, Korea and Indo-China.^a There were also some explorations of the Pacific itself.^b And of course, as ever, inland water transport.^c

For the Han time there is a good deal more information, and only a few points can be touched upon.^d In -219 the emperor Chhin Shih Huang Ti had sent a great military expedition to conquer the southern peoples of Yüeh,^e under the command of Chao Tho¹ and Thu Chü;² its main strength consisted of 'marines' based upon war-boats with deck-castles (*lou chhuan*³).^f A century later, when the province founded by Chao Tho showed signs of becoming a permanently independent kingdom,^g Han Wu Ti, in -112, had to send another expeditionary force, and this again employed a fleet of 'the ships of the south which have deck-castles (or, more than one deck) (*nan fang lou hsiang*⁴)'.^h It was commanded by Yang Phu⁵ and Lu Po-Tê,⁶ whose titles as admirals indicate perhaps the growing importance of naval techniques.ⁱ One such title gives us

ally built, however, in those times, and perhaps the 'Yu-Hüang' was one of them. I suspect that the nearest parallel for the Warring States naval ships is to be found in the Viking longships, which never exceeded 80 ft. in length before the +10th century. For the *ko chhuan* 50 ft. and for the *lou chhuan* 70 ft. might be good guesses.

^a Literary references have been assembled by Wei Chü-Hsien (4), pp. 5 ff., but his conclusions are subject to caution and reserve.

^b Cf. pp. 551 ff. below.

^c Lo Jung-Pang (6), p. 29, has drawn attention to the invasion of Chhu State by Chhin in -312 and -311 under the general Ssuma Tsho,⁷ one of Ssuma Chhien's ancestors (cf. Chavannes (1), vol. 2, p. 74). The chief sources are *Shih Chi*, ch. 70, pp. 10b, 11a, and *Hua Yang Kuo Chih*, ch. 3. Water-transport was organised by Chang I,⁸ a minister famed as one of the School of Politicians (cf. Vol. 2, p. 206). Double-hulled boats (*fang chhuan*⁹), allegedly 100,000, bore fifty warriors each down 3,000-li river routes, and 10,000 small freighters (*sao*¹⁰) carried 6,000,000 bushels of army grain supplies. If inference from these round figures is justifiable, the average burthen would have been 16.35 tons, which may give an idea of the size of the craft. The power of Chhu was greatly diminished by this campaign.

^d Krause (1) did a service in collecting, translating and commenting on some of the texts of the Han and San Kuo periods describing naval warfare.

^e *Shih Chi*, ch. 112, p. 10b. This was the occasion when the great engineer Shih Lu¹¹ built the Ling Chhü Canal (see p. 299 above) to allow of the through passage of waterborne supplies from the north. Cf. Arousseau (2).

^f To this type of vessel a special monograph has been devoted by Pao Tsun-Phêng (2, 2), largely based upon the tomb-model ships described below (pp. 447 ff.).

^g Cf. Cordier (1), vol. 1, pp. 235 ff.; Fitzgerald (1), p. 181.

^h *Shih Chi*, ch. 30, p. 17a (tr. Chavannes (1), vol. 3, p. 592); ch. 113, pp. 7b ff.; *Chhien Han Shu*, ch. 6, pp. 19a ff. (tr. Dubs (2), vol. 2, pp. 79 ff.). Also ch. 24B, p. 16b (tr. Swann (1), p. 306). A few pages earlier (p. 15a; Swann, p. 298) the exercises of these boats, ornamented with flags and standards, on the Khunming Lake in -115, are described, but chiefly as yet another example of imperial extravagance, since the chapter in question is that on economics. The expedition against Nan Yüeh for which these preparations were made was the occasion when the wealthy merchant of Chhi, Pu Shih,¹² volunteered to take charge of the fleet, with a number of technical experts from that province (*Shih Chi*, ch. 30, p. 17b; Chavannes (1), vol. 3, p. 594). But the offer was not accepted. We shall meet again with Pu Shih below. The expedition was completely successful and the admiral of Nan Yüeh, Lu Chia,¹³ was captured after fleeing to the West with what remained of his ships.

ⁱ For example, Lou Chhuan Chiang-Chün¹⁴ (Commander of the Embattled Ships) for Yang Phu, Fu Po Chiang-Chün¹⁵ (the Wave-Subduing Commander) for Lu Po-Tê, and Ko Chhuan Chiang-Chün¹⁶ (the Fighting-Ship Commander) for a former marquis of Yüeh named Yen¹⁷ who had changed allegiance and returned to the service of the Han. On Fu-Po see Kaltenmark (3).

¹ 趙佗² 屠睢³ 樓船⁴ 南方樓船⁵ 楊僕⁶ 路博德⁷ 司馬錯⁸ 張儀⁹ 紡船¹⁰ 艘¹¹ 史跡¹² 卜式¹³ 呂嘉¹⁴ 樓船將軍¹⁵ 伏波將軍¹⁶ 戈船將軍¹⁷ 嚴

a useful glimpse of a particular kind of seamanship important at the time.^a In the following year another substantial river and coastal fleet was organised, and sent under Han Yüeh¹ and others to suppress a rebellion in eastern Yüeh.^b Then in -108 Yang Phu led a sea force against Korea.^c Thus naval operations were conducted on a considerable scale in the reign of Han Wu Ti.^d

At the beginning of the Later Han period, Kungsun Shu² tried to set up an independent kingdom in Szechuan. Three of his military engineers built a remarkable fortified floating bridge and boom in Hupei, but this was destroyed by a Han fleet of thousands of vessels including many 'castled ships'.^e We shall describe this action more closely on p. 679 below, on account of the interest of the types of craft involved. This was in +33. Just ten years later there was the great expedition of Ma Yuan³ to Chiao-Chih⁴ (Tongking) which involved a fleet of 2,000 'castled ships' (*lou chhuan*⁵).^f Subsequently many naval fights between the Chinese and the *Champa* people (of the Lin-I⁶ kingdom; modern Annam) are recorded.^g The term *lou chhuan*⁵ for warships of large size persisted down all through the centuries. By the +8th, the best Thang source says^h that they had three decks, with bulwarks, arms, flags, and catapults,ⁱ but were not very handy in rough weather. When one remembers that Han Yüeh's chief expedition took place just about fifty years before the Battle of Actium, one would like to know much more about these Han warships, and how far (for example) their tactics compared with the boarding technique used by the 'marines' of Rome during the First Punic War (c. -260 to -240).^j There is some evidence that they engaged in ramming, like Greek triremes.^k

Sea communications with Kuangtung, Indo-China and Malaya began to acquire importance from the beginning of the present era. In +2 Wang Mang got tribute of a live rhinoceros from those parts, and it certainly came some of the way by boat.^l This

^a A certain Tsu Kuang-Ming⁷ was appointed Hsia Lai Chiang-Chün⁸ (the Torrent-Descending Commander). He was no doubt an expert in the management of ships in those rapids so abundant on the Chinese rivers. See *Chhien Han Chi*, ch. 14, p. 16.

^b His title was Hêng Hai Chiang-Chun⁹ (the Ocean-Traversing Commander); *Chhien Han Shu*, ch. 6, p. 21a (tr. Dubs (2), vol. 2, p. 82).

^c *Chhien Han Shu*, ch. 6, p. 24b (tr. Dubs (2), vol. 2, pp. 90 ff.). Although the expedition was successful and Korea was divided into four Han commanderies Yang Phu's losses were so severe that he himself fell into disgrace and was dismissed.

^d Ch. 95 of the *Chhien Han Shu*, which gives the fullest account of all the campaigns and their political background, is available to Western readers only in the antiquated translation of Pfizmaier (51).

^e *Hou Han Shu*, ch. 47, p. 17b. Cf. Kungsun Shu's biography in ch. 43, pp. 22a ff.

^f *Hou Han Shu*, ch. 54, p. 10a. Cf. *Shui Ching Chu*, ch. 37, p. 9a, and Maspero (18).

^g Details in Ferrand (3). Among the dates are +248, +359, +407. In +431 more than a hundred Cham ships, with superstructures, ravaged the province of Tongking, but were finally beaten off.

^h *TPYC*, cit. e.g. in *Thung Tien*, ch. 160 (p. 848.3), cf. p. 685 below. There are many references to these war boats or ships in earlier books; as, for instance, the +4th-century *Hai Nei Shih Chou Chi* (end of introduction). This passage concerns the expedition of young men and girls led by Hsü Fu¹⁰ which set forth in search of the Magical Islands in the Eastern Sea, and the herbs of immortality which were supposed to grow there, at the command of the First Emperor. Cf. p. 552 and Sect. 33a below.

ⁱ Trebuchets, perhaps also large crossbows fixed to stands. Cf. Sect. 30i below.

^j Cf. p. 693 below.

^k Cf. p. 679 below.

^l *Chhien Han Shu*, ch. 12, p. 2a; ch. 28b, pp. 39a, 40a. Cf. Duyvendak (8).

¹ 韓說 ² 公孫述 ³ 馬援 ⁴ 交趾 ⁵ 樓船
⁶ 林邑 ⁷ 阻廣明 ⁸ 下瀨將軍 ⁹ 橫海將軍 ¹⁰ 徐福

tribute was repeated in +84 and +94, and continued intermittently as late as the Thang.^a An interesting passage in the *Chhien Han Shu* describes Han trade with the south seas:^b

From the barriers of Jih-Nan¹ (Annam), or from Hsü-wên² and Ho-phu³ (in Kuangtung),^c going by boat for five months, there is the Tu-Yuan⁴ kingdom... [and four other kingdoms are then mentioned, all of which had offered tribute from Han Wu Ti's time onwards].

There are superintendent interpreters (*i chhang*⁵) belonging to the civil service personnel (*huang mén*⁶),^d who recruit crews and go to sea to trade for brilliant pearls, glass,^e strange gems and other exotic products, giving in exchange gold and various silks. In the countries where they come the officials and their followers are provided with food and handmaidens. Merchant-ships (*ku chhuan*⁷) of the barbarians (may) transport them (part of the way) home again. But (these barbarians) also, to get more profit (sometimes) rob people and kill them. Moreover (the travellers) may encounter storms and so drown. Even if nothing (of this kind happens, they are) away for several years.

As for the great pearls, they may measure as much as two inches in circumference...

This probably refers to the two centuries preceding the time when Pan Ku was writing (i.e. about +90), so we may take it as well applicable to the -1st century, indeed back to the time of Han Wu Ti. Since the furthest country is said in the text to require a sea voyage of just over twelve months, and since the whole account is quite devoid of any legendary quality, Pelliot felt that one should visualise Chinese missions penetrating already at this time as far as the western extremity of the Indian Ocean.^f Further evidence for these extensive contacts has come from archaeological investigations in South-east Asia; thus Chinese coins of the first quarter of the +1st century have been found in the tombs at Dôngsón (northern Annam).^g Chinese pottery of the Former Han, one piece bearing an inscription dated -45, occurs in Sumatra, Java and Borneo.^h And certain stone sculptures of Sumatra bear a close similarity to those of the Han.ⁱ

Indeed it is more than likely that the foundations of this maritime trade had already been built (as suggested above, p. 441) by the people of Yüeh in the Warring States period. A passage in *Chuang Tzu*, seemingly often misunderstood,^j may be brought

^a Cf. Pelliot (30); Laufer (15), p. 80.

^b Ch. 28b, p. 39b, tr. auct. adjuv. Pelliot (30); Ferrand (3); Duyvendak (8); Wang Kung-Wu (1).

^c Cf. p. 669 below.

^d On this interesting term cf. Vol. 3, p. 358.

^e *Pi-liu-li*,⁸ see Vol. 4, pt. 1, p. 105 above. Pelliot considered this term equivalent to the Skr. *vaidūrya*, and that it meant glass here. On glass in Indo-China see the remarks of Janse (5), vol. 1, pp. 51 ff.

^f Note that this estimate would place Chinese long-distance navigation two or three centuries earlier than the date normally accepted (see Vol. 1, p. 179). But the text need not mean that Chinese ships with Roman citizens from Greece, Syria and Egypt on the quays of Arikamedu (Virapatnam; cf. Vol. 1, p. 178 and Wheeler (4), pp. 137 ff.).

^g Goloubev (1).

^h De Flines (1).

ⁱ Van der Hoop (1).

^j Ch. 24 (*Pu Chu*, ch. 8b, p. 3a), tr. auct. adjuv. Legge (5), vol. 2, p. 93. The parallel passage in *Lü Shih Chhuan Chhüu*, ch. 65 (vol. 1, p. 126), makes it quite clear that seafarers are intended.

¹ 日南 ² 徐聞 ³ 合浦 ⁴ 都元 ⁵ 譯長 ⁶ 黃門
⁷ 賈船 ⁸ 璧流離

forward in witness of this. The Taoist recluse Hsü Wu-Kuei,¹ having had an interview with Duke Wu of Wei, is discussing his good reception with the Duke's minister.

Have you not heard [he says], of the wanderers of Yüeh? When they have been gone from their country several days, they are glad when they see anyone whom they knew there. When they have been absent for weeks or months, they are happy if they meet anyone whom they had formerly seen at home. But by the time they have been away for a whole year they are delighted if they meet with anyone who even looks like a compatriot. The longer they are gone, the more affectionately they think of their own people—is this not so?

Thus the Duke has wandered far from his true native land of the Tao—no wonder he welcomes a messenger from there. But for us the interest lies in the sails of the merchantmen of Yüeh fitting about the isles of the Indies.²

It may have been not only the Indies. The possibility is still open that Han trading envoys got as far as the Axumite kingdom of Ethiopia. Reading further in the text of the *Chhien Han Shu* just given, we find:^b

In the Yuan-Shih reign-period (+1 to +6) under the Emperor Phing Ti, (the minister) Wang Mang, assisting the government, desired to glorify his majestic virtue. He (therefore) addressed rich presents to the King of Huang-Chih^{2c} enjoining him to send an embassy with a rhinoceros as tribute. From the kingdom of Huang-Chih, going by ship about eight months, one reaches Phi-Tsung.³ Going on further by ship about two months, one gets to the frontier of Hsiang-Lin⁴ in Jih-Nan.⁵ It is said that south of Huang-Chih there is the country of Ssu-Chhêng-Pu.⁶ It was from there that the envoy-interpreters (*i shih*?) of the Han returned.

We still have no definitive identification of any of these countries, but Huang-Chih is generally believed to be Kāncipura (mod. Conjeveram in Madras, then capital of the Pallava State).^d This would fit in with the itinerary through four kingdoms omitted in the previous quotation, for it includes a ten-day land journey sandwiched between months of sailing, and this could very reasonably be interpreted as a traverse of the Kra isthmus in southern Siam. Judging by the timings given, however, Herrmann (4) suggested that Huang-Chih could have been the port of Adulis (mod. Massawa in the Red Sea), in which case Ssu-Chhêng-Pu would be the oldest Chinese mention of East Africa. Most sinological geographers have frowned upon this view, though not all, and it is still on the agenda.

Representations of boats and ships of the Warring States and Han times were until lately scarce. Some quite small boats are shown on the tomb-shrine reliefs of Hsiao-thang Shan and Wu Liang Tzhu (carved between +125 and +150); they are all sampans carrying two or three people each.^e It is hard to be sure about their nature;

^a Wang Kung-Wu (1) has recently given us a useful monograph on the Chinese South Seas trade between -220 and +960 which brings up to date the older treatment of Fêng Chhêng-Chün (1).

^b Ch. 28 n, p. 40a, tr. auct. adjuv. Pelliot (30); Duyvendak (8). The mention of Annam in the midst of Indian Ocean places is puzzling, and no one has proposed a convincing explanation of the whole route.

^c One of the kingdoms mentioned in the previous passage.

^d From many papers we mention only Wang Kung-Wu (1), pp. 16 ff.; Lo Jung-Pang (7); Duyvendak (8); Yü Ying-Shih (1), pp. 172 ff.

^e See *Chin Shih So* (Shih sect. ch. 1, pp. 110 ff., 114 ff., ch. 3, pp. 108 ff., ch. 4, pp. 6 ff.); also Chavannes (9, 11); Chhang Jen-Chieh (2), pl. 17, etc.

¹ 徐無鬼 ² 黃支 ³ 皮宗 ⁴ 象林 ⁵ 日南 ⁶ 巴徼不
⁷ 譯使

some might be dugout canoes, others look more like reed-bundle craft, and P. Paris (1) surely goes too far in seeing an assured stem-post and stern-post in some of them. More interesting are the Warring States and Early Han bronzes depicting war-boats which show distinctly above the rowers an upper deck carrying spearmen, halberdiers and archers. This is the first appearance of the 'castled ships' or *lou chhuan*¹ which have already been mentioned. In Vol. 4, pt. 1, for a different purpose, we reproduced in Fig. 300 a bronze vase of the -4th century, the Yen-Yo Yü-Lieh Thu Hu preserved in the Imperial Palace Museum, Peking.^a Below on the left a naval engagement is proceeding; the two ships are meeting bow to bow, their rowers in the characteristically Chinese forward stance, their pennants flying. The 'marines' at the bow fight with

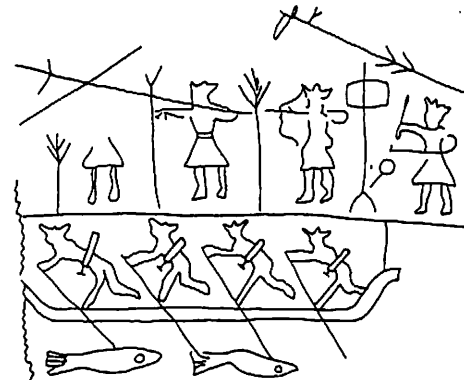


Fig. 959. Representation of a decked ship (*lou chhuan*) of the Former Han period (-2nd or -1st century) on a flat bronze bowl (*chan chien*) described and figured by Sun Hai-Po (2), pl. 14b (a), whence here redrawn. The four sailors within the ship, all facing forward to row, as usual in China, are armed with short swords in scabbards at their waists. The marines on the upper deck are armed not only with short swords in scabbards at their waists. The marines on the upper deck are armed not only with short swords in scabbards at their waists. The marines on the upper deck are armed not only with short swords in scabbards at their waists. The marines on the upper deck are armed not only with short swords in scabbards at their waists. As in the rather older (-4th-century) bronze depicted in Fig. 300, to which the present engraving bears great similarity, there is a drummer at the stern, here beating on two drums, a large and a small. Aft of the ship there is a figure (not shown), seemingly in the water among the fishes, which appears to be pushing the warship along—perhaps a guardian spirit favourable to the warriors.

short swords, supported by 'dagger-axe' halberdiers at longer reach,^b while at the stern of the right-hand ship a small figure beats a drum. The curved and over-arching sterns of the boats are noteworthy,^c and below there are swimmers among fishes. A very similar design occurs on a bronze described by Sun Hai-Po (2) and attributed to the Early Han period (Fig. 959), but archers are more prominent in it.^d There would have been nothing particularly progressive about such ships in -3rd-century China,

^a Yang Tsung-Jung (1), pl. 20.

^b See further in Sect. 30c below.

^c Cf. pp. 394, 435.

^d This has also been described and figured by Bulling (1), fig. 338a.

¹ 樓船

of the presence of Chinese merchants on the shores of +12th-century East Africa. The great Sicilian geographer Abū 'Abdallāh al-Idrisī, writing about +1154, says:^a

Opposite the coasts of Zanj are the Zalej (or Zanej) Islands, large and numerous; their inhabitants are very dark, and everything that they grow is dark—dhorra, sugar-cane, camphor, etc. One of these isles is called Sherbua. . . Another is al-Anjebi, where the chief town is called in the Zanguebar language al-Anfuja, its inhabitants being mostly Muslims though of mixed descent. . . This island is very populous, with many villages and domestic animals; rice is grown there. There is much commerce, and markets to which all kinds of things for sale and use are brought. It is said that once when the Chinese affairs were troubled by rebellions, and when tyranny and confusion became intolerable in India, the Chinese moved their commercial centre to Zalej and the other islands which belong to it, entering into familiar relations with the inhabitants because of their equity, uprightness, amenity of customs and aptitude for business. This is why the island is so populous and so frequented by strangers.

Here we have only a glimpse, for it is not quite clear what al-Idrisī had in mind. The Chinese rebellion to which he refers sounds like that of Huang Chhao¹ (+875 to +884) during which the Arab quarter of Canton was destroyed,^b but trouble on the East African mainland would have been a much more likely cause of the removal of Chinese trading stations there to an island. Nor is al-Idrisī's reference to India easily understandable. Nevertheless what he says about the story of the Chinese 'factory' is itself quite precise, and we may accept it as a picture of such activities about +1000. If there was one such Chinese station on the coast in Sung times there were probably several, and merchant-junks too, to connect them with home. As for the identity of the Zalej or Zanej Islands, they are believed to be the Mafias, off the Tanzanian coast about 150 miles south of Zanzibar.^c

Among the things which the Chinese wanted from Africa were elephant tusks, rhinoceros horns, strings of pearls, aromatic substances, incense gums and the like.^d Statistics preserved in the *Sung Shih* show that these imports increased ten times between +1050 and +1150. Al-Idrisī, on the other hand, tells us what Aden (and hence the Coast) received from China and India—iron, damascened sabres, musk and porcelain (typical Chinese exports), saddles, 'velvety and rich textiles' (probably silk), cotton goods, aloes, pepper and South Sea spices.^e Fortunately some of this was hardware and has survived until today. 'I have never seen', wrote Wheeler (6) in 1955, 'so much broken china as in the past fortnight between Dar-es-Salaam and the Kilwa Islands; literally fragments of Chinese porcelain by the shovelful. . . I think it is fair to say that as far as the middle ages is concerned, from the +10th century onwards, the buried history of Tanganyika is written in Chinese porcelain.'

^a *Nushat al-Mushtāq fi Ikhtirāq al-Āfāq* (Recreation of those who long to know what is beyond the Horizons), tr. Jaubert (1), vol. 1, pp. 59 ff. The better translation of Dozy & de Goeje (1) does not deal with this part of Africa.

^b Cf. Shih Yu-Chung (1).

^c Revington (1).

^d See Duyvendak (8), p. 16, and the elaborate study of Wheatley (1).

^e Jaubert tr., vol. 1, p. 51. A very preliminary sketch of the Chinese-African trade from the African end has been assayed by Fripp (1). Cf. Wainwright (2). David Livingstone (1), p. 50, came across a trade in furs from Botswana to China. On the porcelain finds at Aden see Lane & Serjeant (1); Doe (1).

¹ 黃巢

Archaeological research in East Africa is now in full swing, and general conclusions can only be provisional. But the positive acquisitions are already extraordinary.^a Along the entire Swahili coast from Somalia to Cape Delgado 'an unexpected and improbably large quantity of Chinese porcelain' has been found and is under study.^b A single Tanganyikan collector found 400 shards from thirty sites between the Kenya border and the Rufiji River near the Mafias.^c On these islands themselves, and in the neighbourhood of Kilwa, Wheeler himself saw great quantities of porcelain fragments. But the porcelain is not always broken, for whole pieces are found inset in the plastered walls of houses and mosques, where also there are niches designed to contain them. A pillar tomb near Bagamoyo (opposite Zanzibar Island) was decorated with sea-green bowls of the Yuan period,^d exactly contemporary with the descriptions of Wang Ta-Yuan. Broadly speaking (and perhaps as might be anticipated) the oldest periods are represented most strongly in the north, where Sung celadon finds have been plentiful.^e Further south the evidence points to a great upsurge of the importation of Chinese wares from the middle of the +14th century, after which no reign-period during the Ming and Chhing is unrepresented.^f Possibly this may be attributed to the decline of the Middle Eastern kilns after the collapse of the Abbasid caliphate in the Mongol invasions.^g Nor are the finds restricted only to the coastal areas, for many pieces have appeared far inland.^h Exactly how far south this influence went is as yet hard to determine since few investigations have been reported from Mozambique, but it must at least have reached Sofala.ⁱ In any case the products of Chinese culture are celebrated in Swahili literature. The late +18th-century poet al-Inkishāfi, describing the wealth of the city of Paté before its fall, says:

Wapambaye Sini ya kutuewa
Na kula kikombe kinakishiwa
Kati watiziye kazi ya kowa
Katika mapambo yanawiriye.^j

^a Cf. Kirkman (7, 8).

^b Mathew (3). See also Kirkman (1, 2, 3, 6, 9, 10); Mathew (1, 2); Freeman-Grenville (2, 6).

^c Freeman-Grenville (2).

^d Hunter (1); cf. Kirkman (5).

^e The largest amount of good +13th-century celadon has been found at twelve deserted towns on the borders of Somaliland and Ethiopia which belonged to the medieval sultanate of Adal and were destroyed in the +16th century. Here it occurs as far as 200 miles inland (Mathew, 3). At Kilepwa, just south of Malindi, such porcelain occurs at contemporary levels (Kirkman, 2), as also at Mogadishu.

^f Freeman-Grenville (2). In a tomb with an inscription dated +1399 at Gedi, Kirkman (4) found sherds of Chinese porcelain of all dates from the +13th century onwards, becoming abundant after c. +1325 (Fig. 982, pl.).

^g Hūlagu Khan sacked Baghdad in +1258; cf. Vol. 1, p. 224.

^h Chinese porcelain from the +13th century onwards has been found at the famous site of Zimbabwe in the south of Rhodesia; McIver (1); Caton-Thompson (1); Stokes (1). This is quite far south, about the same latitude as Sofala on the Mozambique coast. On inland finds see also Davidson (1), p. 239.

ⁱ Chinese +14th-century celadon and later porcelain has been reported from Madagascar; cf. Deschamps (1); Grandidier & Grandidier (1), pl. 4.

^j Tr. W. Hichens, mod., in Freeman-Grenville (2). This is as much as to say:

'Their feasts were decked with Seric porcelain bright
Each bowl with finest graving overlaid
And in the midst the crystal pitchers made
Glitter and glow above the napery white.'

(vii) *China and Australia*

Who first navigated the waters of Australia? We know that New South Wales was named by Captain Cook in +1770 and that Captain Dampier had explored the north-west and western coasts of the continent in the years +1684 to +1690. Before that, a long series of Dutch surveys is equally established—first contact in +1606, study of the northern, western and southern shores by Zeachen, Edels, Nuyts and Tasman between +1618 and +1627, the naming of Western Australia as New Holland in +1665. Sixteenth-century recognitions are more controversial, but it seems quite probable that either Cristóvão de Mendonça in +1522 or Gomes de Sequeira in +1525 trod upon Australian land and met its aboriginal people.^a A French claim for +1503 is still more shadowy.^b In recent times, however, the question of a possible pre-European discovery of the great island continent by Chinese sailors has been raised in serious form.

The subject is interesting partly because of the wide area of the Southern Seas over which Chinese discovery and traffic did certainly extend. The Chinese had maritime and commercial relations with the Philippines,^c Java,^d Bali,^e Borneo and Sarawak,^f and the Moluccas and Timor,^g not only in the time of the great Ming expeditions, but also at least as far back as the Sung, when Chao Ju-Kua wrote his classic description of sea trade (*Chu Fan Chih*) about +1225. Of the traffic with Nan Hai,¹ the South Sea Islands or East Indies, the most complete account is probably that of Wang Ta-Yuan, who wrote his book, the *Tao I Chih Lüeh*, about +1350, from notes gathered during his own travels in those parts from +1330 to +1349. Chinese influence in these far-flung Indonesian island countries is shown today (as in East Africa) by the omni-

^a See Peres (1), pp. 120 ff.

^b Cf. Stefánsson & Wilcox (1), p. 626, referring to Binot de Gonneville. It is also claimed that Guillaume le Testu sighted Australia in +1531. But the Lusitano-French maps of the +16th century (+1536 to +1550) may be interpreted as implying early Chinese knowledge of Australia rather than early French. These maps depict consistently (as no earlier ones do) a large continent (Greater Java) south of Java. Collingridge (1), p. 306, after exhaustive study, came to the conclusion that the early Portuguese navigators in the East Indies must have got this information from Chinese or Malay maritime sources (cf. his pp. 166 ff., 180 ff., 192, 220), and passed it on to the French. The tradition of two island Javas, a 'Great' and a 'Lyttil', goes back much further, for it is found in Marco Polo (Yule (1), vol. 2, pp. 272, 284) as well as the later travellers Odoric, de Conti and Jordanus Catalanus (Yule (3), pp. 30 ff.). Before +1536 these appear on European maps just as two large islands (cf. Collingridge (1), pp. 26 ff., 44, 106, 120). It is true, as Lo Jung-Pang (7) has pointed out, that there was a similar confusion between two Javas (Shê-pho² and Chao-wa³) in the Chinese literature, but Schlegel (9) adduced much evidence to show that while one was modern Java the other was some place on the Malayan coast; moreover they were not distinguished as the greater and the lesser. Though the question is complex, there is much interest in Lo's suggestion that one of the Chinese Javas might have been Australia.

^c *CFC*, ch. 1, pp. 36 b ff., tr. Hirth & Rockhill (1), pp. 159 ff. See also Laufer (29); Wada (1); Rockhill (1), pp. 267 ff.

^d *CFC*, ch. 1, pp. 106 ff., tr. Hirth & Rockhill (1), pp. 75 ff.

^e *CFC*, ch. 1, p. 13 b, tr. Hirth & Rockhill (1), p. 84.

^f *CFC*, ch. 1, pp. 34 b ff., tr. Hirth & Rockhill (1), pp. 155 ff. Cf. p. 461 above.

^g *Tao I Chih Lüeh* (+1350), pp. 62 b ff., tr. Rockhill (1), pp. 257 ff., 259 ff.; cf. Fêng Chhêng-Chün (1), p. 87. Wang Ta-Yuan tells the story of the early +14th-century merchant captain Wu Chai,⁴ whose unfortunate voyage to Timor ended with the loss of most of his crew.

¹ 南海

² 閩婆

³ 爪哇

⁴ 吳宅

presence of ceramic pieces, many of high quality and great beauty.^a A rich Chinese traffic with Borneo, for example, especially active in the Thang,^b traded ceramics, beads and metal tools for the edible birds' nests of the Niah caves, for hornbill ivory,^c and for rhinoceros horn.^d The abundance of fine Thang ware, such as jars, in various parts of Borneo, demonstrates that the trade was already old in the time of Chao Ju-Kua.^e But Sarawak affords dated pieces of Chêng Ho's century also.^f And much further evidence assuredly remains to be discovered.

Since Timor is only just over 400 miles from Port Darwin, there seems no inherent improbability in a visit of Chinese ships to that part of the Australian coast at any time from the +7th century onwards.^g Hence the interest of the new study of Fitzgerald (7a, b), who, after disposing of several baseless claims, drew attention to the finding, undisputedly authentic, of a Chinese Taoist statuette, about 4 in. high (cf. Fig. 991, pl.), near the shore at Port Darwin. It represents Shou Lao¹ (the 'spirit of longevity'), mounted on his vehicle the deer, and carrying the peaches of immortality in his hand.^h The discoverers in 1879 found this 4 ft. below the surface of the ground among the roots of a banyan tree at least 200 years old which had to be removed in the course of road-making.ⁱ Black with age when unearthed, the statuette is in style Ming or early Chhing, quite reasonably contemporary with Chêng Ho.^j Its deposition may thus well have antedated the earliest European discoveries of Australia. That the image is Chinese is certain, but it would be hard to prove that it was left there by the crew of a Chinese junk rather than by Malay or Sunda fishermen who, like all South-east Asians, have treasured cult-objects of Chinese origin. The Macassarése and Buginese used to make annual visits to the Australian coast, following the monsoons in going and returning, and written records of their periodical residences are plentiful from the +18th century onwards. In exchange for natural products such as turtle-shell, fish and pearls, they traded food, cloth, tools, tobacco and similar goods. These visits were broken off by the Australian Government in 1907, but the aboriginal inhabitants still look back (not, it seems, altogether justifiably) at their contacts with the Malays as if to a Golden Age. That the Chinese themselves were not far out of the picture, however, is shown by the fact that of all the things which the Northerners came for, trepang was

^a For the Philippines see Cole & Laufer (1).

^b Details in Harrison (1), from whom these words are taken. Domingo de Navarrete noted much china-ware in Borneo in +1657; cf. Cummins ed. vol. 1, p. 111.

^c This comes from the helmeted hornbill, *Rhinoplax vigil*. An interesting account of Chinese carvings in hornbill ivory has been given by Cammann (6).

^d Harrison (6) describes the trade, and Jenyns (2) reviews Chinese carvings in rhinoceros horn as well as the old beliefs about its magico-medical efficacy. The classical treatment of this still remains, however, Laufer (15).

^e See Harrison (4, 5). On Sung ware see Noakes (1); Harrison (2, 3, 7); Sullivan (5, 6, 7, 8).

^f See Thien (1); Pope (1).

^g Cf. the evidence given in Vol. 3, p. 274, that an astronomical expedition from China in +724 went as far south from Sumatra as about 15° S. See also p. 567 below.

^h See Doré (1), vol. 11, pp. 966 ff.

ⁱ The site, fixed by chain measurements and therefore still precisely identifiable, is near one of the only two fresh-water springs around the land-locked harbour of Darwin, and in a gully leading down to a small cove with a sandy beach.

^j Wei Chü-Hsien (4), pp. 99 ff., concurs, with art-historical arguments.

¹ 壽老

was stopped several times. No such inhibitions weighed upon Liu Chhang,¹ however, the last of the emperors of the Nan Han dynasty in the Wu Tai period, who stationed a whole division of soldiers near Lienchow and had them instructed in pearl-diving. The texts concerning these men² say that they weighted themselves with stones and dived below 500 ft. (which must be an exaggeration), so that one after another died of drowning or sharks. But as soon as the Sung armies took Canton in +971, this use of troops was abolished.

One of the earliest texts which attributes to the Tan people the greatest role in the pearling industry is the *Thieh Wei Shan Tshung Than*² (Collected Conversations at Iron-Fence Mountain) written about +1115 by Tshai Thao.³ In a long and interesting passage^b he tells us that the fishermen arrange ten or more of their boats (*hai thing*⁴) over the pearl beds in a ring, and let down on both sides mooring-cables attached to rocks which lie as anchors on the bottom. Then the Tan diver, having attached a small rope to his waist,

takes a deep breath and plunges straight down from 10 to 100 ft., after which he leaves the mooring-cable and feels his way to collect the pearl-oysters (lit. pearl-mothers, *chu mu*⁵). After what seems only a few moments he urgently needs air, so he gives a big jerk to the waist-rope, and the sailors on the boat, seeing the signal, wind this rope in, while at the same time the diver climbs up along the mooring-cable (as fast as he can).^c

From this it would seem that windlasses were employed, and that the waist-rope probably remained attached to the main cable by a smooth loose ring, so that the diver was rapidly brought back to his way of escape when the winding-in began. Tshai Thao continues with a graphic account of the agonies of divers who overstepped by accident the narrow limits of safety, and the means taken to revive them,^d saying that among those who see and admire pearls in ordinary society, very few have any conception of what it costs to get them. The same emphasis, especially concerning the dangers from sharks and other evil beasts of the sea, is found in the long account of Chou Chhü-Fei in his *Ling Wai Tai Ta* sixty years later.^e He adds little to the technicalities however, except to say that baskets are also let down on long cords with the divers themselves, a further

¹ E.g. *Sung Shih*, ch. 481, p. 2b; *Wen Hsien Thung Khao*, ch. 18 (p. 179.2), ch. 22 (p. 220.2); *Ling Wai Tai Ta*, ch. 7, p. 7b, etc.; full details in Schafer (10).

² Ch. 5, pp. 22a ff.; much abridged tr., from a later quotation, in Schafer (10), p. 164.

³ Tr. auct.

⁴ Since 40 ft. is the maximum depth for working long periods (as is now possible using oxygen equipment) without decompression halts on the way up, the unassisted pearl-divers of old, going as much as three times as deep though for shorter times, may sometimes have suffered from 'the bends', i.e. caisson-disease, and diver's palsy. At high environing pressures the blood dissolves much more of the inert gases (especially nitrogen) than normally, and when the pressure is reduced these separate as actual bubbles in the blood-stream and the nervous system, causing dire effects. Chinese powers of observation and inference being what they were, one would hardly be surprised to find in some early Ching text a recognition of the desirability of a decompression halt, the need for which might have become apparent after the introduction of air-pipes.

⁵ Ch. 7, pp. 6b ff., tr. Schafer (10). The divers 'often meet with some marvellous creature which gapes its mouth, exhales and inhales...—giant clams? The worst fish is the 'tiger-fish' or spiny clamobranch (*tsih sha*)—not now identifiable.

¹ 劉鋹

² 鐵圍山叢談

³ 蔡條

⁴ 海艇

⁵ 珠母

⁶ 劉鋹

precaution since these could be wound in at leisure. One begins to get a picture of slow but continuous improvements in diving technique through the centuries, leading to the inventions of the Ming with which we started.

There is nothing improbable in the techniques described in the *Thien Kung Khai Wu*. Indeed, they may be quite ancient. A passage from *Pao Phu Tzu* (c. +320) includes, among magical recipes, the following:^a 'Take a real rhinoceros horn more than 1 ft. long and carve on it the shape of a fish, then put one end in the mouth and enter the water—the water will open out 3 ft. on all sides, and you will be able to breathe in the water.' Perhaps this is a concealed reference, in the alchemical manner, to a diver's tube. In any case both breathing-tubes and diving-bells of a kind are alluded to by Aristotle^b and other ancient writers such as Vegetius. A German ballad of +1190 (i.e. about Li Chao-Thao's time) mentions the breathing-tube of a diver,^c and the first European illustration occurs in the work of the anonymous Hussite engineer about +1430. It is of much interest that between this time and that of Sung Ying-Hsing, Leonardo sketched, in the *Codex Atlanticus*, a breathing-tube such as was used by Indian Ocean pearl-divers;^d and this, besides having spikes to keep off fishes, is strengthened against collapse under pressure by just such metal rings as those referred to in the *Thien Kung Khai Wu*. But the pressure of the water on the diver's lungs must always have been the great limiting factor for the attempt to use atmospheric air. It is therefore interesting that bellows for pumping it down the tube are mentioned in an Arabic work on hydraulic engineering of about +1000, and it would be interesting to know whether the Chinese of the Sung period also used them.^e The first European mention of a double pipe for breathing in and out occurs in the works of Borelli (+1679),^f and Halley in +1716 combined such pipes with a diving-bell. We have not

^a *TPYL*, ch. 890, p. 2b, tr. auct. This text was attributed to the *Huai Nan Wan Pi Shu* by an oversight in Yeh Tê-Hui's reconstruction of that book.

^b *Problemata Physica*, xxxii, 5 (960 b 21 ff.). The *Problemata* as we have it now is not the book that Aristotle wrote, but it certainly stems from the Peripatetic school, and belongs to the -3rd and -2nd centuries (just as much of the *Mo Tzu* book was written by the Mohists and not by Mo Ti, cf. Vol. 2, p. 166). The passage on diving techniques could have been a still later interpolation but there is really no adequate stylistic or other philological reason for thinking so. Moreover there is a reference to these techniques in an Aristotelian text of undoubted genuineness, the *De Partibus Animalium*, II, 16 (659 a 9 ff.). Talking of elephants, Aristotle says: 'Just, then, as divers are sometimes provided with instruments for respiration, through which they can draw air from above the water, and thus remain for a long time under the sea, so also have elephants been furnished by Nature with their lengthened nostril... Thus one kind of artificial aid at least was known in -4th-century Greece. It was not the 'diving-bell' or 'diving-helmet' of the *Problemata*, but all these devices are so simple that there seems no need for hesitation in ascribing them to the -2nd century. We owe thanks to Mr Geoffrey Lloyd for helping to clear up this question.

^c See Feldhaus (1), col. 1119. It is that of Salman and Morolf, and the passage is: 'Eyn rore in daz schiffelin ging, da wirt Morolf den atem ving.'

^d Folios 7ra, 333va and 386rb; an illustration is reproduced by Feldhaus (1), col. 1120, (18), pp. 136 ff. See also McCurdy (1), vol. 2, pp. 162, 215 ff.; Ucelli di Nemi (3), no. 78. Leonardo himself makes (in another MS.) the reference to the Indian Ocean. Many other designs date from this time, e.g. that of Francesco di Giorgio, reproduced in Brinton (1), fig. 27.

^e See Krenkow (1).

^f That other component of the modern deep diver's outfit, the dress, also has Chinese antecedents. Domingo de Navarrete, when journeying down the Grand Canal in the winter of +1665, was much impressed by the fur-lined hide overalls which permitted fishermen to stay casting their nets for a long time while immersed up to the neck in ice-cold water. Such 'diving-suits', with gloves attached to the oars, were also used by rowers. See Cummins (1), vol. 2, p. 227.

Covered Swoopers^a (Mêng-chhung¹); these are ships which have their backs roofed over and (armoured with) a covering of rhinoceros hide^b (*i hsi ko méng fou^c chi pei²*). Both sides of the ship have oar-ports; and also both fore and aft, as well as to port and starboard, there are openings for crossbows and holes for spears. Enemy parties cannot board (these ships) (*ti pu té chin³*), nor can arrows or stones injure them. This arrangement is not adopted for large vessels because higher speed and mobility are preferable, in order to be able to swoop suddenly on the unprepared enemy. Thus these (Covered swoopers) are not fighting-ships (in the ordinary sense).

Combat-junks (Chan hsien⁴);^d combat-junks have ramparts and half-ramparts^e above the side of the hull, with the oar-ports below. Five feet from the edge of the deck (to port and starboard) there is set a deckhouse with ramparts, having ramparts above it as well. This doubles the space available for fighting. There is no cover or roof over the top (of the ship). Serrated pennants are flown from staffs fixed at many places on board, and there are gongs and drums; thus these (Combat-junks) are (real) fighting-ships (in the ordinary sense).

Flying Barques (Tsou ko⁵); another kind of fighting-ship. They have a double row of ramparts on the deck, and they carry more sailors (lit. rowers) and fewer soldiers, but the latter are selected from the best and bravest. These ships rush back and forth (over the waves) as if flying, and can attack the enemy unawares. They are most useful for emergencies and urgent duty.^f

Patrol Boats (Yu thing⁶) are small vessels used for collecting intelligence. They have no ramparts above the hull, but to port and starboard there is one rowlock every four feet, varying in total number according to the size of the boat. Whether going forward, stopping, or returning, or making evolutions in formation, the speed (of these boats) is like flying. But they are for reconnaissance, they are not fighting ships.^g

Sea-Hawks (or *Sea-Grebes*)^h (Hai-hu⁷); these ships have low bows and high sterns, the forward parts (of the hull) being small and the after parts large,^h like the shape of the *hu* bird (when floating on the water).ⁱ Below deck level, both to port and starboard, there are 'floating-boards' (*fou pan⁸*) shaped like the wings of the *hu* bird. These help the (Sea-hawk) ships, so that even when wind and wave arise in fury, they are neither (driven) sideways, nor overturn.^j Covering over and protecting the upper parts on both sides of the ship are stretched

^a Perhaps this word requires the reader's indulgence. It is necessary to translate the impression of rushing violent motion. The word 'destroyer' seems natural only because we are accustomed to it in a naval context, just as we are used to the idea that a submarine is not an apprentice sea-soldier.

^b A material of famed use in ancient Chinese armour, see Sect. 30e below.

^c Note that this word, so pronounced, had meanings such as a hen sitting on eggs, or soldiers in ambush.

^d *WCTY/CC*, ch. 11, p. 10a, and *TSCC*, *Jung chéng tien*, ch. 97, p. 8a, have 'Tou hsien' here.

^e It is to be presumed that some kind of crenellated bulwarks are meant.

^f Although nothing is said in either of these descriptions of mast and sails we are reluctant, in view of all else that is known of Chinese shipping, to assume that anything like galleys purely rowed was intended here.

^g For the birds in question see R258 and 314.

^h The text must be inverted here; we translate in corrected form.

ⁱ The significance of this remark, in connection with what has already been said about hull shape of Chinese craft (p. 417 above), will not be missed.

^j This is a most important passage concerning leeboards (see p. 618 above). Conflating *TPYC* with *WCTY* and *TSCC*, it runs: '*chu chhi chhuan sui feng thao nu chang erh wu yu tshé chhing*'.¹⁰ The existence of leeboards in the +8th century gives China a long priority in their invention.

¹ 蒙衝

² 以犀革蒙覆其背

³ 敵不得近

⁴ 戰艦

⁵ 走舸

⁶ 遊艇

⁷ 海鵝

⁸ 浮板

⁹ 圍板

¹⁰ 助其船雖風濤怒漲而無有側傾

raw ox-hides, as if on a city wall.^a There are serrated pennants, and gongs and drums, just as on the fighting-ships.

This text seems to show us that the general principle of projectile warfare at sea from 'armoured' ships which could approach their targets rapidly, deliver a broadside, and make away again, can be traced back to the +8th century at least. Although the Covered swoopers (Mêng-chhung), surely the lineal ancestors of the Turtle ships of Yi Sunsin, are said to be hardly fighting-ships in the strict sense, while the Combat-junks are specifically so termed, this may have been an explanation intended for military readers used to close combat on *terra firma*, and it would be unwise to conclude that grappling and boarding had always been typical of Chinese naval practice in earlier times. Indeed the term Mêng-chhung itself as a designation of naval vessels goes back at least to the +2nd century.^b Then the tendency to cover over the upper deck appears also in the sixth type, the Sea-hawks (Hai-hu), which from the description suggest some kind of converted cargo-boat like the Ma-yang-tzu or the river junks in Sung pictures.^c And the great majority of the crew and soldiers, except perhaps the artilleryists on the topmost deck, were clearly protected in the 'battleships' known as Lou chhuan.

So much for the general principle of ship-armour. But there is more than this, for we have several Chinese records of plating with iron considerably earlier than the time of Yi Sunsin. One scene was the confusion at the end of the Yuan period. In +1366 Ming Shéng¹ had succeeded his father as ruler of an independent State of Shu (Szechuan) which was rising out of the ruins, but Chu Yuan-Chang mounted a Western Expedition against him which began to make its way up the Yangtze valley in +1370. The *Ming Shih* says:^d

Next year Liao Yung-Chung² was deputy commander of the Western Expedition, and followed Thang Ho³ as admiral of the (river) fleet against Shu. Thang Ho had his headquarters at Ta-chhi-khou.^e (Liao) Yung-Chung set off in the vanguard, arrived at Old Khueifu^f and routed its defenders under the (Szechuanese) general Tsou Hsing⁴ and others; then going on he reached the Chhü-thang⁵ Gorge. Here, where the cliffs are very precipitous and the water most dangerous, the Szechuanese had set up iron chains (*thieh so⁶*) (as booms), and bridges (*chhiao⁷*),⁸ to block the gorge horizontally so that no ships could get through. (Liao)

^a Moistened ox-hide was a well-known protection against incendiary projectiles. Cf. p. 449.

^b In Sect. 27g above (Vol. 4, pt. 2, p. 416), we gave a passage from the *Sung Shu*, ch. 45, p. 7a, which uses the expression for fast assault craft apparently propelled by treadle-operated paddle-wheels. The date of the action was +418. Cf. p. 680 above.

^c Cf. Figs. 933, 976, 1032 (pls.) above. But perhaps more probably a ship like the Swatow three-master in Anon. (17), pl. 10. See also Figs. 939, 950, 1013 (pl.), 1028.

^d Ch. 129, p. 12a; tr auct.

^e There is now a place of this name about 200 miles below Chungking, but the locality here referred to must have been somewhere between I-chhang and Pa-tung, i.e. below the gorges.

^f Between present-day Wu-shan and Fêng-chieh.

^g The text reads as if these were iron-chain suspension bridges (which they could well have been), but the account in the *Ming Shih Lu*, Hung-Wu (Thai Tsu) sect., ch. 63, p. 4a, shows that the chains were booms, and that three cable suspension bridges were set up to command them. It says that 'these were fixed to the cliffs on both sides, and provided with flat decks of wooden boards bearing the upright wooden

¹ 明昇

² 廖永忠

³ 湯和

⁴ 鄧興

⁵ 瞿瑄

⁶ 鐵鎖

⁷ 橋