THE CHINA JOURNAL OF SCIENCE & ARTS

EDITED BY
ARTHUR DE C. SOWERBY (SCIENCE)
JOHN C. FERGUSON, PH.D. (LITERATURE & ARTS)



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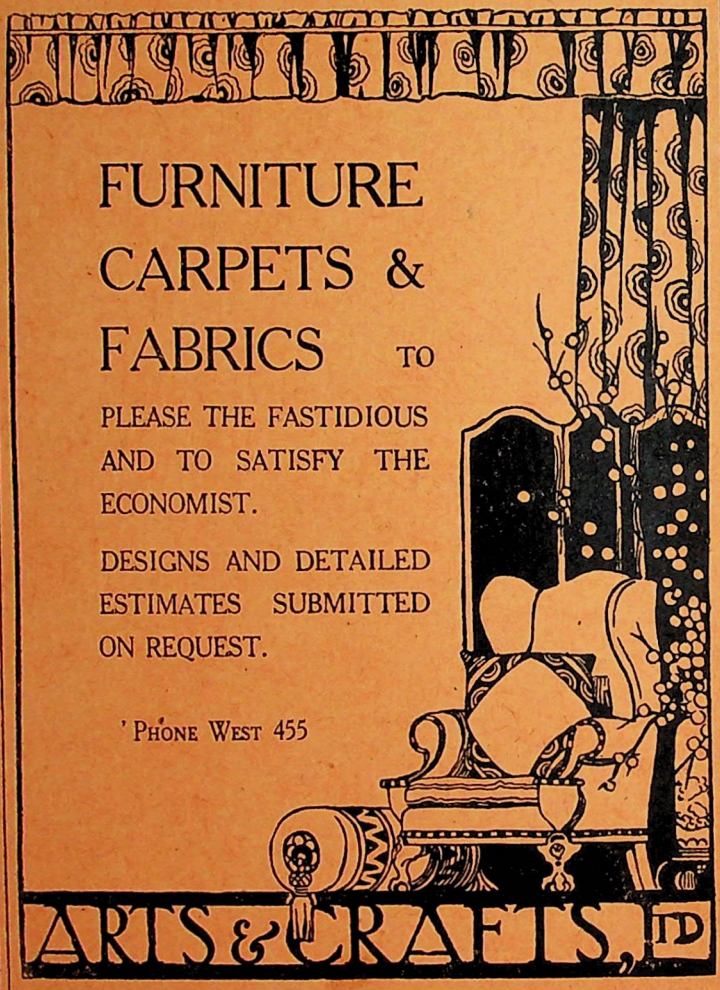

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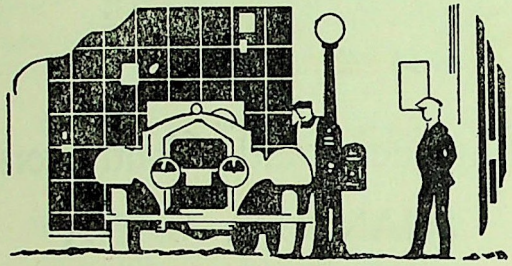

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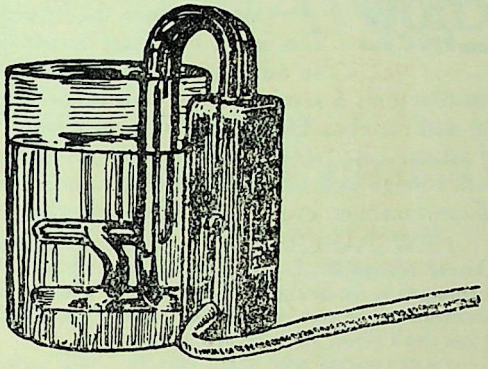

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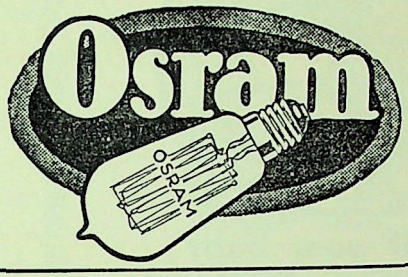

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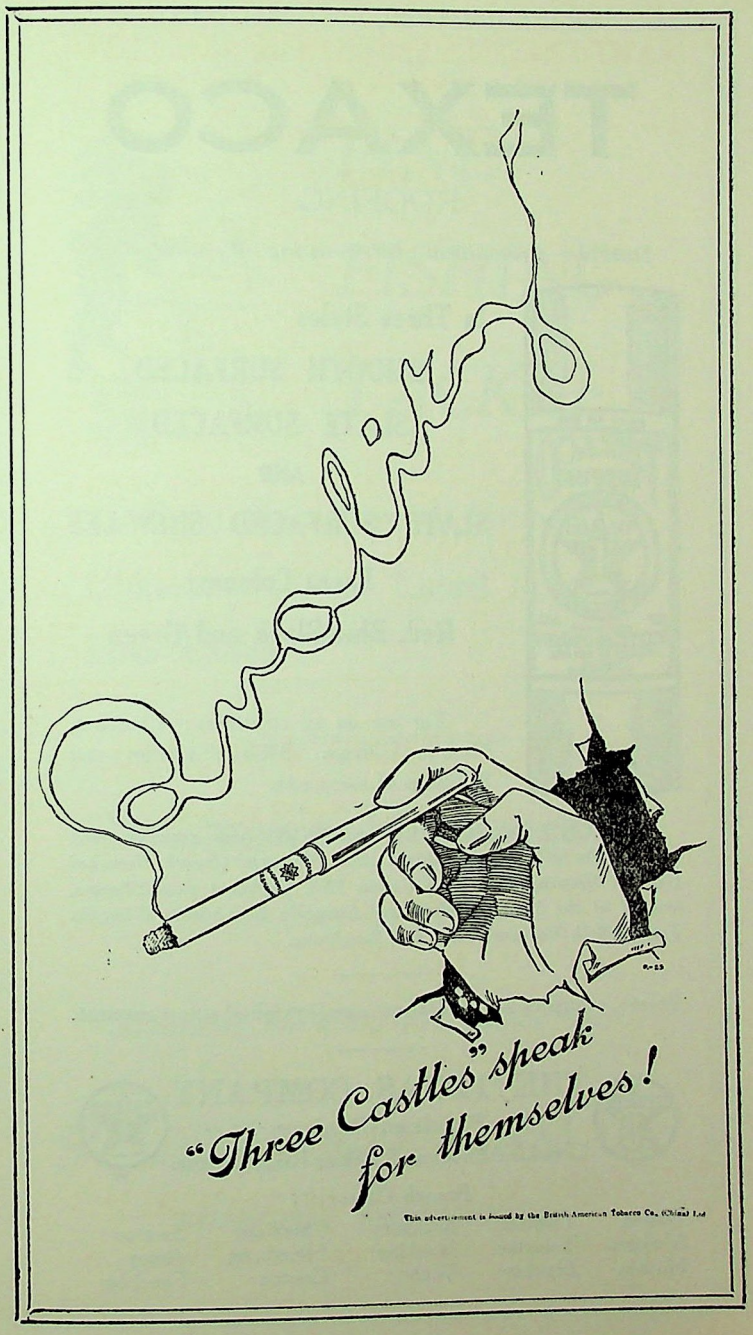
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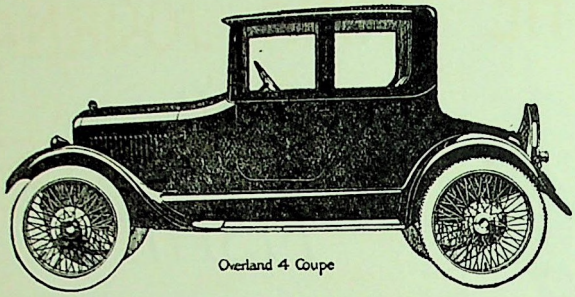
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THE CHINA JOURNAL
OF
SCIENCE & ARTS

[REGISTERED AT THE CHINESE POST OFFICE AS A NEWSPAPER]

VOL. II MARCH, 1924 No. 2

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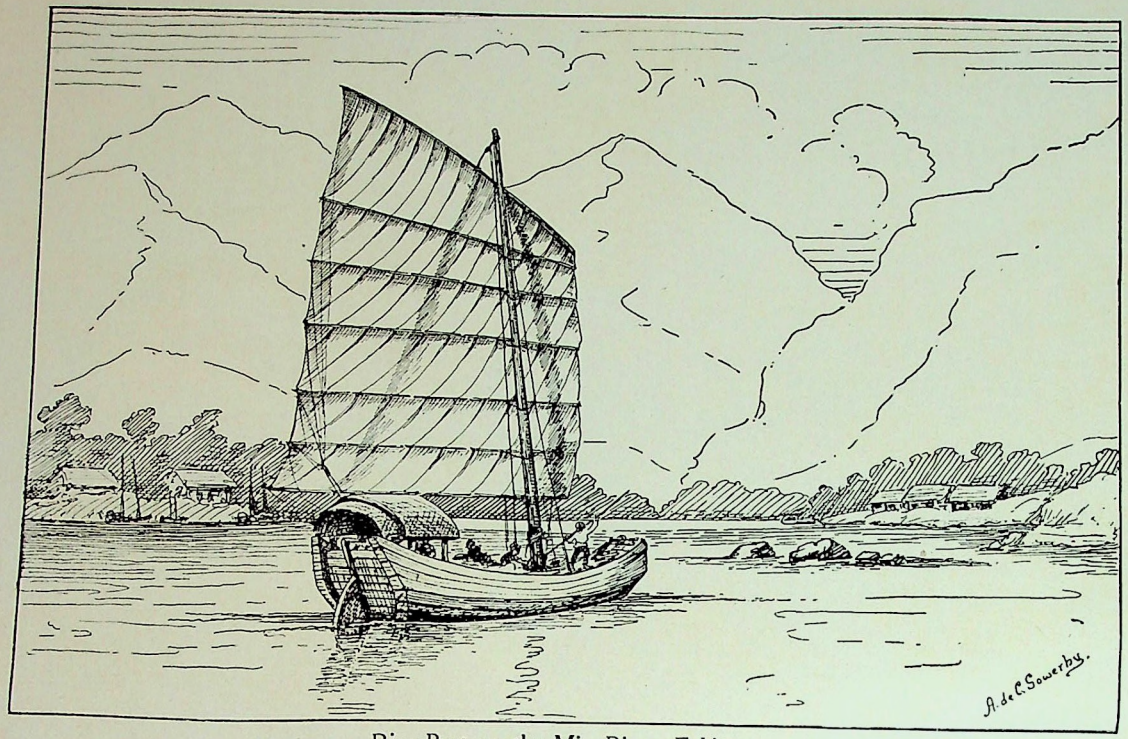


Rice Boat on the Min River, Fukien.

THE CHINA JOURNAL OF SCIENCE & ARTS

VOL. II MARCH, 1924 No. 2

CHINA TEA

Tea comes from China! This statement some of our readers may remember was one of many such that formed headlines in copy books, in the days when school, even for the very young, consisted of sums, arithmetic, spelling and other abominations, with little enough of real interest to the childish mind by way of relief. Such copy book headlines stick in the memory, which may help to account for the fact that in the minds of the older members of the present generation the words "China" and "Tea" are closely associated, it might almost be said are complementary.

To-day, however, the mind of the average European or American will turn more instinctively to India and Ceylon than to China at the mention of the word "Tea," which may be explained very simply by the fact that the teas from these countries have almost completely superseded those of China in the world's markets.

The reader very naturally asks why this should be, and it is with a view to answering this question that we here take up the subject of China Tea, briefly studying the history of the trade from the days when Foochow was the main point of export from China and China tea was consumed throughout the world, to the present day when Foochow can only be considered a fourth-rate treaty port and its trade in tea is but a very small percentage of the greatly reduced volume of China tea sent abroad.

When tea first began to be consumed in Europe, especially in England and Russia, to any considerable extent, Foochow was the port whence it was exported, and it was the hilly country of Fukien province that provided the fragrant leaf.

In those days merchants in London and Foochow grew prosperous, and once established in a good tea firm, a lad's future was looked upon as assured. As much as £1,000 might be paid by his parents for his

apprenticeship, but this mattered little, since sooner or later he would be a prosperous tea merchant.

It was in those days that the world-famed China tea-clippers used to make their long and rapid runs from Foochow to London by way of the Cape of Good Hope, each captain straining every effort to be the first to reach the home port in order to secure the best prices for his valuable cargo. The captain and crew of the first clipper to drop anchor in the Thames received a special monetary prize (£100 to £300) from the owners, hence the keen rivalry between the ships' masters.

It is recorded that in the year 1866 a number of these tea clippers had a race from Foochow to London. The ships that participated were the *Taeping*, the *Ariel*, the *Serica*, the *Fiery Cross*, and the *Taitsing*. Ninety-nine days after weighing anchor at Pagoda Anchorage below Foochow on the Min River, the *Ariel* arrived at the Downs at 8 a.m. on September 6th. Ten minutes later the *Taeping* dropped anchor beside her, while the last ship arrived in the forenoon of September 9th. Not one of these ships had sighted any other during the whole voyage.

The Foochow tea trade steadily increased in volume until in the year 1878, the number of pounds exported reached the enormous figure of 78,765,247. Sad to say this was the climax, and from that time on the trade with Europe declined, though it increased with Australia for a while. Various reasons have been given for this, but the most universally accepted one is that the grôwers, most of whom were but small holders of land, rendered foolish by their greed for gain, began to adulterate the tea they sent to the treaty port with leaves of the sweet potato and other plants. Do what they would, the merchants could not secure the same pure tea that had captured the world's markets, and the end of it was tea from other parts of China, notably from the Hankow district of the Yangtzu Valley, began to gain favour.

Once the decline in the Foochow tea trade had set in things went from bad to worse very rapidly. At length most of the Russian tea merchants, whose trade with Siberia overland by way of Peking and Mongolia was developing rapidly, moved from Foochow to Hankow. Other non-Russian firms opened up in the latter place as well, and ocean-going steamers ascended the Yangtzu to this point to take on cargoes of the leaf for European, American and Australian ports.

The main centre of the export trade in China tea thus shifted from Foochow to Hankow.

Meanwhile, tea planting had been developing in India and Ceylon, and as time went on great provisioning firms were able to put Indian and Ceylon tea on the market at a price considerably below that of even the poorer qualities of China tea. Not only so, but these teas were found to be stronger and to stand more watering than China teas, which fact made them even more economical.

Thus the China tea trade, and especially that of Foochow, was further hit. The final blow seems to have come during the late world war with the prohibition by the British Government of the importation of China tea into Great Britain, and the collapse of Russia, which country had remained the one great foreign consumer of China tea.



Picking Leaf in the Ningchow District.



Withering Green Leaf before rolling.

To-day not more than 30,000,000 pounds of black and 25,000,000 pounds of green tea are exported from China, of which but 7,000,000 pounds of black, and practically no green tea* is sent out from Foochow, as against about 550,000,000 pounds from India, Ceylon, Java and Sumatra.

It may well be asked: Cannot this state of affairs be remedied? The answer appears to be in the negative, at all events for the present.

The strongest reason is that China tea is not so suited to general consumption as other teas. There appears to be something in the soil of India and Ceylon that is lacking in the soil of China that gives the tea what is called "body." It was thought at one time that it might be the methods employed in drying and roasting the tea in these countries that had something to do with the matter, and at considerable expense drying plant as used in Ceylon was set up in China, and the leaves treated exactly as those of the Ceylon plantations. The result was a dismal failure. The tea looked excellent, but, brewed, it was anything but a success.

Yet many forms of China tea have excellent flavour, preferred by many consumers to those of India or Ceylon. So it was thought that if China tea could be produced at about the same price as these teas it might command a more ready market. An attempt, therefore, was made to purchase land in Fukien province with a view to establishing extensive plantations as in Ceylon, and so produce the leaf in bulk at a lower price. Immediately land, which formerly could be purchased for a mere song, went up to prohibitive prices, and this new attempt to revive the China tea trade was brought to naught.

In the Hankow district and the Yangtzu Valley generally, the great trouble is labour. The tea crop is what is called a "snatch" crop, labourers from far and near making a six weeks' or so round trip to pick the tea between the sowing and reaping of the harvests of rice, etc., on their own little plots of land. Instead of, as in Ceylon and India, plucking the tips of the shoots on the bushes, they strip them from base to tip in one sweep of the closed hand, coarse leaves and tender shoots being thrown into the same basket, and having to be sorted out later. One stripping takes place in the season instead of three pickings as in other countries, it being impossible to hold labour long enough for the latter operation in China.

Thus with the inferior soil in China, the lack of honesty on the part of the growers, and the utter impossibility as matters now stand of growing and producing tea on a scale comparable with that in India, it is not to be wondered at that China tea has been knocked out of the world market by those of other countries.

If China were not in such a hopeless state of anarchy, and if foreign enterprise were given a chance, something might be done in the way of looking for suitable soils and extensive planting in the regions where such occur. It is well known that some of the China teas are all that could be desired, and if the circumstances surrounding the production of these were investigated, and up-to-date planting and roasting methods introduced, the result might be an article capable of competing with the other teas, and possessing the superior flavour of all China teas.

* There is a very considerable trade in China itself in the green teas of Fukien, which are highly prized by the Chinese.

But this cannot even be contemplated till some form of law and order exists in China, and vested interest is safeguarded against the hand of the marauder, official or otherwise. Meanwhile China tea, that once held the proud position of being supreme, remains little more than a cipher in the world's markets, and Foochow, once the centre of a flourishing trade and the most important treaty port in China, is dead.

A LUCKY YEAR

According to popular Chinese beliefs based on ancient superstitions and traditions, the present year is going to be a prosperous one for the Chinese people, the reasons for which are as follows :

In the first place it is the year of the " Rat " in the cycle of twelve animals. This means prosperity for the farmer.

Secondly it is the first year of the new cycle of sixty years by which the Chinese reckon time, just as we do centuries.

Thirdly the first day of the year coincided with the first day of spring.

And fourthly the first day of the year in these parts (Shanghai district) was bright and sunny.

These four factors, conspire to ensure a prosperous year, especially for the farmer, and therefore for the community at large.

Foreign merchants in China should rejoice at the prospects, for with everything in favour of a " lucky " year, Chinese merchants and dealers will be more willing to go into commercial ventures, and the net result must be good for business.

For the sake of the uninitiated the Chinese system of marking the passing of the years may be explained.

Sixty years is the Chinese equivalent of the century of western nations. This cycle is divided into twelve sub-cycles, each year of which belongs to a special animal. These are :—

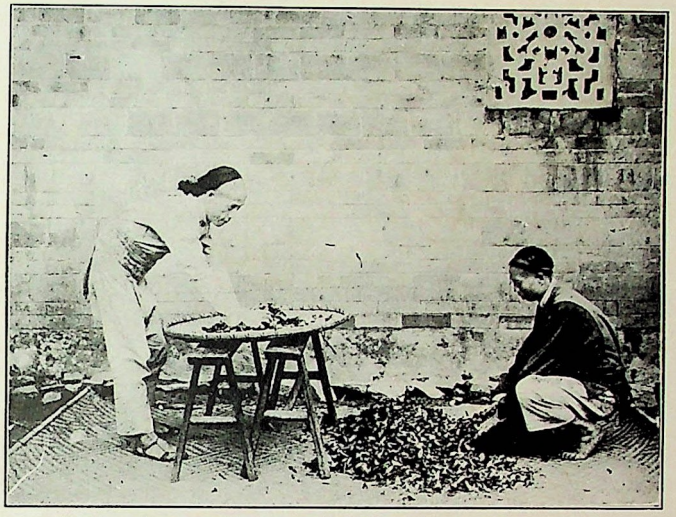
1. Rat 鼠 (甲 子)
2. Ox 牛 (乙 丑)
3. Tiger 虎 (丙 寅)
4. Rabbit 兔 (丁 卯)
5. Dragon 龍 (戊 辰)
6. Snake 蛇 (己 巳)
7. Horse 馬 (庚 午)
8. Sheep 羊 (辛 未)
9. Monkey 猴 (壬 申)
10. Domestic Fowl 雞 (癸 酉)
11. Dog 狗 (甲 戌)
12. Pig 猪 (乙 亥)

(Each year has a special name, given above in Chinese.)

This cycle of twelve years, of course, comes round five times in each 60 year cycle, and the luckiest of all years is the "Rat" year when it coincides with the first year of the 60 year cycle.

When a Chinese is asked his age he will often reply by mentioning the special name of the year in which he was born, leaving the questioner to decide in which set of twelve years his birth occurred.

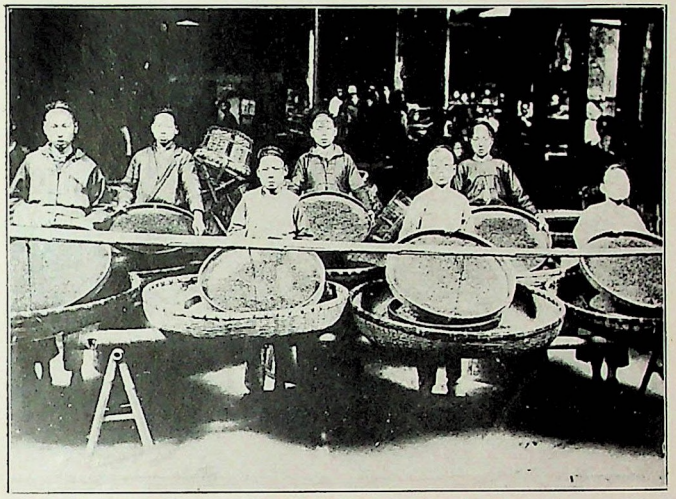
It is to be hoped that the popular belief will be justified, as it is about time things took a turn for the better in this strife-ridden country. If any credence can be given to the theory of the power of suggestion, the prosperity of the present year should be assured.



Rolling the green leaf; usually done with the foot in a tub.



The firing process; first firing. Subsequent firings, usually two in number, are carried out in the same way.



Sifting out coarse leaf, stalks, etc., after the first firing.



A further stage in the sifting and sorting process.



Nothing is wasted. Breaking up tea that has formed into lumps through careless manipulation. This leaf is only used for mixing in inferior grades.



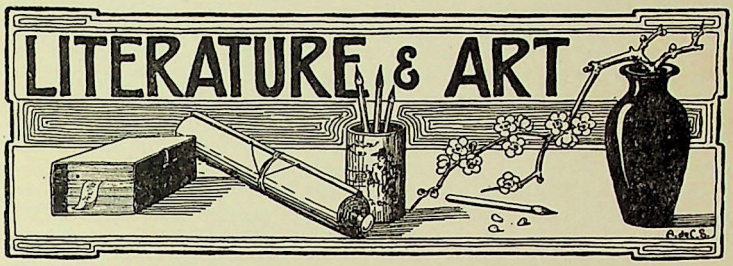
Tea being carried out from the blending floor for packing.



Tea being packed. The best teas are packed while still a little warm from the third and last firing



Sealing up the tea chests. The final stage before being transported to the Treaty Port.



GREY TIMBERS

BY

JULIET BREDON.

Beyond Peking the Western Hills rise into the blue sky, bathed in a limpid magnificence of light which lends a sort of apparitional charm to far things seen through it. "Their crests are piled high upon each other"—so say the poetical old Chinese records—"their summits pierce the Milky Way." Their valleys shelter shrines whose grey timbers exhale a thin, sweet odour ot incense. Ghosts of the worship of centuries follow these temples in their decay, and phantoms of the past haunt their dusty sanctuaries.

Time was when sovereigns and courtiers made munificent gifts to such monasteries and even to-day ephemeral Cabinet Ministers occasionally regild an idol or restore a chapel. But there is one very ancient little shrine—which rivalled in its time the best of Buddha's cathedrals in this countryside, both in antiquity and reputation for sanctity—which is beyond repair. Lost in a maze of farm-houses in the little hamlet of Pai Chia T'an (or "Three Li Village"), its one remaining building is used as a coffin shop. Altars and gods are gone. A stone tablet and a guardian granite lion are all that remain to remind us ot its glory. Even the inscription on the tablet is almost illegible now, while the lion has his nose awry and a faint ironical smile on his half-defaced features.

Legend connects the founding of this ruined temple with a eunuch who, in the reign of the magnificent T'ang Emperor Ming Huang (A.D. 712-762), sought a peaceful retreat in this "White Dragon Vale" and became a monk. His name is forgotten but the reigning title of his erstwhile Imperial Master, "K'ai Yuan," has been incorporated into the name of the shrine which is still called K'ai Yuan Ssŭ.

When faith or world-weariness drove this courtier to spend his fortune, doubtless of ill-gotten gains, in honour of the gods, Ming Huang was on his throne, still in the height of his glory. It was only later that this poet-philosopher allowed his artistic tendencies to sink him in

sensuous voluptuousness. His downfall, like that of many a stronger man, was due to a woman. Unwittingly he sealed his doom on that fateful day, when, surrounded by the most talented courtiers of his vast realm in a setting worthy of the dazzling descriptions of the Arabian Nights, he allowed his choice, guided by one of his pet butterflies, to rest upon the concubine of his eighteenth son, the Lady Yü Huan, eternally famous as Yang Kuei Fei, most beautiful of Chinese women. Now, love is a jealous task-master demanding all, and Ming Huang paid generously for his great affection, giving of his time and talents, till, presently, the virile founder of the Hanlin College and of the Peking Gazette degenerated into the abject slave of his beloved, hearkening to her advice in all matters and idling his time away in her company. Yet, not she herself so much as her followers and the enervating influences of Court life were actually responsible for the fall of the dynasty. The unhappy events which later came to pass were due especially to one An Lu-shan; a Turk by origin and reputed to be the son of a witch. His barbaric energy, his force of character and his unquestionable mental superiority over his contemporaries allowed him to ingratiate himself with Yang Kuei Fei and obtain what we should call nowadays a "pull" in the Palace. In the midst of the hyper-refinement of the time, his rude strength joined to his personal connections permitted him to push himself into the governorship of Peking then an important frontier post against the rising power of the Tartars. Once safely in the saddle there, he raised the standard of revolt, conquered the northern provinces from his master the Emperor, and then met his deserts—death at the hands of his own son. Nor did the sovereign fare much better in the end than his unfaithful servant, since, broken in spirit, he was forced to flee to distant Szechuan, where he ended his days, after having witnessed the slaughter of his fair but faithless Yang Kuei Fei at the hands of rebellious soldiers.

When Ming Huang disappeared, his country fell into the inevitable chaos which follows when an autocratic hand drops from the helm of the ship of state. In the disorder that ensued, the Peking plain became—and remained for centuries—a battleground between the supporters of the "Dragon Emperors" and hordes of invaders. Crowning the Wang Erh Shan, the north-eastern peak of the spur of hills that run down into the fields a few miles beyond K'ai Yuan Ssŭ, there is a grim yet touching memorial of these stormy days, a ruined temple erected by the Khitan Empress Hsiao Jui-chih about A.D. 1000 in honour of her six sons killed before her eyes. All these young princes paid the supreme price in that great adventure of their warlike mother, who, in the absence of their father, personally directed the campaign that ended in the repulse and rout of the Sung dynasty of Southern China. Another monument reminiscent of this age of strife is an old dagoba high up on the hills above Ta Chüeh Ssŭ and to the west of K'ai Yuan Ssŭ. Some say it marks one of those romantic spots where the Nüchen sovereign Chang Tsung (1190-1219) used to rest in his wanderings through the Western Hills which he so dearly loved. But the peasants call it the Liu Lang T'a, or "Tower of the Sixth Wolf," because legend, that so often persists after historic fact grows dim, has it that the famous Chinese warrior, sixth son of General

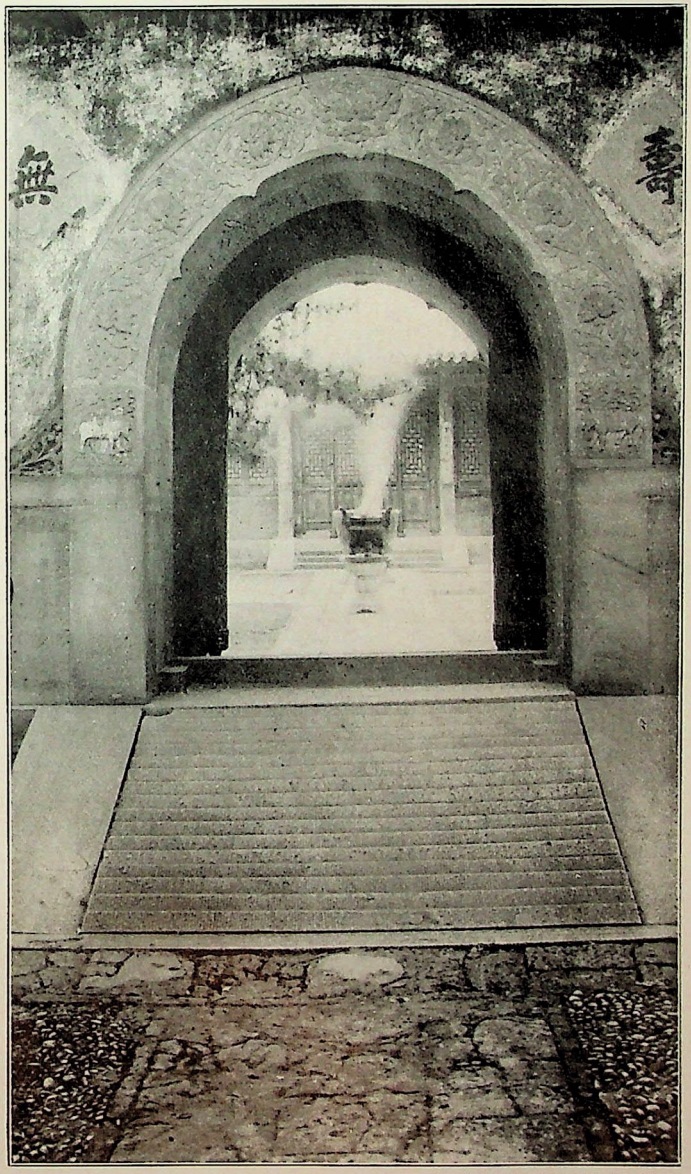


Photo by Mrs. Bertha Lum.

The Entrance to the Memorial Temple of Prince Yi.

Yang Chi Yeh—an ardent and valued supporter of the Sung dynasty in their ceaseless struggles with the barbarian invaders from the North—surveyed the movements of his troops from this vantage point. On the mountain slope a clear gushing spring, so rare in arid North China, bears witness to the intelligence and devotion of the "Liu Lang's" horse, who, when his master was thirsty, struck the rock with his hoof and caused water to flow.

Ghosts of yesterday still seem to haunt the narrow boulder-strewn pass that leads to the old tower sharply silhouetted against the sky. When heavy shadows, like fallen spires, hide the nodding larkspurs and silence the plaintive song of a half-witted shepherd boy, the spirit of Liu Lang and his faithful steed toil up the impossible path again to survey the frightened countryside of other days. And by a trick of the wind playing through an aeolian harp of rocks we seem to near the shouts of the Khitans rise sweeping across the plain, wild nomads knowing no law but the sword, no home but the saddle, no faith but the "black magic" of their Shaman priests.

The feuds and invasions of these savage tribes devastated the land. Not a monument escaped their ravages, and K'ai Yuan Ssŭ fared no better than the rest. Then, in the succeeding century, Time, which deals harshly with Chinese buildings of soft brick and brittle tiles, laid its heavy hand upon the sanctuary, slowly taking toll of roofs and rafters, slowly wiping away the signs of piety.

But long after the smoke of incense had ceased to rise from the altars of the T'ang temple, the charm of its site was still recognized. It had, indeed, a situation calculated to delight the heart of geomancers. Lying under the shadow of the "Spider Hill" (Chu Chu Shan) crowned with a lonely pine whose roots, when cut, still bleed in grief over bygone days—K'ai Yuan Ssŭ stood between the "White Dragon" of Po Chia Shui, hidden in a fold of the hills, on one side, and the "Black Dragon" of Hei Lung T'an. Later, much later according to legend, the mighty Ch'ien Lung himself was so affrighted by the auspicious omen of two dragons playing with the Chu (which, in Chinese, may mean either Spider or the Imperial Pearl) that he ordered the hill cut in half, thus destroying the possibility of the birth, in this propitious locality, of a new sovereign, founder of a new dynasty.

In the days of the Mings, when the Dragons were still free to disport themselves with their friend the Spider, a prince of the Buddhist Church, with the proud title of "T'ien Fo-tzŭ Ta T'ung Fa Wang," was made Abbot of Ta Chüeh Ssŭ, in the reign of the Emperor Hsüan Téh (1425-1435). Those were the days when the "Monastery of the Great Awakening" (Ta Chüeh Ssŭ) was in its glory, when a library of priceless volumes drew scholars there for peaceful research, when the steaming rice boiled continuously in the big ovens, and the long refectory was often filled with pilgrims on their way to Miao Féng Shan, when the little travelling palace was swept and garnished to receive the Sovereign, and Court favourites strolled in the temple garden.

But the holy man, filled with a divine discontent, abandoned the rich monastery urged beyond its prosperous gates by a longing for the

view of "quiet fields and soft air" perfumed with newly-tilled earth. Hearing of the site of K'ai Yuan Ssü, doubtless more attractive then than now, since the village had not yet encroached upon it and the dried up river-bed near by still bore its burden of the waters gushing from the White Dragon's mouth further up the valley, he visited the spot and later built out of his own purse a new temple on the old site.

Again the years rolled over a new K'ai Yuan Ssü, fading and greying it. Then, finally, with the passing of centuries, the Mings were pushed off their throne. New masters came to rule the capital and the countryside, Manchu conquerors, descendants of those same Tartars who fought the "Sixth Wolf." Many of the temples in the Western Hills owe much to their later emperors, men like K'ang Hsi and Chien Lung, but little K'ai Yuan Ssŭ appears to have passed unnoticed. Nevertheless, when the stranger dynasty which so ignominiously ousted the Mings appropriated vast lands both in Peking and in its environs for their adherents, several members of the Imperial family received properties near Pai Chia T'an, some of which still belong to their descendants. Hei Lung T'an, home of the Black Dragon, now in charge of the Peking Gendarmerie as the result of a long lease doubtfully obtained from the degenerate local priest by one of the proscribed Anfuites, stands on Imperial ground. The high peak of C'eng Tzŭ Shan towers over the charming summer residence of T'ung Chiang Ch'ün, brother of Prince Pu Lun, and further to the north lies the magnificent mausoleum prepared for the last Manchu Prince Regent.

Under the Emperor Yung Cheng, certain lands round about K'ai Yuan Ssü were owned by his brother, Prince Yi Yün Hsiang (1686-1730) known as the "Harmonious" who, alone of all the turbulent sons of K'ang Hsi, showed love and loyalty to the new sovereign. Amid the bitter family quarrels that ensued when Kang Hsi's strong hand was removed by death, Yung Cheng, who found himself forced to imprison and even execute some of his unruly kin because they plotted against him, learned to trust Prince Yi. While the behaviour of his co-regents, who managed affairs of state during Yung Cheng's three years' formal mourning for his father, was so unseemly that it led them to disgrace and ruin on the new sovereign's accession, Prince Yi was rewarded with new honours for his faithful stewardship.

Yung Cheng had a retentive memory for benefits and for wrongs. His vindictive spirit showed in his persecution of the Roman Catholic Fathers whom he suspected of too great intimacy with members of the Imperial clan who had conspired against him. How firmly Prince Yi sided with his brother the sovereign is proved by his reply to the missionaries, when they appealed to him to intercede for them with the Emperor in the name of Kang Hsi who had showed them much kindness. "What would you say," the Harmonious Prince replied, "if we were to transport ourselves to Europe and act there as you have done here? Would you permit it for a moment? In the course of time I shall master this business, but I declare to you that China will want for nothing when you cease to live in it, nor will your absence cause it any loss. Here,



Photo by the Author.

The Memorial Temple of Prince Yi.

nobody is retained by force. But nobody will be permitted to remain who breaks our laws or ignores our customs." Boulger, in quoting these words, points out how often their sentiment has since been repeated by Chinese Ministers of State and political writers.

Historians agree that Prince Yi lived not only an upright and honourable life, but a most active one He was often about the sovereign's business, even fulfilling for his brother a last and most intimate service—the choice of the dynastic burial ground. The Hsi Ling, or "Western Tombs," remain to this day a fitting tribute to his taste and a final proof of the confidence and affection which Yung Cheng felt for him.

Soon, too soon, alas! after he had chosen the beautiful site of his brother's tomb, this good man went to rest within his own. Students of Chinese history are prone to ask whether, had fate placed him upon the throne instead of his bigoted relative, the whole course of the dynasty might not have been changed. Could China in general have profited by the wise administrative talent that he showed as landlord of the fields around K'ai Yuan Ssŭ, who knows how many subsequent calamities might have been averted. Speculation, though interesting, is idle. Suffice it to say that Prince Yi's talents, within the scope that Fate allowed them, were appreciated by high and low, and at his death there were many spontaneous manifestations of affection and esteem, from the Throne downwards throughout all ranks of the people.

Not the least touching tribute to the memory of this good man came from his peasant-tenants in the Western Hills who sent a petition to the Emperor begging permission to erect a memorial shrine in honour of their Master on land close to K'ai Yuan Ssŭ. The gift of these humble folk was indeed worthy of their Prince, since it entailed the sacrifice of valuable food-land from their fields.

The Sovereign's gracious permission and lordly contribution is recorded on a stone tablet which we may still see in the temple courtyard, while opposite, on the other side of the handsome terrace, is a similar slab engraved with a rather pathetic list of humble donations from the villagers: the Wang family—forty coppers, the Li family—thirty coppers, and so forth.

When the memorial shrine was completed, it was presented to the house of Prince Yi, as a living tribute for all time to the well-beloved landlord of the countryside. There is no need for the people to be ashamed of their gift, nor can the Soul of the good Prince feel that he rests in a temple unworthy of his dignity. Unlike so many temples of the Western Hills, where cramped courtyards and low buildings huddled together forbid an impression of grandeur, this shrine has been planned on a grand scale. There is a wide approach, with grass and trees, which separates it from the village, and at the end of this private common a charming open-air theatre. There is an outer red wall, softened by time to the pink of the Imperial City walls—pink with a tinge of grey ashes in it. Behind this is an outer court with more trees and glorious vistas of mountains, the wounded "Spider Hill" to the east, the peak of Ch'eng Tzŭ Shan to the west. Here is a central prayer-hall dedicated to the gentle Kwanyin,

on whose birthday a pretty service is still held, with incense burning in the brazier facing it under the pines. Finally, there is an inner courtyard with the tablet-house where the spirit of the "Harmonious Prince" is enshrined in the simple wooden tablet guarded by four magnificent white pines. Happy indeed is the soul whose purity has earned such a resting place, happy in the sheltering mountains behind the sanctuary, alive with lights and shadows, softened by resting clouds. Moreover, the pines are a perpetual orchestra to soothe a spirit. Now they sigh softly, now they wail like wandering wolf-packs, and again they roar like the breaking of waves on a sea-beach. And, on quiet nights, sometimes they stand quite still, their songs forgotten. Only, then, with their thousand fingers pointing heavenwards, they appear to be huge candelabra shining with the stars.

Some great artist, worthy to collaborate with a builder who gave a noble sweep to eaves and a fine sense of proportion to courtyards, planted the trees in this temple; not only the white pines which stand alone, in a separate little gardens on either side of the tablet-house, but all the other trees that adorn the place, the umbrella-pines whose outstretched arms drape the roofs of the main hall like green scarves, the sweet-smelling catalpas leaning over a "tiger-skin" wall, the flowering quince that in spring sends a light snow of petals on the terrace, the trumpet-vine whose fiery blossoms glow against the simple "spirit-screen" beside the guest chamber, and the ginko that drops golden coins on the grey timbers of a falling roof.

For, alas! the Shrine of the good Prince Yi is crumbling. It was another prince of the same name, unworthy successor of the line his Harmonious Ancestor founded, who began the ruin of the family. This man was the ambitious Councillor Tsai Yuan, who, as Imperial Commissioner, was responsible for the make-shift negotiations which brought Anglo-French troops into the Chinese capital in 1860. His treachery, which caused the captivity of Parkes and Loch, brought Allied vengeance on the sovereign and direct retribution in the destruction of the Summer Palace. When retribution overtook him personally, the traitor fled to Jehol with the Emperor Hsien Féng, leaving his own mansion in the Tartar City to be occupied by the two foreign envoys, Lord Elgin and Baron Gros. But still the lesson was not hard enough. At Jehol the master-schemer made a bid for supreme power at his sovereign's death, pitting himself against the Empress-Dowager Tzŭ Hsi for the regency in the spectacular "Tsai Yuan conspiracy." But he proved no match for his Imperial mistress, who, with Yung Lu and the faithful eunuch An Téh-hai, mastered him and his fellow-plotters on the return of the Court to the capital. Then, truly, Tsai Yuan "ate bitterness," losing all his ranks and titles and gaining nothing but the Imperial permission to commit suicide.

His disgrace, as is inevitable in China, was shared by his entire family who never recovered from the blow, declining in wealth, power, and prestige, until 1900 brought the last shock to their dwindling fortunes. As was but natural, the Shrine of Prince Yi suffered also. There was no money for repairs, and eaves fell and timbers faded through these years of

disaster. Indeed, the Yi Wang Ssŭ might have sufferred the fate of K'ai Yuan Ssŭ but for the energy of the priest in charge, a devout and cultivated man, proud of the traditions of his sanctuary. To him, and to the contributions which he has managed to secure from those who still respect the memory of a princely patriot, are due certain repairs and restorations which have been carried out in a spirit of harmony that should be pleasing to the soul of the "Harmonious Patron."

And every year, in autumn, the envoy of the heir of the house of Yi, a child, last of his illustrious line, comes, to burn incense before the tablet of the "Illustrious Ancestor," while theatricals are held in the open-air theatre, and the sunny courtyards resound with the laughter of children and the prayers of simple peasant-folk, whose names, mayhap, are still among those on the stone tablet where the Wangs and Lis, two hundred years ago, recorded their gifts of coppers in memory of a good man.

FOLK MUSIC IN CHINA

BY

ELIZABETH N. SHIROKOGOROFF.

In the present article I wish to call the attention of musicians and others interested in Chinese folk-lore to the Folk Music of the Chinese. This is almost unknown to Europeans, notwithstanding the fact that the study of Chinese culture in general and art in particular is very advanced. There have been, however, several publications on Chinese music since those of the Reverend Father Amiot,* as, for example, the recent publications of Soulie† and Fischer,‡ while the Chinese literature treating of Chinese music is really enormous, there being hundreds, possibly thousands, of works in existence. Lately Mr. Jasser, professional musician and composer of the Moskow Conservatory (the highest musical school), who lived for a short while in China, has prepared a very interesting publication on Chinese music, treating the subject from a purely musical standpoint. His predecessors seem to have been unable to do this, being sinologues rather than musicians. But all these studies written by Europeans, and, as far as I know, all Chinese treatises of this matter, deal with the 'official' music of the Chinese that is strictly regulated by the principles elaborated by Old China.

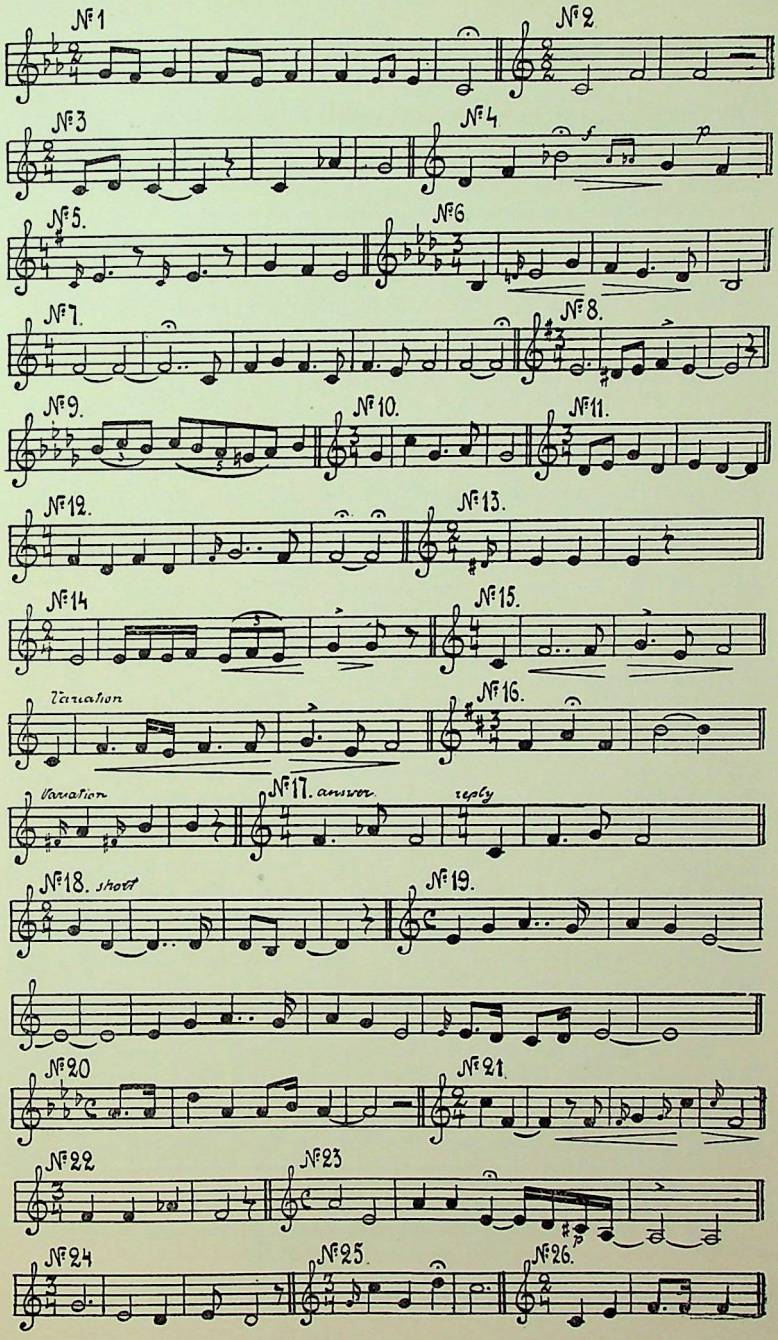
This classic Chinese music is already known, but the folk-music is not known at all. Meanwhile the folk-music is probably the basis of the classical composers' music, a source for their musical fantasy, much as the work of European classical composers like Beethoven and others, and especially of modern musicians, developes and beautifies the musical treasure of the people which is often quite national and typical of its ethnographical environment. This very simple and easily investigated subject appears to have escaped the attention of professional musicians and historians of music. However, the recent movement to collect and investigate folk-music as ethnographical material has already given fruitful results. Long before the war, a society was organized in Moscow by conservatory professors and ethnographers to collect folk-music material. In a comparatively short period this society collected a considerable number of popular songs, as well as very simple musical phrases, such as are cried by the street-hawkers and pedlars in Russia. Modern Russian composers such as Grechaninoff, Liadoff, Arensky and several others associated their names with this work. The publications of the society now number several volumes.

In the Museum of Anthropology and Ethnography in Petrograd in 1911-12 a section of musical phonograms was also organized, which, according to the organizer's idea, was later to be developed into a special department for such studies. Since that time every investigator has had

* "*De la musique des Chinois tant anciens que modernes*" in Memoires concernant l'histoire, les sciences, les mœurs, les usages, etc., des Chinois, par les missionaries de Pé-kin. Vol. VI. Paris 1780.

† *G. Soulié* 'La Musique en Chine.' Paris, 1911.

‡ 'Beiträge zur Erforschung der Chinesischen Musik.' Leipzig, 1910.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Variation
№16.
Variation
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with him a phonograph and rolls to collect original folk-music amongst the peoples of Siberia, and Asia in general. In the United States this movement has already created a literature and the study of the native music is now very far advanced*.

As regards the collecting of folk-music in this part of Asia, it is not so advanced, and we have only very incidental material, collected by a few investigators†.

During expeditions with my husband, Dr. S. M. Shirokogoroff, into various parts of Eastern Siberia and Manchuria, I collected considerable musical material. The greater part of these are in phonograms and are now in the Museum of Anthropology and Ethnography of the Russian Academy of Science in Petrograd. A small part was taken down on the spot from ear, and is now at my disposal. This collection was completed during our visit to Peking in 1917-18.

I give below a series of Chinese street merchants' calls and songs, which are especially typical of the Chinese. The variations in this kind of musical manifestation is really wonderful, and it is to be assumed that the number of these short songs in China runs into several thousands‡

These songs here given are, of course, characteristic of the Northern Chinese. On the streets of Shanghai the songs of a different style are to be heard. I here give some examples of the Pekinese songs.

To show the variations that exist in these kinds of folk-music manifestations, I also give here some Chinese, Tungus and Manchu simple songs such as they sing not for artistic purposes but for their own amusement and distraction, or in their shamanist performances. It can be seen that the Manchu and Tungus songs are composed on other principles than are those of the Chinese.

These examples show how complicated is the question of the music of these peoples. They show such differences in the various groups that they are distinguishable one from the other without any minute analysis. It is beyond doubt, then, that this kind of folk-art is connected with other manifestations of folk-culture, folk-psychology and particularly esthetic development. Therefore the study of folk-music must be conducted in future hand in hand with our knowledge of languages, and, in China, of dialects. The geographical distribution of the songs and of the simpler pedlars' calls may also be of great interest, as they are the natural, almost unconscious, creative power of the people. Collections and studies of such songs may be useful to historians, but they are also useful to musicians, who doubtless, will discover some new themes and motives for their compositions.

The origin of these songs is also very interesting. In order to show an example of song origin, I give here a Tungus song which is based on a motive borrowed directly from nature.

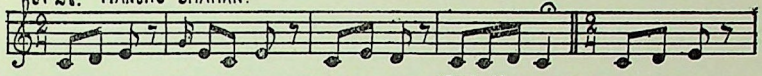
The Tungus used to imitate the male deer when it cried in the beginning of Autumn challenging other males to fight. For this purpose,

* Publications of the Smithsonian Institutions.

† For example, Prof. A. Rudneff.

‡ In the Moskow region alone several hundreds of these songs have been collected.

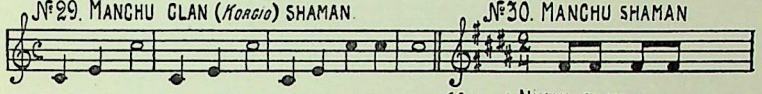
№27. Manchu shaman.



№28 Manchu shaman.

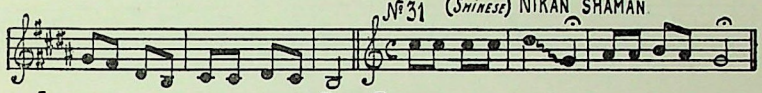


№29. Manchu clan (*Korgio*) shaman.



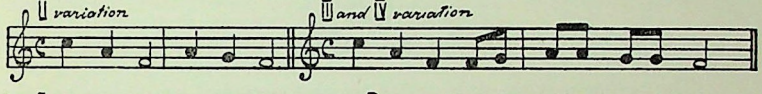
№30. Manchu shaman

№31 (*Shinese*) Nikan shaman.



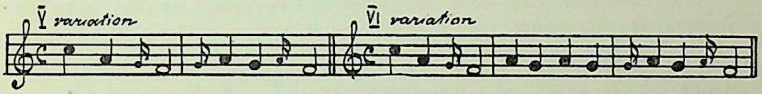
I variation

II and IV variation

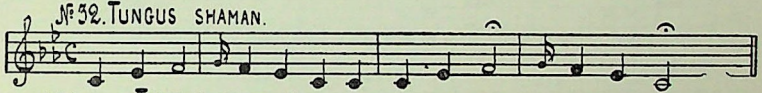


V variation

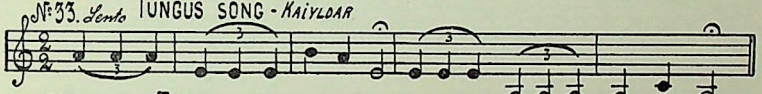
VI variation



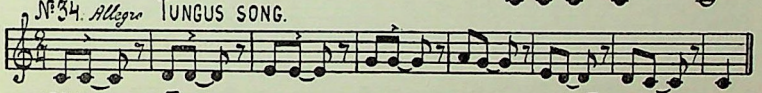
№32. Tungus shaman.



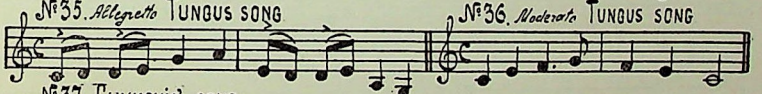
№33. *Lento* Tungus song - *Kaiyloar*



№34. *Allegro* Tungus song.

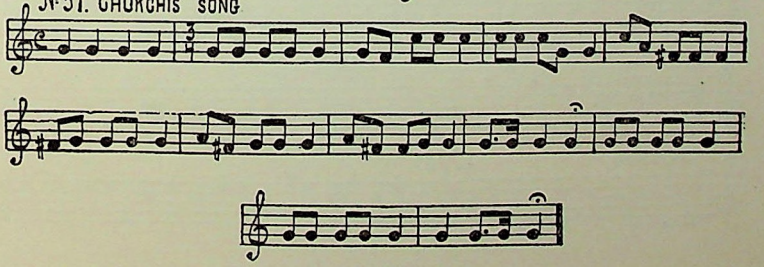


№35. *Allegretto* Tungus song

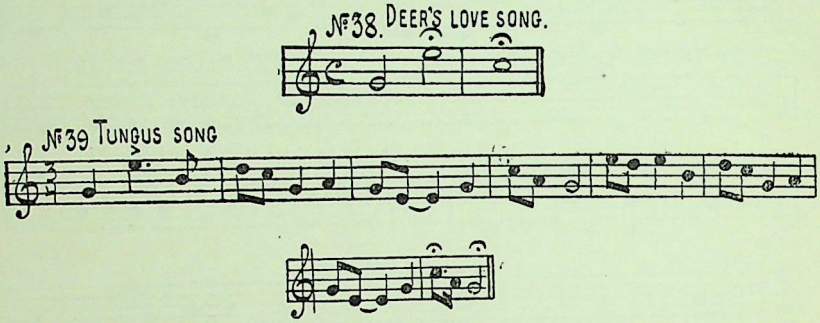


№36. *Moderato* Tungus song

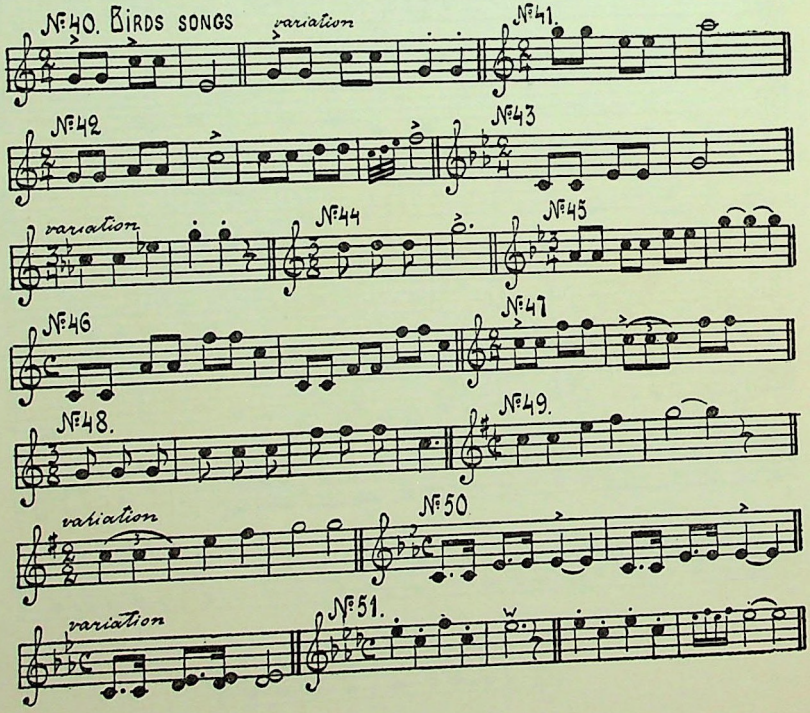
№37. Chukchis' song



they have a kind of instrument made of wood and birch-bark. The beasts hearing this imitation approach the hunter, who is thus able to kill them. It is very significant that the tiger of Manchuria is said also to use the imitation of a deer's love song in its hunting.



The accompanying birds' songs are also borrowed as motives by the Tungus for their songs.



Thus the direct imitation of the noises in nature in many cases is the origin of the folk-music of people, so that the study of birds' and animals' songs generally must go side by side with the collecting and studying of human musical manifestations.

As regards Chinese instrumental music, it belongs to classical music rather than to folk-music. As is well-known, the Chinese more than most other people are fond of theatrical performances. The Chinese theatre gives an essential part of its programme to historical drama, which is always accompanied by music, and it is only natural that ancient classic music has thus always been propagated amongst the Chinese. The number of Chinese musical instruments, according to the authorities already mentioned, is very large.

The very detailed works of Sorel and Amiot practically exhaust the technical side of this subject, but the collecting of specimens of the instruments of folk-music is also very important, though less accessible from the technical standpoint than the folk-songs.

Having as my principal purpose the turning of the public's attention to Chinese folk-music, it is necessary for me to demonstrate the practical way in which the collections can be made.

The best way is, of course, the phonographic registration of musical manifestations, but it is not always possible, because the singers are very often too shy to perform in the presence of foreigners or for any special purpose. In such cases, it is necessary to take down the songs by ear. Such material must, of course, be very carefully corrected, because the European ear is not accustomed to the Chinese musical spirit and errors in registration are always possible. For phonographic registration very simple and cheap phonographs may be used. The phonograms (rolls) must be registered as soon as the performance is finished. The rapidity of the rotation of the roll during the performance must always be registered as well as the place, province, town, village and so forth, the performer's sex, age, social position, and so on. Details registered by the collector never obstruct the further working out of the material, but the lack of necessary data may greatly depreciate the value of the collection. The same details must be added to every piece taken down by ear.

From my personal experiences I can say that collecting such material is not as difficult as it might seem in the beginning. The first pieces registered may be of little use as reliable material, and must be corrected later, but as soon as the collector becomes accustomed to distinguish the characteristic Chinese combinations, he can collect very reliable material. It would be very useful to secure the help of the Chinese themselves in this work, but there are very few educated Chinese who are interested in the folk-music of their country. However, colonies of Europeans are now so numerous in China, that this work can easily be done by the latter, who, living well away from the Chinese cultural centres, are in the best position to carry out the collecting of material.

THE GREAT CHINESE PHILOSOPHERS *

BY

J. C. KEYTE.

The publication of these two volumes marks a notable advance in the attempt made by foreign scholars during the last two decades to approach Chinese thought upon purely philosophical lines. Earlier workers had of necessity to give their time to translation pure and simple, leaving the Chinese viewpoint to manifest itself. Later, came foreign scholars who with the wonderful quarry opened for them by Legge, Julien and their followers were able to work upon definitely historical, political, religious or ethical phases of Chinese thought. Much of Chinese metaphysics is to be found in such work, but an attempt to elucidate the fundamental conceptions in Chinese philosophy was naturally reserved for a later date. Père Stanislas Le Gall's *Le Philosophe Tschou Hi* and Dr. Suguki's *Brief History of Early Chinese Philosophy* are evidences that that time has arrived, and with the publication of Dr. Bruce's two volumes we are able to study seriously a definite school of Chinese philosophy, extending roughly over a century and a half (1050-1200 A.D.), which has proved to be the most formative and the most sustained effort of Chinese speculative thought.

The Sung philosophers most known to posterity were five in number. All were men who in addition to the scholar's ardour combined much that was lovable in disposition. The founder was Chou Tun I, referred to in this article as Chou Tzŭ. An official associate and friend of Chou Tzŭ, a military officer named Ch'eng Hsiang, sent his two sons, Ch'eng Hao and Ch'eng I (referred to here as the Brothers Ch'eng) to be his friend's disciples. The fourth member of the school was Chang Tsai the uncle of the two Ch'engs who, however, came later to learn from Chou Tzŭ. In the school of the Ch'eng brothers appeared also Yang Kuei Shan who through his pupil, Lo Ts'ung Yen, found his philosophical descendant in Chu Sung, an official in Fuhkien, who, in turn, himself became the instructor of the last and the most famous of the Sung School, his son, Chu Hsi. Thus at a time when the Sung dynasty was at its lowest ebb, and China politically was enduring humiliation after humiliation, her greatest thinkers were giving to their people the most formative thought this country has known.

The genesis of Dr. Bruce's work in this field has an interest of its own. Eighteen years ago, as executor for his colleague, the Rev. Alfred Jones, he was faced with the problem of conserving the result of investigations begun in this field. The mass of notes left by Mr. Jones would have been lost to the world unless carefully arranged and worked over

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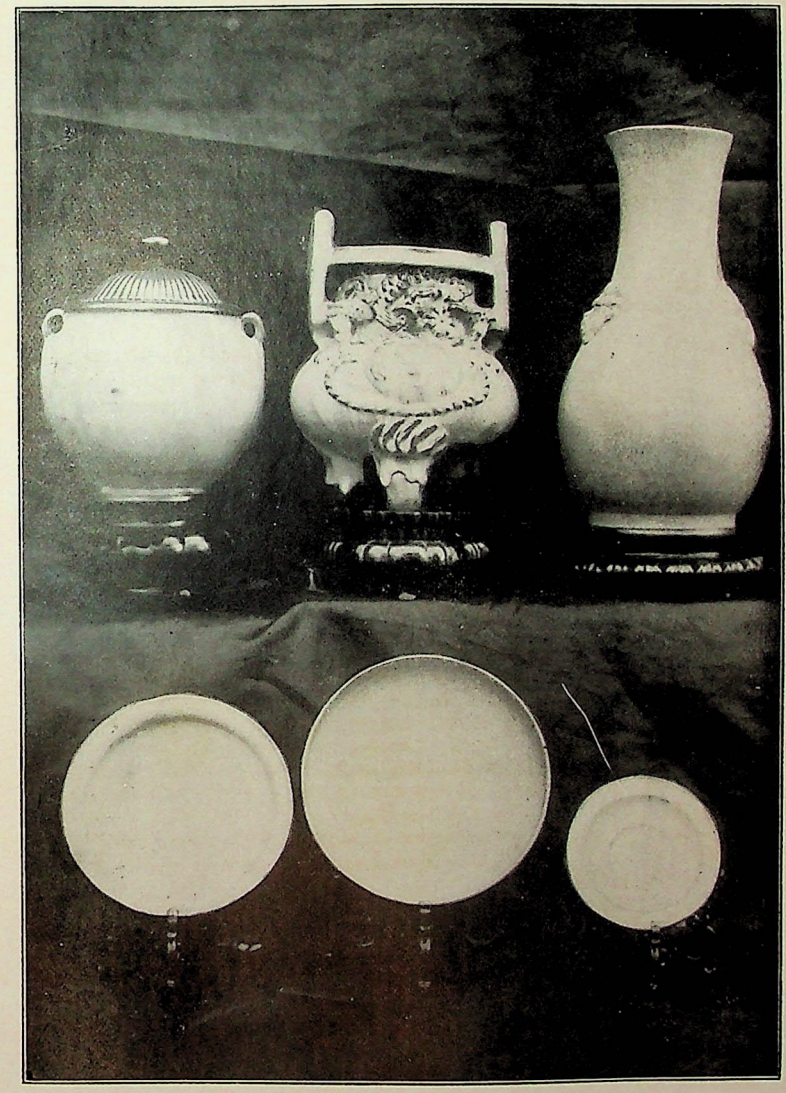
* The Philosophy of Human Nature by Chu Hsi, translated by J. P. Bruce, M.A., D. Lit. (Lond.) Probsthain & Co. 36/-. Chu Hsi and His Masters. By J. P. Bruce. Probsthain & Co. 36/-.

CHINESE ART THROUGHOUT THE AGES

(George Crofts Collection, Toronto)



Yuan Dynasty Stoneware
(A.D. 1273-1368)
Lilac to Clare de Lune.

by someone acquainted with his mode of thought. It says much for the influence of Alfred Jones' life that so busy a man as Dr. Bruce should have seriously contemplated the task of reducing these papers to an orderly arrangement. It meant that as literary executor he must be ready to give up such leisure as he might from the next two years. Chinese philosophy, however, has its own compulsions. The arrangement of the papers left was an affair of a year, but the man who began thus skirting the edges of a subject eighteen years ago found himself penetrating further and further into its recesses ; each vista as it opened up to his gaze proving more compelling than the last, and the investigator found himself the prisoner of his subject.

The interest of the above from the students' standpoint lies in the fact that Dr. Bruce approached his subject with an unusually open mind, becoming philosopher and sinologue in the process of his investigations instead of bringing to his work a set opinion. He had, like most readers of Chinese general history, taken it for granted that the Confucian teaching had been unfortunately diverted into materialistic channels by the commentaries of Chu Hsi. Very early in his investigations, however, he found that on this point he must be prepared to shed accepted theories. Nor was he, fortunately, enmeshed in any one Western school of philosophy. The result has been that a singularly alert Western intelligence has been brought to an open eyed contemplation of the Sung philosophers' work and has patiently studied them with the minimum of prepossession.

The former of Dr. Bruce's two volumes consists of a translation, accompanied by very full notes of that portion of Chu Hsi's *Conversations* (朱子語類) and his collected writings (朱子文集) two compilations now included in the Imperial Edition of the philosopher's *Complete Works* (朱子全書) which is known as *The Doctrine of Human Nature* (性理). The subjects dealt with include "The Nature and The Decree," "Mind," "Feeling and Motive," "The Will," "Thought," "Law," "Moral Law," "Love and Righteousness." Much of the interest of the volume to the modern student lies in the fact that Chu Hsi so closely connects philosophy with psychology. The treatment is after the manner of the Athenian Academy and the continued dialogue method may be found at first somewhat trying by the reader of to-day. Yet of the method's stimulus we may judge by a part of Chu Hsi's answer to the first question asked as to the distinction between the four terms, Heaven and the Decree, Nature and Law.

> "Law is Heaven's substance, the decree is Law in operation, the Nature is what is received by man, and the Feelings are the Nature in operation.
>
> The Decree is like letters patent appointing a man to office, the Nature is the duty pertaining to such office, the Feelings are the performance of that duty, and the Mind is the man himself."

Dr. Bruce makes the Western world his debtor by the freshness, the smoothness and the clarity of his translation. Anyone who has spent some time over the Chinese original knows how easy it is to turn the phrase which is so fresh in Chinese—and the Chinese of Chu Hsi *is* often

delightfully fresh—into dull, and what is far more serious, unconvincing English. Whilst faithfully following his original Dr. Bruce has avoided the above pitfalls.

> "In works of history or poetry the translator may with perfect propriety claim a measure of freedom from strict literalness and mechanical consistency; but in an argumentative work such as this is, if he would be faithful to his author's purpose, he must adhere closely to the text, no matter how much his literary sense may be offended, otherwise the very point of the argument will be lost."

Nor has the translator, with one exception, followed the easy way of retaining the original word, e.g., *Tao*, leaving the reader to supply the meaning as the argument proceeds. One is specially grateful to Dr. Bruce for his courage in dealing with the Chinese connecting particles, which if slavishly adhered to make the reading wearisome without any gain in clearness.

> "The aim, kept steadily in view, has been not only to represent the thought of the original truly, but to do so in clear and readable English."

The exception referred to above is a serious one. It is the use throughout of the term, The Nature (性). Dr. Bruce is by no means content to leave this as being synonymous with "Human Nature." For him it is frequently "The Nature of Reality" or "Reality." If we read him correctly he would consider "these virtues belong to human nature as such" in the passage 成己仁也, 成物知也, 性之德也, 合外內之道也 (Doctrine of the Mean ch 25, sec. 3) as an inadequate translation of 性之德也, and would hold that the nature of reality was such that the 成物 was necessitated in a rational universe. In such a passage as that quoted from 書 the conversation of Mencius: 天下之生久矣, 一治一亂 (Bk 2, ch 9, v. 2) the author of Chu Hsi and His Masters would probably, like Legge, at least question the usually received reading of 生 as being 生民 and would refer it with its ceaseless flux of 治 and 亂 to Reality. Yet on the other hand it is clear that the term 性 is often used by Chu Hsi for "human nature." This being so, even though it should mean frequent footnotes, one hopes that in future editions of the work the translator will indicate boldly the particular meaning to be ascribed to 性 in specific instances instead of taking refuge in the inclusive but vague "The Nature." That the difficulty is constantly in the writer's mind is clear when we turn to the second of Dr. Bruce's volumes where he reminds his readers that this twofold aspect of "Nature" (性) is to be kept continually in mind.

> "When reading of Law and Matter, for example, or of the Supreme Ultimate, we must remember that the writer is treating of these from the point of view of human nature; or perhaps in some passage where it is least expected he is referring to them as inherent in man and as explaining the constitution of man's being."

That the difficulty is a real one is seen when we come to the consideration of the Ultimate Ground of Reality in the writings of one of

CHINESE ART THROUGHOUT THE AGES

(George Crofts Collection, Toronto)



Carved Jade of the Ming, Kang Hsi and Chien Lung Periods.

the earlier thinkers in the Sung school—Heng Chü (Chang Tzŭ, the uncle of the two Ch'eng Brothers). Here we find the Supreme Ultimate (太極) of Chou Tzŭ, the founder of the Sung school, referred to both as the Great Harmony and the Great Void, the one being

> "The Ultimate Reality of the universe regarded as the all-comprehensible and all-pervading Moral Law; the other is the same Reality regarded as the substance of Being, the nature common to heaven, earth, man and all forms of existence."

Here "nature" (性) clearly cannot be translated as if it were synonymous with "Human Nature."

In connection with this Supreme Ultimate of the earlier members of the school Dr. Bruce leaves us in some difficulty. If "Matter" and "Law" are the two terms to be resolved into a final synthesis (The Supreme Ultimate) are we left to deduce that one of the members absorbs the other? Does "Law" really contain "Nature"? Is one of the members of the synthesis the synthesis itself? The impression finally left upon the reader is that, while for Chu Hsi, the greatest of the school, and possibly for Chou Tzŭ its founder, the dualism is ultimately resolved into a monoism, the Sung school never would consent to declare itself finally as monistic.

We are not sure that we can follow Dr. Bruce in his interpretation of the celebrated "Infinite, and also the Supreme Ultimate!" passage. Chou Tzŭ seized upon a saying in the *Yi Ching* or *Canon of Changes* that "the eight diagrams symbolizing the phenomena of the universe have their origin in the T'ai Chi—the Supreme Ultimate" and on the strength of this from it elaborated a theory of the universe the fundamental thesis of which is the twofold assertion of the unity of the Great Source from which all things proceed and the essentially ethereal character of that Source.

> "The One Source to which all things are traced is described as "Infinite! And also the Supreme Ultimate!" by which the author meant to predicate infinity of the First Cause, not in the bare negative sense of the absence of all limitation, but with the positive connotation of an ethical Being, the absolute Truth, immanent in the universe as the source from which all things spring, and at the same time transcending time and space and all material existences."
>
> "The *T'ai Chi*, therefore, is like the roof ridge of a house, the highest point that can be reached. It is like the zenith in the heavens beyond which even thought cannot pass. It is the Great Pivot of the universe, the Source of all things visible and invisible, material and moral. In a word it is the Ultimate Reality in the Cosmos, the Extreme Limit in the vast chain of Causes, the Final Cause of all things."

What then is that nature of this Supreme Ultimate or Final Cause of the Sung philosophers? Dr. Bruce tells us that "the answer as the Dictum itself would indicate, leads us into the region of paradox and calls for patient enquiry." It is (1) Thought (Law) and it is (2) inherent

in Matter often identified with it. (Dr. Bruce finds here an approach to a modern equivalent in the *élan vitale* of Bergson) and (3) it is *always* ethical.

The same difficulty over the resolution of the dualism appears in the discussion of "*Tao*" (Moral Law) and "The Nature." "The Nature" is the concrete expression of Moral Law (道) the mind is the *enceinte* of the Nature; the Body is the habitation of the Mind; and the external world is the vehicle of the body. Chu Hsi is here impelled towards a monistic solution by reason of his insistence upon the objectivity of the Moral Law as against the Taoist for whom that Law was unknowable. For Chu it is law written upon the heart. To this objectivity he clung as to a sheet anchor. It is probable that the above conclusion would have led to an unmistakable personal idealism but for the imprisonment of the Sung philosophers within the premises of the Confucian Classics. This same imprisonment comes out continually in Chu Hsi's *a priori* reasoning. If his conclusions are wrong the error is in the premises which his loyalty to those Classics induced him to adopt rather than to any process of his own reasoning.

(*To be continued*).

ART EXHIBITION IN SHANGHAI

The members of the Art Section of the British Women's Association in Shanghai are to be congratulated on their enterprize in organizing a very successful and highly interesting exhibition of pictures by local artists, which was held in the rooms of the Association on Friday, Saturday and Monday, February 15, 16 and 18.

Surprise at the number of artists in Shanghai and the high standard of their work has been freely expressed. It is not really surprising, however, when it is remembered that there are something like five thousand foreigners, by which is meant Europeans and Americans, in Shanghai, amongst whom the average standard of education is very high when compared with communities in the home lands. There is bound to be a number of good artists in such a community. What is surprising is that in a town—it may even be called a city—the size of Shanghai, there is no building of any sort dedicated to Art, where such an exhibition might be held, so that an organization of local ladies has to give up the use of its club-rooms for several days while the public is regaled with a view of the work of the local artists.

Strange though it may seem, and, to readers of this journal in countries outside China, inexplicable, the fact remains that Shanghai, one of the largest ports in the world, and by far the most important city in the Orient, is without a public art gallery, museum or even reference library. The North China Branch of the Royal Asiatic Society has a small but interesting collection of Chinese natural history objects, as well as a useful library of books on China, both thrown open to the public, but contained in premises that are utterly inadequate. At Zi-ka-wei, the Jesuit missionaries have a small natural history museum containing much valuable material, but its collections are for the working naturalist rather than for public exhibition. But neither of these museums is adequate to the present needs of the Shanghai community. They are, of course, private concerns, and, except for a small grant to the Royal Asiatic Society from the Shanghai Municipal Council, in no way supported by public funds.

Somewhat of an anomally is presented by the fact that the international settlement, through its Council, supports a municipal band at a yearly cost of something like $150,000 so that the Shanghai community may have good music once or twice a week. This only makes the absence of an art gallery and of museums all the more remarkable, and it certainly seems a very one-sided policy to spend so much money on one phase of the aesthetic life and needs of the community and absolutely neglect all others.

Shanghai is right to have good music, and no one would suggest spending less upon having it, but both art and science should also be served, and at least an equal sum devoted to their interests. And until Shanghai has adequate public buildings containing collections of Chinese *objets d'art*, antiques, archeological and biological specimens, a gallery for art exhibitions, an art school and a reference library, she cannot be considered even up to date, let alone progressive.

Space will not permit of a detailed account of the work in the exhibition that has called forth the above remarks, and, knowing the artistic temperament, we hesitate to mention any individual artists' pieces. Suffice it to say that while there were exhibits by a few artists of outstanding merit, mainly professionals, the general standard of the work shown was unusually high.

It may here be mentioned that " The China Society of Science and Arts " hopes to hold a similar though much larger exhibition, and all who wish to exhibit are asked to communicate with the secretary of the society, Mr. Verne Dyson, at the offices of this journal.

REVIEWS

A SKETCH OF CHINESE HISTORY, by F. L. Hawks Pott, D.D., Kelly & Walsh, Ltd. (*4th Edition-Revised*) 1923.

As with all other histories of China written in a foreign language that we have seen, this "sketch" devotes too little space to the earlier history of China and too much to the events of the last century or so. The account of "The Struggle between the Chinese and Western European Nations," covering the period 1662-1900, commences in the fourth chapter, before the middle of the book is reached, the whole of the vast period from the beginnings of the Chinese people, the "Mythological Age" about B.C. 2852, to the advent of the Manchu in the 17th century of the Christian era is dealt with in some ninety odd pages.

One cannot help feeling that this is hopelessly disproportionate, and gives an utterly erroneous idea of the history of the Chinese people, to understand whom it is necessary to study in some detail the great philosophers, poets and artists of the Sung dynasty, the culture of the Tang dynasty, the doings, aims, and ambitions of the great Tsin, the builder of the Great Wall, and the man above all others who welded the Chinese into a nation. The great Chu Hsi is not even mentioned, yet his influence on Chinese thought and philosophy is second to none. Such men belong to history.

Not that we would suggest cutting down the latter half of the book, dealing with the important events of the last two centuries, when China was awakened, so to speak, from her sleep of satisfaction by the restless West, but rather that a much greater space could be given to the earlier history. A couple of hundred pages is not a great deal of space to devote to the history of a country like China, even in a sketch, and another fifty or so on the ancient and mediæval periods would not render the work cumbersome, but would add greatly to its value.

For the rest, we have nothing but praise for this excellent little book, which should be on the shelf of every foreigner in China.

LETTERS OF A SHANGHAI GRIFFIN, by Jay Denby, Kelly & Walsh, Ltd., Shanghai, 1923.

This new edition of Mr. Denby's famous "Letters of a Shanghai Griffin" is welcome. The author's keen insight into the relationships that exist between Europeans and Americans in the Treaty Ports and the Chinese, coupled with his sense of humour, make his work both profitable and amusing to the reader, and we cannot do better than to recommend the book to all new-comers to China. While there is a certain amount of warrantable exaggeration in the descriptions of the author's and other's experiences with the wiley and ingenuous Chinese, there is more than a substration of truth, and the young man or woman just out from home will do well to peruse these descriptions and learn therefrom. Old timers will rejoice as they refresh their memories, and live again their "Griffin" days in China. The illustrations are delightful, and all racing men,

owners of ponies, and race club stewards are advised to study the sketch by H. W. G. Hayter, who illustrates the book, of a China pony : it is absolutely typical.

CIVICS, by Daniel Harrison Kulp, II, M.A. : Edward Evans & Sons, Ltd., Shanghai, 1923 (Mex. $1.35).

One of the most interesting and, we believe, profitable textbooks in Social Science that has yet been published in China for Chinese students is the new series of Middle School inductive studies by Daniel Harrison Kulp, II, M.A. entitled " Civics."

Professor Kulp was for ten years Head of the Department of Sociology at Shanghai College and Director of the Yangtszepoo Social Centre. He is now associate in educational sociology at Teachers' College, Columbia University.

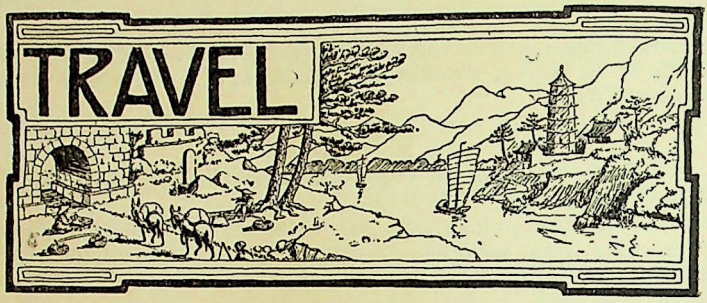
This new " Civics " of which Book I has been published, is based on the new philosophy of education which emphasizes school activities not as a preparation for experience in later life but as life which the student is actively leading while in school. By the proper modification of students activities and thought, habits of attitude and action are formed in the experience of school life that have a reasonable chance of carrying over into the life of the community both at the time or later.

Professor Kulp presents a series of problems of community life with which the student is already partly familiar, in such a way that he, with his colleagues, is interested in finding out additional facts about his community. Book I delves into the problems of recreation from a psychological and social standpoint, into the problems of health and the prevention of sickness, and into the problems of the protection of the community from various types of injustice, accidents, robberies, fires, etc.

The result should be to develop in each student studying this book a much keener sense of social responsibility than he now has. Chinese have enjoyed a family organization that has brought forth devotion and loyalty to the family group but are now finding that this loyalty is not carrying over into the larger groups of the community. With a teacher who can suggest and lead the class, the students should develop this wider loyalty to their city, province, and nation, which is so greatly needed.

The book is bi-lingual with Chinese and English parallel versions. Book II is in preparation and will cover Economic Maintenance. Books III and IV will deal with Education, Religion, the Family, Social Agents, etc. It is a combination text and notebook. This book is a new departure from the older type of textbook which the student memorizes. Here he must do his own thinking both for himself and his fellow students. It should develop that originality of the Chinese which is so often left latent.

We would like to commend this book not only to teachers in Social Science in schools, but also to community study groups of various kinds throughout the country.



SINIMILIA

BY

WILLIAM B. GOLDRICK

I. ZANG ZOH

Zang Zoh is a smiling little city curled tight about the southern base of a hill, sun saturated, wind protected, and covered by a bluer sky than elsewhere, I think. But I have seen Zang Zoh before, somewhere—in Tuscany, or perhaps along the coast road between Algeciras and Cadiz. . . Well, if you would see Zang Zoh as I saw it, climb the hill against which the city rests.

You make the ascent from just without the north gate. The side of the hill is covered with a fine growth of trees through which the path leads, and when you emerge at the top you find that the city wall has kept apace. At a corner where it has tumbled down you scramble over, and there is Zang Zoh before you.

"What a place for a pipe of tobacco : " I remember thinking. Now, it is my delight in life to search out where the pleasantest of arts may be practiced ; my brain is a catalogue of spots where there is a view and a warmed wall against which to lean my back. I find one—then let the enemies of tobacco smoke flee ! So, exhaling the fragrant vapor, I considered the countryside.

The city lay immediately below in a sunlit half circle, white and black, with mediæval appearing gates and fortifications, and a shining bit of canal about the whole. To the south and west were the two lakes from which are taken the fish that make Zang Zoh beloved of epicures ; beyond rose the Soochow hills. And then, to borrow a happy phrase, "In the dimmest northeast distance dawned the Yangtze, grand and gray," with a steamer headed toward the sea and three conical mountains on the opposite shore. In between, and in every direction, the valley was very fresh and very green, crossed and recrossed by scores of water-ways alive with little boats bearing great white sails.

There is a temple near the wall in one room of which an old Chinese artist from Soochow paints astonishingly vivid miniatures of his friends.

"Why here ? " I asked, and he pointed through his window far across the valley to the purple hills. I understood. O painter, if I might work at your window—how much time I would spend smoking !

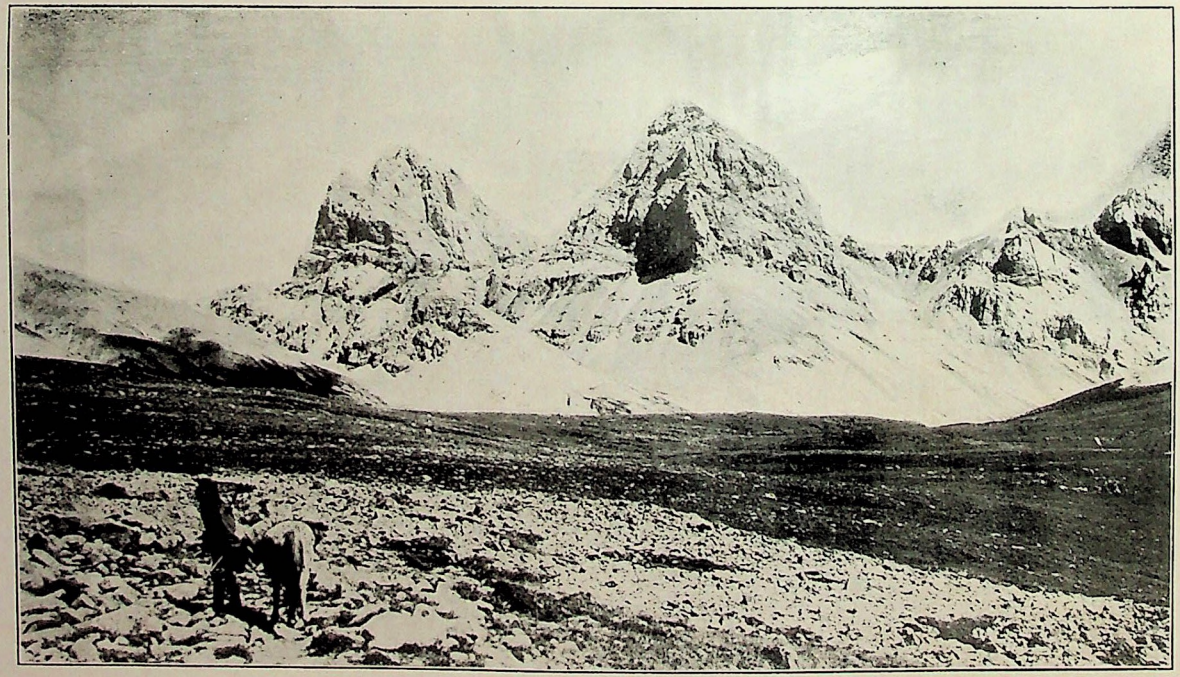


Photo by courtesy of the "North-China Daily News"

Some of the Magnificent Mountain Peaks in the Highlands of the Chinese-Tibetan Border.

RECENT EXPLORATIONS IN CHINA AND NEIGHBOURING REGIONS

(*Continued from page 45*)

The Third Asiatic Expedition of the American Museum of Natural History, lead by Mr. Roy Chapman Andrews, is now well known to most people, thanks to the wide publicity given to this important and ambitious undertaking.

Previous to its inauguration, Mr. Andrews had twice visited Asia, on the first occasion explorating part of Korea and South-eastern Manchuria, and on the second the Chinese provinces of Yunnan, Fukien, Chekiang, Chihli and Shansi and Inner Mongolia.

He then returned to America, where he raised the necessary funds for the present undertaking, which aims at a complete palæontological survey of the whole of Mongolia, with the main object of discovering remains of the oldest ancestors of man. According to certain authorities, man, as such, must have originated somewhere in the great central plateau of the Asiatic land mass.

A strong staff of scientists was gathered together, and, during the past two years, not only have two expeditions been made into Mongolia, resulting in palæontological discoveries of the utmost importance, but other minor expeditions have been made by various members of this staff into China.

Thus, Mr. Walter Granger, the palæontological expert of the expedition, has twice visited Szechuan to make collections of fossils there; while Mr. Pope has visited various parts of China, including North Shansi, the central provinces and Hainan Island, making extensive and very valuable collections of fishes, reptiles and amphibians.

Mr. Andrews himself has visited various parts of China, including the wild sheep country of North Shansi, the Tai-pei Shan district of South Shensi and the Tung Ling area of North-eastern Chihli, in search of big game animals, meeting with considerable success.

The results of the two excursions into Mongolia, in carrying out which the members of the expedition relied to a hitherto unprecedented extent upon motor transport, are that some extensive fields of fossil remains of the Cretaceous and later periods have been located, where, according to previous Russian explorers, nothing of the kind existed. The specimens already collected have thrown a flood of light upon the history of the great faunas of America and Africa, and have confirmed Professor H. F. Osborn's prognostications to an extraordinary degree. Amongst the most interesting discoveries made were the skull and other bones of the gigantic *Baluchitherium*, the largest land mammal that ever existed as far as at present known; the probable ancestor of the *Triceratops*, one of the great extinct reptiles of North America; and the actual eggs of some pre-historic monster of the Dinosaur type. These three discoveries alone would have made the expedition worth while, but there are a great many others of equal importance, announcements upon which are being held up pending the examination of the material by experts in the museum at New York.

So far, however, the expedition has failed to discover the early human remains of which it is in search.

The work will be renewed in the summer of 1925, Mr. Andrews meanwhile paying a visit to America to raise more funds.

The biological field work of the expedition has resulted in a number of new species and subspecies of birds, mammals, and fishes being made. Reports on Mr. Andrews' previous work in this direction have been made, especially in regard to the mammals, birds and fishes of Yunnan and Fukien.

In the latter province, the services of the Rev. Harry Caldwell, a missionary of considerable experience and a keen naturalist, were secured, and he was mainly responsible for the fine collection of birds and fishes sent to the museum. He also accompanied Mr. Andrews to Chekiang and North Shansi, materially assisting in securing the good collections of big game animals made by the expedition. He was responsible for securing specimens of the Fukien tiger, in which connection it may be mentioned that he has shot some eight or nine of these animals, while his native assistant has accounted for at least another ten.

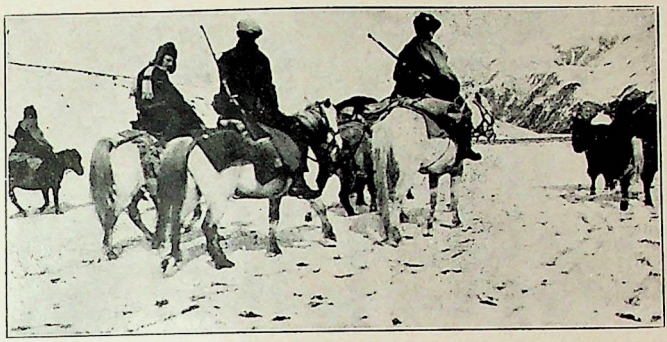
While in Mongolia, the members of the expedition made a very fine collection of biological material in the vicinity of the end of a southern spur of the Altai Range, where their best palæonotogical discoveries were made. It was found that this fauna was in every way typical of the Altai fauna higher in the range. Ibex and even snowcocks were secured.

The future plans of the expedition are to explore the whole of Mongolia for palæontological remains, as well as large areas of Central Asia. This survey will take years to complete, but its value cannot be denied, nor can it be doubted that the enormous funds required for its accomplishment will be forth-coming.

In the American Museum of Natural History, under whose auspices the expedition works, and to which all the collections are sent, a special hall is being devoted entirely to Asia, and in it are to be exhibited the animals collected by the expedition, mounted and arranged in groups with their natural surroundings, as well as the fossil remains of the more interesting and important extinct animals unearthed by the capable members of the expedition.

The whole expedition is on a scale such as has never been undertaken before, in these parts, and the leader and his staff are deserving of the greatest credit for the way it has been planned, organized, and carried out. We can only hope that it will stimulate others to attempt similar projects, for there is no manner of doubt that explorations, carried out in this extensive way and lavishly financed, accomplish infinitely more than is possible where individual collectors, badly handicapped for funds, and facing alone the dangers and privations of the wild are sent into the field. We must not disparage the work of the latter, however, for it is not easy to raise funds for such extensive undertakings as the Third American Expedition, and many a lonely worker has accomplished remarkable results; while it is upon the work of the hundreds of such explorers that our knowledge up to the present is due. At least they act as pioneers, scouts, the vanguard, and make it possible for larger expeditions to be organized with a minimum expenditure of time and energy in the wrong direction.

(*To be continued*).



General Pereira and party on their journey from Batang to Kanze.



Dr. Gordon Thomson riding on a Yak.



Photos by courtesy of the "North-China Daily News"

Four Horsemen of the Golok Tribe.

PEREIRA'S LAST JOURNEY

At a crowded meeting in Shanghai held under the auspices of the North China Branch of the Royal Asiatic Society, in its lecture hall at 5 Museum Road on February 12, Dr. Gordon Thompson gave a most interesting account of his recent journey through West China with Brigadier-General G. E. Pereira, whose death at Kanze on the Tibetan border last November brought to a close the career of one of the most noted explorers of the day.

Seldom has it been the privilege of any audience to listen to a simpler, more straight-forward and modest account of what, under the exceptional circumstances and conditions prevailing in China to-day, was a remarkable, not to say heroic, accomplishment. At the best of times the Sino-Tibetan borderland is dangerous and difficult country, and any kind of travel is not to be lightly undertaken in that region, but under present conditions, with practically no governmental control in Chinese territory, banditry and brigandage rife throughout the country, and border warfare and inter-tribal vendettas the order of the day along the Tibetan marches, it is surprising that any European, however courageous and resourceful, should have undertaken a journey the whole length of China, along the Tibetan and Mongolian frontiers from Yunnanfu in the extreme south-west to Peking in the extreme north-east, and lived to tell the tale.

Yet, but for a few pregnant statements regarding the severe conditions experienced on the uplands of the wild and unexplored regions where North-west Szechuan abuts on Eastern Tibet, and a humourous reference to his own unpleasant experiences as "guest" of the robber band in the Pao-tou district of North-west Shansi, north of the Ordos Desert, Dr. Thompson dealt with the whole journey almost as a commonplace occurrence.

Beneath the surface, however, it was possible to detect recollections, on the part of the lecturer, of unspeakable hardships, appalling dangers, and almost unsurmountable difficulties, bravely faced, endured and conquered.

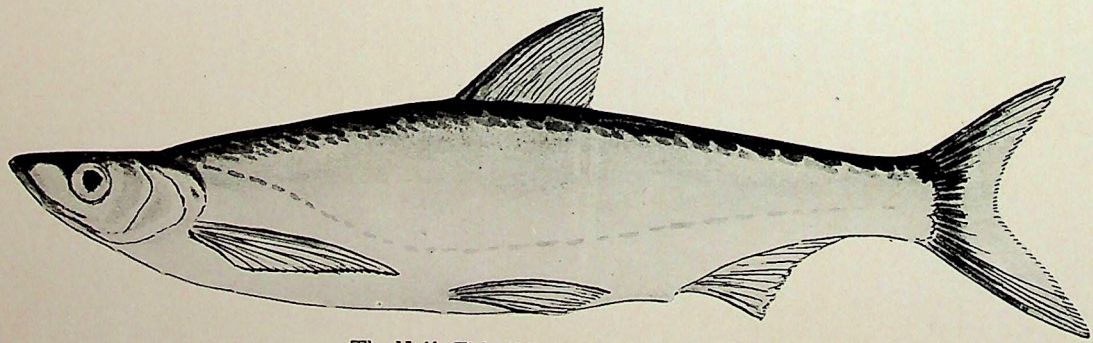
The journey was undertaken with a view to entering various stretches of hitherto unexplored territory along the Chinese border of Tibet, and while it was not carried out in its entirety, largely owing to the disturbed conditions that prevail in those remote regions, yet a good deal of new ground was covered by the explorers and a wide stretch of country was mapped in. The territory of various tribes-people was passed through, including those of the Mosu Tribe in North-western Yunnan, and of the Washih people in Western Szechuan, across which the explorers travelled by yak caravan on their way from Batang to Kanze. The Golok territory in Eastern Tibet was entered with a view to crossing direct from Batang to the Yellow River, but, owing to tribal warfare, it was impossible to proceed in this direction, and the party had to turn back into Chinese territory and take the Washih territory route.

General Pereira's death, apparently, was the result of the long strain endured as the party travelled for many days over the upland plateau in the latter territory at an altitude of some 20,000 feet previous to reaching Kanze where he died.

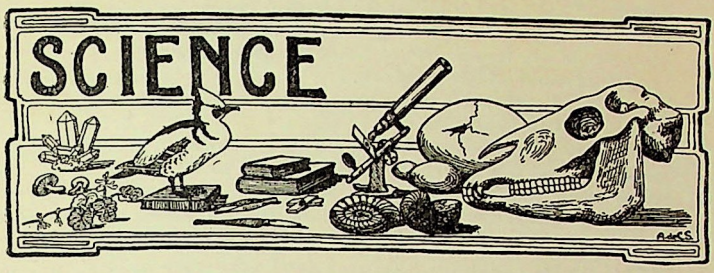
After this sad occurrence, Dr. Thompson was faced with the alternative of going on alone and completing the expedition, or turning back and reaching civilization by way of mid-Szechuan and the Yangtze. He bravely decided to go on, as he felt this was what his companion would have liked. He continued mapping as he went and also taking photographs. Fate seems to have been working against him, however, for when within a few miles of the rail-head at Pao-tou in North Shansi, after having crossed Kansu province and rounded the northern loop of the Yellow River north of the Ordos Desert, he was ambushed by a force of some 200 bandits and carried off prisoner. He was robbed of everything except the maps, which he had secreted about his person. He himself was held hostage, his captors attempting to secure their enrollment in the regular army, a payment of a large sum of money and the handing over to them of large quantities of munitions and arms by the Government officials in exchange for his freedom.

By pretending to be an aged man of 80, and the clever expedient of a hunger strike, thus hampering the bandits' movements, and through his servant's getting into communication with the officials at Pao-tou, he finally made his escape, and reaching the railway arrived soon after at Peking. The maps and photographs were the only things that escaped the robbers' hands, the latter because they had been sent to Shanghai from post offices encountered during the journey.

The whole expedition constitutes a record of travel such as has seldom been equalled in any country, and the results obtained when fully worked up must prove of the greatest interest, particularly to geographers.



The Knife Fish *(Hemiculter leucisculus)*



FISHING IN CHINA

BY

L. W. LORDEN.

The new comer arriving in Shanghai with rods and dreams of unexplored fishing waters soon has his ardour damped by being told that there is no fishing in China. This theory has arisen, I believe, by the persistent way in which waters near the Treaty Ports are netted, but it must by now have become apparent to many that any waters where netting is prohibited soon show signs of fish which in a short time grow very large. In order to dispel the idea that there is no fishing in China, I consider that if a few of us who have acquired some experience were to write occasional articles on fishing it would be of assistance to others, and would, perhaps, lead ultimately to clubs being formed for preserving waters for angling. With this in view I propose to commence with what I have found out about a delightful and game little fish found around Shanghai called the knife fish. The correct name for it is the *Hemiculter leucisculus*, but, as such a name can never be popular with anglers, this fish is usually known amongst us as the knife fish, which is a literal translation of the Chinese name. Sometimes on a hot day, when your house-boat has been anchored in a creek of clean water containing beds of reeds, you may have seen slender, very active, small fish pass you in shoals just under the surface of the water, and if you kept still they may have swam around you with their snouts just out of the water, then as something disturbs them with a splash they have disappeared only to return a few minutes later. If you had asked a friend he would have told you they were dace. They were not dace : you were being introduced to the knife fish, and if you had taken the trouble to cultivate his acquaintance, he would have afforded you some delightful hours.

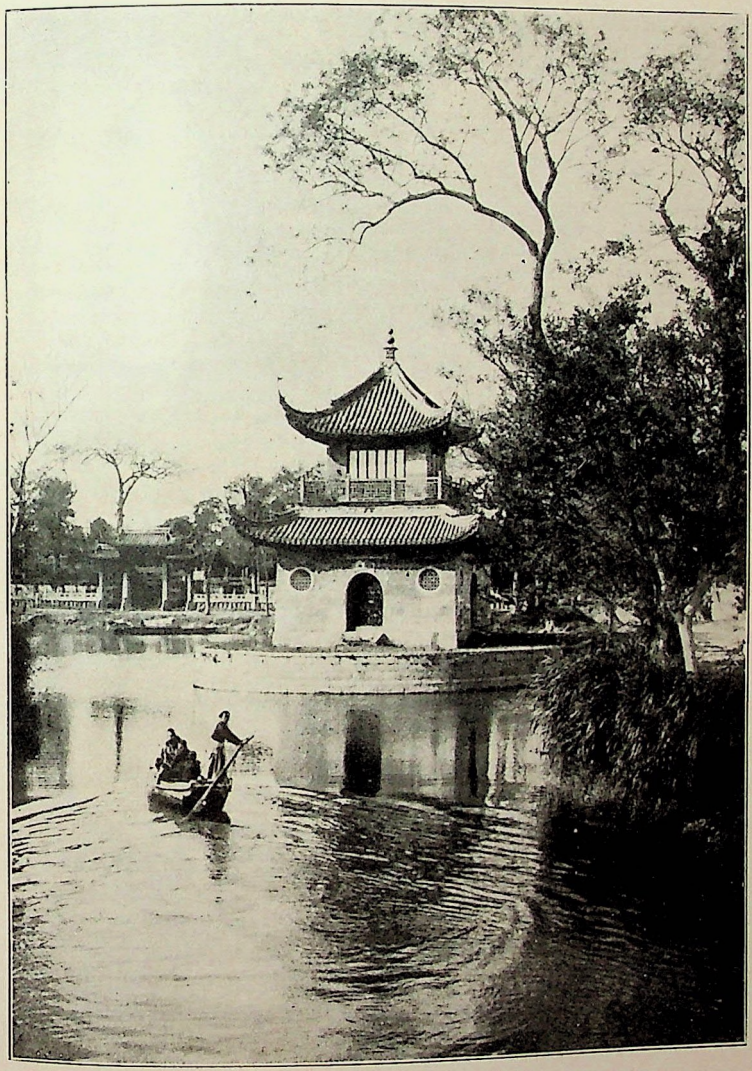
The knife fish is usually six to seven inches in length, and, viewed in the water, appears to be light green in colour, with a large tail of a darker tint. Out of water he is silver with a green back, and looks as you will see by the illustration rather like a herring. The scientific description of him for classification is as follows :

Length of head into total length about 5 times.
Depth of body into total length about 4½ times.
Diameter of eye into length of head, about 4½ times.
Length of adult about 8 inches.
Dorsal fin : 3 stiff and 7 soft rays.
Anal fin : 13 to 16 soft rays
Scales in serial row along the lateral line, 50 to 51.
Scales in serial row above the lateral line, 8 to 9.
Scales below the lateral line 1 to 3.
Colour : bright silvery on sides : dark greyish green on back and top of head : caudal fin grey, darker than body.

For his size the knife fish puts up a good fight when hooked, and as he is a voracious feeder, gives one good sport, for there are very few days when he is not on the feed. But the great charm about the knife fish is the delightful way he rises to the artificial fly, and it is by this means above all others that he should be caught. Take a light trout rod, fine, dressed silk line, and six feet of finest drawn gut, and put a black knat fly on an OO hook for the front fly with a cow dung fly for the dropper. Other suitable flies I have tried are the black ant, blue bottle, wickhams fancy and satourn. Such flies as the red palmer I have not found successful. I fish with a wet fly which should be kept moving. The knife fish appears to take the fly by leaping to it, as there is generally a splash when he rises. The best weather is a bright day with a light breeze to ruffle the surface of the water and on such a day I generally expect to catch about twelve fish in an hour. I have, however, caught as many as forty-five. For float fishing you should use a very fine porcupine quill and fish about one foot deep with a small hook. Early in the spring the fish take paste well, but in the summer a gentle or small piece of red worm is the best bait. The Chinese use boiled rice or a house fly soaked in vegetable oil. I find a grain of boiled rice is too easily taken off the hook so that fishing with it one misses a good number of bites.

At the mouth of almost all the numerous creeks which join the Whangpoo the knife fish may be caught at the ebb tide. A very good day's fishing can be had by taking the early morning train to Nanziang from where you can for five dollars a day hire a small Chinese houseboat to take you about seven miles to Kading. If pressed for time a rickshaw can be hired at the railway station which will take you all the way by road. If you travel there by houseboat when you come to Kading go through the city wall until the creek opens out into a large pond. (In order that you may recognize the spot I have given an illustration of it.) Fish with an artificial fly from the stone wall shown in the illustration and you will have quite an enjoyable day in the open air with a bag of two or three dozen fish.

After September knife fish do not rise well to a fly but from then on all through the winter they may be caught by the following method :— Throw two or three handfuls of dry bran into the water close to the bank. This will attract the fish to the surface where they may be caught using a trout rod, fine silk line and three feet of fine gut, at the end of which should be three or four large shot and a very small hook. No float is



A good place for fishing at Kading

used, but bait the hook with ordinary flour paste and drop it lightly into the floating bran. Allow it to sink very slowly about nine inches and then slowly raise it and allow it to sink again. Strike immediately you see the line move. Occasionally a handful of dry bran should be thrown into the water while fishing to keep the fish arround you. In the winter the best time for fishing is in the middle of a bright sunny day when there is little or no wind.

As the knife fish is a surface feeding fish it does not taste muddy and if fried in butter is quite nice to eat.

If cultivated in a pond the knife fish will soon exterminate any mosquitoes which breed there. Apart from this useful service they are delightful fish to keep in ornamental waters for being surface feeders it is a pleasure to watch them swimming in shoals amongst your water lilies, rising every now and then with a splash to seize a passing mosquito.

When bottom fishing in almost any of the ponds or creeks you will constantly catch cat fish. It is of a dark mud colour on the back which turns to a bright canary yellow on the underside. The pectoral fin, which can only be moved horizontally, is furnished with a sharp spike so that the fish has to be handled with care. When caught it makes a curious squeak and is the only fish I have ever caught which is capable of making a noise. It devours small fish, and inside its mouth are small teeth. When I turned some goldfish into the same tank with some of these fish, they one by on disappeared. It has ten feelers or cat-like whiskers and instead of scales has a skin something like an eel. There is a fin on the lower back, which, instead of having rays, is fleshy. This fish is very fond of a piece of shrimp, but can also be caught with a worm. I constantly see them for sale, and am told that they are very good to eat, being considered a delicacy by the Chinese.

When bottom fishing with a worm as bait, the angler will sometimes find his float begin moving slowly along the top of the water, and every time he strikes he finds he has missed catching the fish. These bites are caused by large fresh water shrimps. If a very small hook is used, and the fisherman waits a good time after he gets a bite, he will find that he can catch them.

MIGRATION NOTES

BY

G. D. WILDER.

Extension of Range for the Bullfinch, *Pyrrhula, p. major.*

Since the observations made at Peitaiho early in October, as reported in the last issue of the Journal, the writer has been restricted exclusively to the city as a field for nature study. Of all cities with which I am acquainted Peking is by far the best for bird study. The large trees, and secluded spaces in the palaces scattered throughout the Tartar City, make fine rookeries. Before the plume hunters had all but exterminated the egrets there were also heronries here, and these are still frequented by the night heron, and a few pairs of egrets and great blue herons. In winter the same places are the haunts of great numbers of kites, rooks, and, at times, of jackdaws. The chain of large clear water lakes attracts water fowl of many species that are not expected in the ordinary city. The huge towers and palace roofs bring swifts, swallows, and a variety of falcons and other hawks. Almost every fair in the different parts of the city has its place for the sale of the birds commonly used as pets. The game markets, also, are well stocked with a larger variety of birds than one would expect, inasmuch as thrushes, larks, waxwings and sparrows are food birds along with the sandpipers and fishing ducks that westerners usually leave out of the list of game birds. Frequent visits to these different markets give one a line on the migrations, if one can make due allowances for cold storage and for the shipping in from a distance on the railways. Mallards seem to be brought from the Yangtze region all through the winter, for instance. The regular shops where parrots and other southern cage birds are sold rarely deal in local birds, and so are of little interest to the student of the avifauna of his own region. Some years ago my list for birds seen wild in Peking had reached 135 and would probably be 170 if the market specimens were included.

On November 27 about twenty pin-tailed sand grouse appeared in the market. It was just at the time of a heavy snow fall reported at Kalgan. Friends told of seeing a flock or two outside the city, but none has been seen in the market or alive since then. It is very different from the great rush with which they came by flocks of thousands about November 8 last year. We do not know whether they bred less plentifully in Mongolia this year, or whether the snows have not been extensive enough or deep enough to drive them all south. The Lapland bunting (*Calcarius lapponicus*) has been reported in unusually great numbers this winter from Paotingfu. This bird comes from the same regions, doubtless, that the sand grouse does.

The market has yielded several rare birds this season. On November 16 four or five Guldenstadt's redstarts, which come down from high mountains for the winter, were brought into the market badly cage-

worn as though they had been caught for many days. Also two or three Japanese waxwings, exquisite birds not seen for several years, were taken earlier in November. On October 29 three specimens of the white headed tit, *Aegithalus caudatus caudatus* (L) were bought in good plumage as though recently caught. The dealers said they had been taken in the reed beds near the city. Mr. La Touche had reported them from Ch'ing-wang-tao and Chinese have told me that they are found in the Eastern Tombs area. This is a charming little fellow with its fluffy, downy plumage and snow white head. It is very like the more common *Aegithalus glaucogularis*, excepting in having the white head, where the latter is brown.

On November 16 a pair of bullfinches (*Pyrrhula pyrrhula major* Brehm) in exquisite fresh plumage were brought down by an old trapper from the railway station at the great wall, Ch'ing Lung Ch'iao. They were very wild and were kept covered in a cage, so that I could not tell whether they had the white tips to the greater wing converts of *P. p. kamtchatica*, or the grey tips of the European form. The rich vermillion red under parts of the male, however, distinguished them from other bullfinches. As the old man demanded $5.00 for his rarities I sadly allowed him to take them home, with an offer of $1.50. He did not appear at the next Lung Fu Ssu fair, ten days later, as I hoped, but a few days after he sent them to my house, with tails already somewhat damaged by wear in the cage but well worth the price I had offered. The identification is now perfect, and, so far as my lists go, this pair is the first to be reported from China. Two other bullfinches, *P. griseiventris* and *P. erithaca wilderi*, Riley, are found in the Eastern Tombs area, and a hunter tells me that *P. p. major* is found there too, but haunt high trees and are hard to get. Dresser gives Dauria as the eastern limit of range of this form.

Another rarity bought on December 6 is a long-tailed rose finch, *Uragus sibiricus sanguinolentus*. This is the third female I have seen in several years though I have never seen the male.

Our cold weather came early this year, the rivers and ponds freezing up in November, and it seems to have brought with it a good many of the rarer northern forms. A freshly killed whooper swan was peddled around town early in December. It seemed a rather late date for it to be lagging in these parts, but of course the jade fountain waters were not frozen over then. Bustards appeared in market as usual late in October. On November 2 the first throng of kites was seen establishing its winter roosting place.

As I write on the last day of the year, several flocks of jackdaws are passing over, numbering hundreds each. This is after some time without having seen them. Probably this last cold snap has brought them down from some place farther north where they had been delaying their flight.

THE TERMITES (WHITE ANTS) OF CHINA
WITH DESCRIPTIONS OF SIX NEW SPECIES

BY

S. F. LIGHT.

(From the Laboratory of Zoology, University of Amoy, Amoy, China)

(*Continued from page* 60).

FAMILY RHINOTERMITIDAE

COPTOTERMES FORMOSANUS Shiraki

Coptotermes hongkongensis Oshima, 1914.
Coptotermes formosanus, all references to China.

CHINESE COLLECTIONS EXAMINED.

Number in my collection	Locality	Collectors and Date	Castes	Habitat, etc.
H 6	Hainan, Kiungchow	Light, VIII '22	S. W.	Attacking floor boards
H 7	Hainan, Hoihow	Light, VIII '22	S. W.	Attacking roof and ceiling timbers
Hg 1	Hongkong University	Barney, Light, VII, '22	S. W.	From dead tree stump
Hg 2	Hongkong University	Barney, Light, de Lusignan, VIII, '22	S. W.	Earthen gallery on tree
Hg 5	Hongkong, Cheung Chau Island	Campbell, 15-V-, '22	A.	Flight in great numbers after dark
C 1	Amoy, Kulangsu Is.	Light, IV, '22	S. W.	Attacking dead parts of plum tree
C 2	Amoy University	Light, 26 V, '22	A.	About lights at dusk
C 3	Amoy University	Light, 27 V, '22	A.	About lights at dusk
C 4	Amoy University	Tan Yen Ting, 2 V, '22	S. W.	Attacking pine posts
C 6	Foochow	T'ang Wangwang	S. W.	
C 10	Kwangtung, West River, Tin Wu Shan Monastery	Barney, 28 VIII, '22	S. W.	Attacking branch on ground. Same branch produced *Termes formosanus*, *Kalotermes sinensis* and *Cryptotermes sp.* (nymphs).
C 20	Kulangsu Is., Amoy	Light, 10 VI, '23	A. S. W.	A flight from 6 to 9 p.m.
C 21	Amoy University	T'ang, 10 VI, '32	A.	A flight at dusk.
C 26	Near Kuliang, in mountains back of Foochow	Light and Kellogg	S. W.	In the heartwood of the stump of *Myrica*. In association with *Termes formosanus*, *Macrotermes barneyi* sp. nov. and *Reticulitermes fukienensis* sp. nov.

S=soldier, W=worker, A=alate adults, K=king, Q=queen, N=nymphs of reproductive adults, Sr=supplementary reproductive adults.

DIAGNOSIS.

Imago.—14 to 15.5 mm in length with the wings ; body generally a light brown except wing stumps, bases of wings and anterior surface of head which are a smoky brown. A yellow costal stripe just internal to the radial sector in the distal half of the wing. Head broad, 1.5 to 1.7 mm wide ; fontanel very small, median suture visible as a white line. Somewhat in front of fontanel, one on either side of the mid line, are two light areas bounded anteriorly by distinctly white club-shaped areas. Antennal spots oval or slightly concave anteriorly, indistinct, smaller than the ocelli. Antennae with 19 to 21 segments, III usually shortest. Wing membranes and all other parts of body very hairy.

Soldier.—Head oval, narrowed anteriorly, vaulted ; fontanel directed forward ; abdominal tergites more or less evenly haired (no definite rows of spiny hairs). Antennae usually with 15 segments (14 to 17). Head width 1.1 to 1.3 mm ; pronotum 0.8 to 0.9 mm wide and 0.47 to 0.5 mm long.

Workers.—Head pale yellow to white, 1.13 to 1.3 mm wide.

This is the commonest termite of the China Coast and to it is due practically all the damage to buildings attributable to termites.

The workers and soldiers of *Coptotermes* which I have seen from Foochow, Amoy, Hongkong, the Kwangtung mainland, and Hainan, with exception of those of a colony from Kulangsu Island, Amoy, and one from the mountains back of Foochow, differ from those from Formosa in being smaller and lighter in varying degrees and the soldiers show 14 to 16 antennal segments instead of 15 to 17. This is particularly true of the Hongkong race which Dr. Oshima has described as a separate species, *Coptotermes hongkongensis* (1914), from soldiers and workers collected in Hongkong by Mr. Harper in 1910. Through the kindness of Dr. Oshima I have had the opportunity of examining the type specimens and have before me a paratype specimen.

A careful comparison of the paratype with several collections from Hongkong, with numerous collections from various places in South China and with collections from Formosa and from Japan shows the differences to be of degree and not fixed. There seems to be no distinctive morphological character to distinguish the soldiers and workers of the *Coptotermes* races of Hongkong and other parts of China from those of Japan and Formosa. Furthermore the soldiers of different colonies vary greatly. Head width of soldiers, for instance, varies from 1.15 mm to 1.27 in soldiers from Amoy and vicinity.

I have numerous winged adults from Amoy and a great number from Cheung Chau Island, Hongkong. Here again comparison with Formosa specimens fails to bring out any characters to differentiate the Chinese *Coptotermes* species from *C. formosanus* Shiraki.

I conclude, therefore, that the Hongkong *Coptotermes* is but a nanitic race of *C. formosanus* Shiraki to which are to be referred all *Coptotermes* collections so far known from China.

Reticulitermes fukienensis sp. nov.

Collections Examined.

C 22	Muiwha, near Foochow.	Light, VII, '23	S. W.	In dead portion of a living tree near seashore. In close connection with a colony of *Termes formosanus*.
C 24	Near Kuliang in the mountains back of Foochow, 2,000-ft.	Kellogg and Light, 4 VIII, '23	S. W.	In the stump of a recently cut "arbutus" tree (*Myrica*) in association with *Termes formosanus*, *Coptotermes formosanus*, and *Macrotermes barneyi* sp.nov.
C 30	Baekliang, in mountains back of Foochow, 1,200-ft.	Light, 10 VIII, '23	S. W.	In dead stump of *Cunninghamia* together with *Capritermes sowerbyi* sp. nov.
C 32	"	" " "	"	In a dead root, in close association with *Capritermes sowerbyi* sp. nov.
C 34 Type Colony.	"	" 11 VIII, '23	Q.K.S.W.	In dead root of living tree. King and queen taken in small royal chamber in root. *Termes formosanus* was found in close association.

Diagnosis*.

Imago. (Queen and King).—Pronotum with extensive areas of irregular brown pigment spots. Ocelli larger, head slightly shorter in proportion to width. Otherwise as *R. speratus* Kolbe.

Soldier.—Smaller and generally lighter than *R. speratus*. Head much lighter and considerably narrower and longer in proportion. This is the chief diagnostic character of the new species.

Worker.—Somewhat smaller and more delicate than *R. speratus*.

Systematic Position.—The *Reticulitermes* species of Formosa is considered by Doctor Oshima to be distinct from that of Japan. Doctor Hozawa considers them to belong to the same species. Whether this be true or not the present form with its much narrower and proportionately longer head very light in colour seems to represent a separate but closely related species.

Biology.—This species shows a very interesting tendency to association with the other common termite species of the region as will be seen by a perusal of the collection notes. The king and queen are of particular interest as representing the first known to have been taken in China.

(*To be continued.*)

*Owing to demands of the printer a full description of this species will be left for a later paper and only the diagnosis is given here.

THE GENETICS OF TWO MUTATIONS IN THE FRUIT-FLY, DROSOPHILA MELANOGASTER.*

BY

TSE-YIN CH'EN.

(*Continued from Vol. I, No. 6, page 603*)

B. Localization of Chromosome Group

The monograph on Sex-Linked Inheritance in *Drosophila* by Professor T. H. Morgan, and Dr. C. B. Bridges gives an account as to how the factors are located in the chromosomes. It runs as follows : " A character is in the first chromosome if it is transmitted by the grandfather to half of his grandsons, while, in the reciprocal cross, the mother transmits her character to all of her sons (criss-cross inheritance) and to half of her granddaughters and to half of her grandsons, in other words, if the factor that differentiates the character has the same distribution as the sex-chromosome. If, however, a new mutant type does not show this sex-linked inheritance, its chromosome is determined by taking advantage of the fact that in *Drosophila* there is no crossing over in the male between factors in the same chromosome. For instance, if a new mutant type is found not to be sex-linked, its group is determined by the following tests : It is crossed to black, whose factor is known to be in the second chromosome, and to pink, whose factor lies in the third chromosome. If the factor of the new form should happen to be in the second chromosome, then, in the cross with black, no double recessive can appear, so that the F2 proportion is 2:1:1:0, but with pink, the mutant type should give the proportion 9:3:3:1, typical of free assortment.

" If, however, the factor of the new form is in the third chromosome, then, when crossed to black, the double recessive and the 9:3:3:1 proportion appear in F2. But when crossed to pink no double recessive appears in F2, and the proportion 2:1:1:0 occurs.

" If these tests show that the new mutant does not belong to either the second or the third chromosome, that is, if both with black and pink the 9:3:3:1 ratio is obtained, then by exclusion the factor lies in the fourth chromosome, in which as yet only two factors have been found."

Following up the method just referred to above the factor of Extreme Rudimentary and Yellow characters are located in the chromosome group.

The Rudimentary males were crossed to wild females. In the F2 there were 2,560 females and 1,575 males of wild type, and 777 males of Rudimentary type. In the F2 the Rudimentary character appeared only in males, though less than half of the total males, which is a typical

*A Thesis presented to the Faculty of the College of Science and Arts, Peking University, as partial fulfillment of the requirements for the degree of Master of Arts.

ratio of sex-linked inheritance. Because the factor producing the Rudimentary character has the same distribution as the sex-chromosome it is clear that it lies in the sex-chromosome. Therefore the Rudimentary is a sex-linked character.

Like rudimentary, the factor for Yellow has the same distribution as the sex-chromosome. The Yellow males were crossed to wild females. In the F2 there were secured 3,953 females and 2,050 males of wild type, and 1,914 males of yellow type, a typical ratio of sex-linked inheritance. The yellow character of the grandfather was transmitted to half of his grandsons. This meets strictly the ratio of sex-linked inheritance and therefore definitely determines the yellow factor to be a sex-linked one. It is therefore located in the sex-chromosome.

C. Determination of Loci of Yellow and Rudimentary in the Chromosome

In the light of the Chromosome Theory of Heredity, it is assumed that the factor or gene which gives rise to a morphological character lies in the chromosome. Moreover, it occupies a definite place in the chromosome. The place may be determined experimentally by analysis of the phenomenon known as crossing-over. The gene for Yellow and the gene for Rudimentary, two mutant characters described elsewhere in this paper, have been located to be both in the sex-chromosome. The two places or loci occupied by the gene for Yellow and the gene for Rudimentary are certainly traceable if the theory holds at all true. To determine these two loci the experiment is purposed.

So far as the investigations in *Drosophila* reveal that there are many genes in a single chromosome. Yellow, Bar, White, Rudimentary and others are known to be in the same sex-chromosome. Because they are in the same chromosome they tend to be inherited together. But in a definite proportion of cases they are not thus inherited. This is due to the fact that during gametogenesis the homologous chromosomes pair and may twist about each other. When they separate portions of the chromosomes became exchanged as shown in the Diagram 3. This is called crossing-over. The amount of crossing-over between any two factors in a single chromosome is definite at a given age and under given environmental conditions. This allows us to determine their distance from each

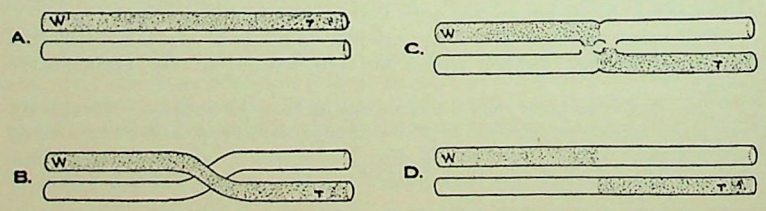


Diagram 3. Scheme to illustrate the process of Crossing-Over between the White (W) and Rudimentary (R) Genes in the Chromosome.

other. For example if we cross a male fly with black body and vestigial wing to a wild type female (gray body and long wing), the offsprings are grey and long. If one of the F1 females is back-crossed to a black vestigial males there are four kinds of offspring produced : the two original combinations, black vestigial, and grey long, and in addition two recombinations, of these ; black long and grey vestigial. The latter two classes are called the cross-overs and the former non-cross-overs. The gene for vestigial and the gene for black are in the same one chromosome and their normal allelomorphs, the gene for grey and the gene for long are in the homologous chromosome with the first one. When crossing over takes place, the gene for black goes over into the other chromosome, the converse phenomenon takes place, the gene for grey goes over into the chromosome that gives up its black gene. The longer the distance between two genes in the same chromosome the greater the chances for them to cross over, and consequently the greater the percentage of crossing over in them. The distance between two loci is measured by the crossing-over value which is found by dividing the number of cross overs by the sum of the non-cross-overs and the cross-overs and multiplying this quotient by 100. In this case there are 83 per cent. of non-cross-overs and 17 per cent. of cross-overs. Therefore the crossing over value is 17., that is, the distance between black and vestigial genes is 17 units (Morgan takes 1 per cent. of crossing over as a unit length between any two genes in the same chromosome) apart in the chromosome.

In order to determine the loci of the gene for Yellow and the gene for Rudimentary two other sex-chromosome characters White and Bar are used in the experiments for reference. The gene for Bar lies 43.6 units apart from the gene for White (Morgan's data) in the sex-chromosome. The data presented in the following tables give the cross-over value of 43.08 per cent. of white and Rudimentary, of 46.17 per cent. of Yellow and Rudimentary, and of 2.48 per cent. of Yellow and White. That means that the distance is 46.17 units apart between Yellow and Rudimentary, 43.08 units apart between White and Rudimentary, and 2.48 units apart between Yellow White. The distance between Yellow and Rudimentary is 3.08 units longer than that between White and Rudimentary, and 43.69 units longer than that between Yellow and White. In otherwords the Yellow lies, instead of somewhere between White and Rudimentary at one end of the sex-chromosome, and 2.48 units from the White and 46.17 units from the Rudimentary.

The Rudimentary and Bar give a cross-over value of 2.29 per cent., the Rudimentary and Yellow a cross-over value of 46.17 per cent., and the Yellow and Bar a cross-over value of 47.06 per cent. That is to say the Rudimentary and Bar lie 2.29 units apart, the Rudimentary and Yellow 46.17 units apart, and the Yellow and Bar 47.06 units apart in the sex-chromosome. The sum of the distance between Yellow and Rudimentary (46.17) and that between Rudimentary and Bar (2.29) is just equal in length to the distance between Yellow and Bar (47.06) if the deficiency of 1.40 of the actually observed figure (47.06) and the expected figure (48.46) is explained on the basis that a double-cross over occurred among other genes which lie between Yellow and Bar.

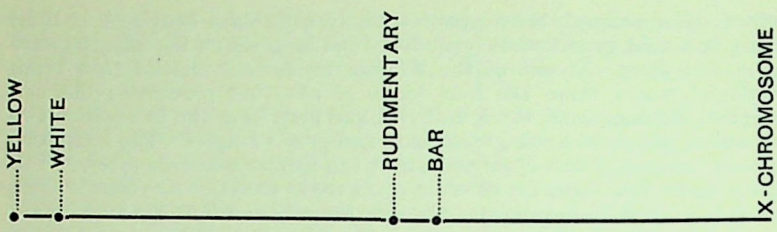


DIAGRAM 4

THE DISTANCE BETWEEN:

YELLOW——————WHITE	2.48	UNITS
YELLOW——————RUDIMENTARY	46.17	,,
YELLOW——————BAR	47.06	,,
RUDIMENTARY——WHITE	43.08	,,
RUDIMENTARY——YELLOW	46.17	,,
RUDIMENTARY——BAR	2.29	,,

That double crossing over cuts 1.40 per cent. from the expected figure. From the figure given above the Rudimentary is determined to be between the Yellow and Bar. It lies 2.29 units to the Bar and 46.17 units away from the Yellow.

TABLE 8. F_1 YELLOW ♀♀ × RUDIMENTARY ♂♂

F_1 WILD TYPE ♀♀ × F_1 YELLOW ♂♂

Reference	Females		Non-Cross Over ♂♂		Cross-Over ♂♂		Total ♂♂	Cross Over Value
	Yellow	Wild Type	Yellow	Rudi.	Yellow Rudi.	Wild Type		
YR1	91	123	52	51	35	56	194	46.90
YR2	112	113	56	51	36	69	212	49.50
YR3	67	82	45	43	20	58	166	46.38
YR4	107	104	43	43	45	28	159	46.54
YR5	55	82	39	36	44	19	138	45.65
YR6	92	89	45	36	38	35	154	47.40
YR7	89	97	36	37	35	29	137	46.72
YR8	72	92	44	34	32	35	145	45.51
YR9	82	63	35	31	46	10	122	45.98
YR10	89	97	60	31	56	15	162	43.82
YR11	90	88	41	19	44	11	115	47.82
YR12	83	90	31	28	33	14	106	44.34
YR13	115	123	47	31	35	28	141	44.68
Total	1,144	1,243	574	471	499	407	1,951	46.17

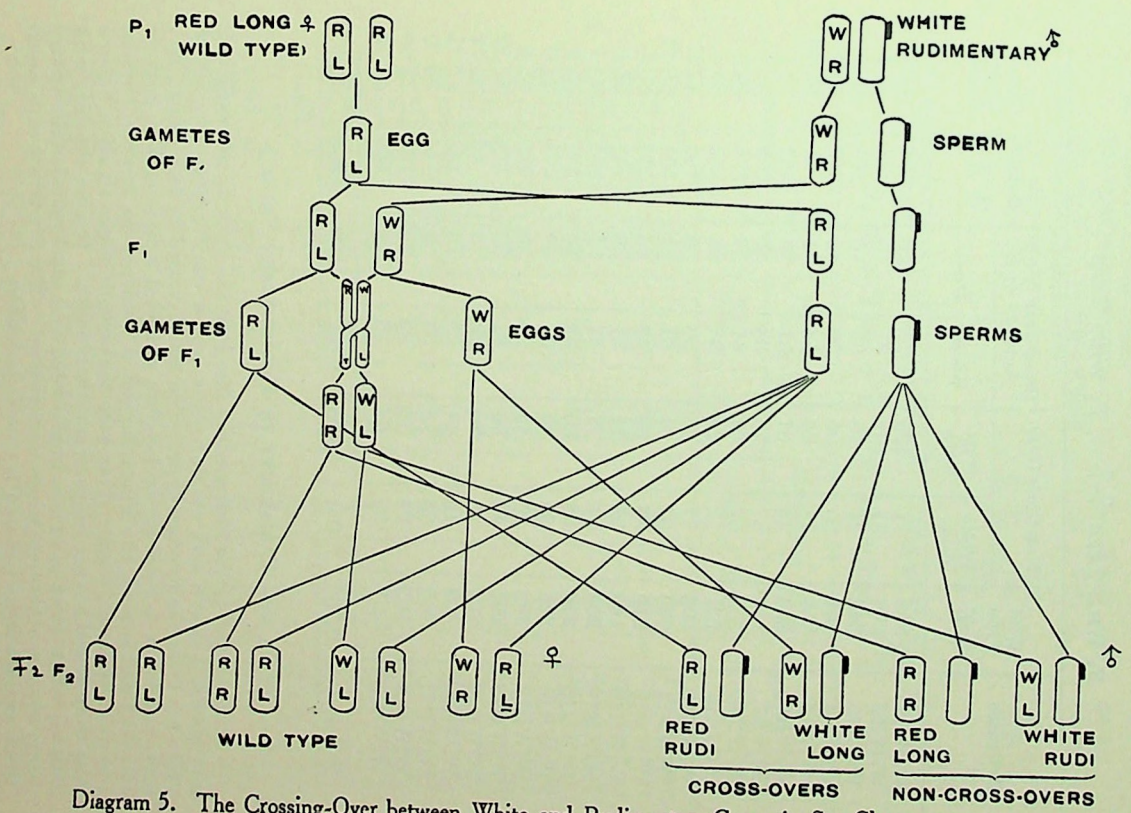


Diagram 5. The Crossing-Over between White and Rudimentary Genes in Sex-Chromosome.

TABLE 9. P_1 WILD TYPE ♀♀ × WHTIE RUDIMENTARY ♂♂

F_1 WILD TYPE ♀♀ × F_1 WILD TYPE ♂♂

Reference	Wild Type ♀♀	Non-Cross-Over ♂♂		Cross-Over ♂♂		Total ♂♂	Cross Over Value
		White Rudi.	Wild Type	White	Rudi.		
WiWR1	313	11	105	77	18	211	45.00
WiWR2	272	37	101	87	18	243	43.2
WiWR3	342	21	79	60	16	176	43.2
WiWR4	404	20	96	89	12	217	46.5
WiWR5	254	14	22	14	11	61	44.26
WiWR6	220	34	61	31	16	142	33.1
WiWR7	294	37	75	58	26	196	42.8
WiWR8	209	37	61	41	37	176	44.7
WiWR9	251	33	79	48	23	183	38.8
WiWR10	296	27	86	50	30	193	41.4
WiWR11	230	34	64	61	32	191	54.43
WiWR12	210	33	59	42	24	158	41.7
WiWR13	160	31	45	37	28	141	46.1
WiWR14	254	34	77	47	31	189	40.7
WiWR15	250	58	60	43	40	201	41.2
WiWR16	235	50	53	47	44	174	52.0
WiWR17	186	20	48	50	20	138	51.4
WiWR18	297	43	50	61	35	189	51.30
WiWR19	206	13	36	28	5	82	40.24
WiWR20	159	15	44	28	16	103	42.71
WiWR21	242	23	75	33	9	140	30.00
WiWR22	192	24	57	32	16	129	37.00
WiWR23	216	32	62	36	22	152	38.15
Total	5,702	681	1,495	1,100	529	3,805	43.07

ON THE VARIABILITY IN RUDIMENTARY FLIES.

It was found in the rudimentary flies that the form of the wing was not always uniform and stable: there was a considerable amount of variation from the average type. The wings varied in two directions: first, there was a tendency to lose the wrinkled character and became smooth; and second, the wings showed a tendency to become twisted out of their normal shape. Nor were the smooth wings all alike. Some flies were found having wings of unequal length. Among the flies with twisted wings some possessed one twisted and one typical rudimentary wing, while in other both wings were twisted. The frequency with which these variant forms occured is shown as follows:

1.	Typical Rudimentary	1,762 flies,	47.3%
2.	Smooth Rudimentary		
	(*a*) both wings short	1,358 ,,	36.3%
	(*b*) wings of unequal length ..	208 ,,	5.5%
3.	Twisted Rudimentary		
	(*a*) one wing twisted	216 ,,	5.7%
	(*b*) both wings twisted	191 ,,	5.2%
	%	3,730 flies	

TABLE 10. P_1 WILD TYPE ♀♀ × WHITE YELLOW ♂♂, F_1 WILD TYPE ♀♀ × F_1 WILD TYPE ♂♂

Reference	Wild Type ♀♀	Non-Cross-Over ♂♂		Cross-Over ♂♂		Total ♂♂	Cross Over Value
		White Yellow	Wild Type	White	Yellow		
WiWY1	220	92	100	1	3	196	2.40
WiWY2	239	69	181	3	2	255	1.96
WiWY3	234	92	92	4	2	190	3.15
WiWY4	207	51	159	2	4	216	2.78
WiWY5	264	102	119	1	3	225	1.77
WiWY6	236	79	89	2	2	172	2.32
WiWY7	241	96	86	4	1	187	2.67
WiWY8	258	98	113	1	3	215	1.86
WiWY9	250	103	103	1	3	210	1.89
WiWY10	260	107	107	1	2	117	2.55
WiWY11	241	101	106	2	3	212	2.36
WiWY12	305	120	148	2	6	276	2.89
WiWY13	224	65	171	5	2	243	2.42
WiWY14	241	100	128	1	2	231	1.29
WiWY15	246	84	95	4	2	185	3.24
WiWY16	229	59	121	5	—	185	2.70
WiWY17	277	84	132	2	1	219	1.37
WiWY18	241	79	102	3	2	186	2.15
WiWY19	221	90	97	4	3	194	3.60
WiWY20	236	96	86	2	2	187	2.15
WiWY21	216	140	91	5	1	237	2.53
WiWY22	182	86	78	1	2	167	1.79
WiWY23	250	133	94	5	2	234	2.99
WiWY24	224	96	127	6	1	230	3.03
WiWY25	314	96	152	7	1	256	2.10
WiWY26	308	140	160	7	—	307	2.27
WiWY27	294	116	155	3	2	276	1.81
Total	6,658	2,574	3,193	84	57	5,908	2.48

The main types of variation are not sharply distinguished from each other since there are intergradations between the typical rudimentary wing and the smooth or twisted condition.

TABLE 11. P_1 YELLOW ♀♀ × BAR ♂♂, F_1 WILD TYPE ♀♀ × F_1 YELLOW ♂♂

Refer.	Females		Non-Cross Over ♂♂		Cross-Over ♂♂		Total	Cross Over Value
	Yellow	Wild Type	Yellow	Rar	Bar Yellow	Wild Type		
YB1	66	62	28	40	35	22	125	45.60
YB2	64	77	21	19	27	23	190	55.55
YB3	87	79	12	43	27	17	99	44.44
YB4	85	79	40	35	36	36	147	49.00
YB5	70	72	45	42	25	31	143	39.16
YB6	63	98	35	33	42	25	147	53.74
YB7	88	122	44	51	49	42	186	48.92
YB8	88	111	37	33	45	39	154	54.71
YB9	66	65	21	40	34	29	124	58.06
YB10	91	98	47	48	41	39	175	45.71
YB11	87	88	39	31	33	33	136	48.52
YB12	93	61	38	43	32	30	153	47.06
YB13	75	93	46	75	34	31	186	34.40
YB14	62	67	31	33	36	24	124	48.38
YB15	100	83	30	48	34	17	129	39.57
YB16	92	83	52	42	49	26	169	44.38
Total	1,278	1,355	566	656	589	476	2,287	47.93

Flies of these four kinds were crossed to wild females in order to test the inheritance of the variation. In the F2 generation each of them reappeared. However the data are not sufficient to determine the real nature of these variations, that is, whether they are truly inherited or whether they are brought about by change in the environment. A few observations indicate that the condition of the food is in some way connected with their development.

Flies emerged from a new generation usually coming out continuously for 10 to 12 days if the female was kept in culture bottle 10 days for laying eggs. Those that hatched out first or earlies were the ones first had access to the food which was abundant and fresh. It is generally true that as the culture grows the food becomes less and less abundant. It is also true that flies hatched out toward the end of the period are smaller in size than ones hatched earlier. Their smaller size is undoubted due to under-nutriation, observation was made on the occurance of the

TABLE 12. P_1 BAR ♀♀ × RUDIMENTARY ♂♂, F_1 WILD TYPE ♀♀ × F_1 BAR ♂♂

Reference	Females	Non-Cross-Over ♂♂		Cross-Over ♂♂		Total ♂♂	Cross Over Value
	Bar	Wild Type	Bar	Rudi. Bar	Wild Type		
BR1	223	119	62	2	2	185	2.69
BR2	169	72	62	4	5	143	6.29
BR3	200	93	63	2	4	162	3.70
BR4	218	88	76	—	6	170	3.52
BR5	197	62	54	1	2	119	2.52
BR6	178	79	76	1	2	158	1.90
BR7	227	86	68	1	1	156	1.2
BR8	212	93	83	—	2	178	1.1
BR9	201	101	80	—	3	184	1.6
BR10	259	103	104	1	2	210	1.4
BR11	198	91	97	1	1	190	1.0
BR12	247	125	120	—	3	248	1.2
BR13	212	95	109	2	2	208	1.9
BR14	175	82	72	1	2	157	1.9
BR15	228	71	100	1	3	175	2.2
Total	3,144	1,360	1,227	17	40	2,644	2.29

typical type and the four variant forms in first 6 days and in second 6 days. The number of flies of those types secured in these two periods is shown in the table below:

	1st 6 days	2nd 6 days
1. Typical Rudimentary	1,245	517
2. Smooth Rudimentary		
(*a*) both wings short	886	470
(*b*) wings of unequal length ..	208	
3. Twisted Rudimentary		
(*a*) one wing twisted	216	
(*b*) both wings twisted	191	
	1,746	987

From the above figure we see that in the second 6 days none of the last three variant forms appeared, while the first variant form appeared in both periods. And more flies hatched out in the first 6 days than the second. Undoubtedly flies came out in the first 6 days were better nurished than those in the second period. Since the poor-food or under-nutriation diminishs the size of a fly, there is reason to think, the abundance of food just as well to varify the wing-pattern of a fly. Before

further evidences come to light, this may take as a tentative explanation of the variability of wing-pattern in Rudimentary flies.

TABLE 13. THE FLUCTUATING VARIABILITY IN "RUDIMENTARY"

Reference	Typical Rudi.	Both wings short	Wings of unequal length	one wings twisted	both wings twisted	Total
MVA1	10	32	48	9	19	118
MVA2	7	52	92	7	7	165
MVA3	7	107	102	4	7	226
MVA4	6	51	85	2	4	148
MVA5	6	41	37	6	7	97
MVA6	5	42	90	3	3	143
MVB1	7	38	37	7	3	92
MVB2	7	23	59	9	7	105
MVB3	9	47	62	15	6	139
MVB4	8	34	52	4	3	101
MVB5	4	74	49	4	6	142
MVB6	11	48	88	8	6	161
MVB7	3	32	30	5	3	73
MVC1	4	19	26	3	2	52
MVC2	8	32	41	12	7	100
MVC3	6	18	36	6	5	71
MVC4	8	27	28	6	9	78
MVC5	5	23	45	11	3	87
MVC6	7	25	44	9	3	85
MVC7	3	24	49	4	8	88
MVC8	5	48	26	5	10	94
MVC9	5	34	57	5	1	102
MVD1	5	36	38	5	5	89
MVD2	8	24	46	8	6	92
MVD3	3	30	32	5	5	75
MVD4	5	29	20	6	4	74
MVD5	7	48	58	3	6	122
MVD6	6	35	43	5	4	93
MVE1	7	62	76	7	7	159
MVE2	5	50	57	6	7	125
MVE3	8	51	71	9	9	198
MVE4	7	67	74	6	4	158
MVE5	7	50	64	7	5	133
Total	208	1,353	1,768	216	191	3,730
	5.57%	36.3%	47.3%	5.72%	5.01%	

ON STERILITY IN RUDIMENTARY FEMALES.

Rudimentary females are obtained by crossing rudimentary males with wild females, and then back crossing the female offspring to rudi-

mentary males. If now rudimentary males and females are mated they produce no offspring at all. Many matings of this kind were made and the results of all were negative. In order to determine whether one parent or the other or both were sterile the males and females were out crossed to other strains of fertile *Drosophila*. The males proved to be fertile with the exception that in the F2 the ratio of the rudimentary males to the wild males is about 1:7 instead of the normal ratio 1:1 when rudimentary females are crossed to fertile males of other strains they are found to be comparatively infertile.

To test out the sterility of rudimentary females three series of experiments were carried out. In series 2 the rudimentary females were crossed to males of other strains. Twelve pairs were made. Each pair was allowed to lay eggs for ten days. The number of eggs laid during that period was recorded. The eggs were removed to a bottle of fresh food and the food conditions and so forth were so favourable that eggs usually hatched out readily, 358 eggs being laid by 12 females in ten days, out of which number 41 eggs hatched into larvae, 21 to pupae, and 21 to adults of 13 males and 8 females. On an average, then, each female laid 30 eggs; four of them hatched into larvae, 2 to pupae, and 2 to adults. From the above figure we conclude that the rudimentary females when mated to the males of other strains are nearly sterile. In series 3 the rudimentary females were mated to the rudimentary males, 16 pairs being mated and 559 eggs produced with the average of 34 eggs per pair. The eggs, however, were kept in the same condition as that in the series 2, but none of them hatched out even into larvae or pupae. So this was a case of complete sterility of the rudimentary females. The series 1 was the control. The average number of eggs laid per couple of flies other than of a rudimentary character was 85, of which 83 were hatched into larvae, 82 into pupae and 82 into adults of 40 males and 42 females. In series 2 and 3 the average number of eggs laid by each pair was 30 and 34 respectively, that is, about 35 per cent. and 40 per cent. of the control. In the control more than 95 per cent. of the eggs were hatched out, but in series 3 none of the eggs hatched, and in series 2 less than 12 per cent. of the eggs hatched into larvae, less than 6 per cent. to pupae and adults.

The next step was to inquire into the nature of the sterility of the rudimentary females. Five rudimentary females were dissected out, and it was found that the ovaries were present. In the young flies the ovaries appeared normal. In adults a few eggs (about 35) enlarged rapidly during the first few days after hatching. The other eggs in the ovaries remained at an early stage of their development. The fact that the rudimentary females laid small numbers of eggs, about 35-40 per cent. of the normal flies, was due to the failure of the eggs to develop properly. This confirms the observation on the sterility of rudimentary females made by Dr. Morgan in 1915. But in this case the females produced only a very few offsprings with the males of other strains, while Morgan states that they are fertile if they are mated to any other males of a different strain. But they did lay quite a number of eggs (30 in series 2, 34 in series 3, on the average). The eggs laid by the females failed to hatch out. As the eggs were kept in the conditions which are favourable for the eggs of the normal fly to hatch,

then there must have been something abnormal in the eggs. So the failure of the eggs to hatch was hardly due to the external conditions, but rather to conditions in the eggs themselves. Since lethal factors

TABLE 14. ON STERILITY OF RUDIMENTARY FEMALES.

Reference	Number of Eggs	Number of Larvae	Number of Pupae	Number Adults	Sex ♂	Sex ♀
1. Control	85	83	82	82	40	42
2. Rudi. females crossed to males of other strains.						
1	43	0	0	0		
2	15	3	2	2	1	1
3	20	3	1	1	1	
4	48	0	0	0		
5	25	0	0	0		
6	36	5	2	2	2	
7	32	7	3	3	1	2
8	29	0	0	0		
9	43	7	3	3	2	1
10	41	9	5	5	3	2
11	12	3	2	2	2	
12	14	4	3	3	1	2
Total	358	41	21	21	13	8
3. Rudi. females crossed to Rudi. males.						
1	40	0	0	0		
2	47	0	0	0		
3	40	0	0	0		
4	43	0	0	0		
5	37	0	0	0		
6	43	0	0	0		
7	38	0	0	0		
8	40	0	0	0		
9	20	0	0	0		
10	22	0	0	0		
11	29	0	0	0		
12	35	0	0	0		
13	25	0	0	0		
14	27	0	0	0		
15	35	0	0	0		
16	38	0	0	0		
Total	559	0	0	0		

which cause the death of an individual in different stages of development are not uncommon in *Drosophila*, without evidence to the contrary, the failure of the eggs laid by rudimentary females may be, for the present at least, ascribed to such lethal factors which inhibited the eggs in the ovaries from developing properly, so that a large number of eggs remained undeveloped, while those which in some way did develop failed to hatch out. The sterility of the Rudimentary females, therefore, is partly due to the failure of the eggs to develop properly and partly to the failure of the developed eggs to hatch out. Beyond this point, no further substantive evidence has so far been obtained.

The failure of the rudimentary males to give a typical sex-linked ratio instead of the 1:7 ratio observed in the F2 when they are crossed with wild females as mentioned above is most likely due to the partial infertility of the males. However, on the other hand, the low viability of the flies having this character is a very probable cause. That is to say, in some way flies having this character are very weak, and consequently they are kept back in competing with flies having other characters during their developmental stages. The real nature of this case is so far not very clear.

Summary

1. The Yellow and Rudimentary (extreme) are both sex-linked characters, and therefore the gene for Yellow and the gene for Rudimentary are both found in the Sex-chromosome.
2. The locus of the gene for Yellow lies 2.48 units from that for White, and 46.17 units from that for Rudimentary. It is at one end of the sex-chromosome. The locus of the gene for Rudimentary lies between that for Yellow and for Bar, 2.29 units to the Bar and 46.17 units away from the Yellow.
3. The wing-pattern of the Rudimentary varies in two directions: 1.—from the typical wrinkled surface to smoothness of the wing, and 2.—to the twisted condition of the wing. The probable cause of the variability in rudimentary flies is found to be an environmental one. An abundance of food and moisture tended to produce the extreme variant forms. The occurance of the smooth-winged type seems to have no relation to the conditions of food and moisture, for flies of this sort appeared when living conditions were both favourable and unfavourable.
4. The Rudimentary female is absolutely sterile and the Rudimentary male is partially fertile. The cause of the infertility in the female is partly due to the failure of the eggs in the ovaries to develop properly, and partly to the failure of the eggs laid to hatch out. The partial fertility in the males is so far not quite understood.
5. The genes for Yellow, Rudimentary, White and Bar are found to be arranged in a line in the sex-chromosome, as the "Theory of Linear Order of Genes" advocates.

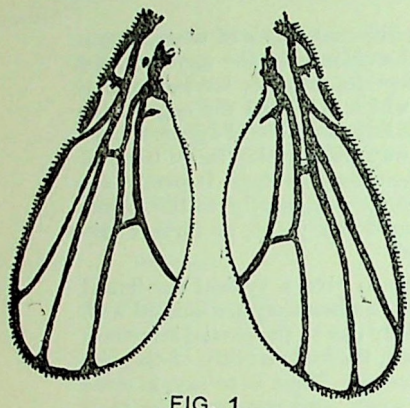


FIG. 1.
NORMAL
WINGS

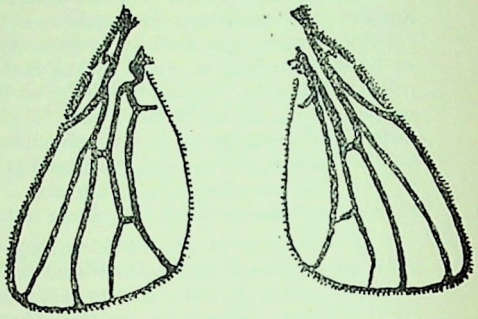


FIG. 2.
RUDIMENTARY,
SMOOTH-WING TYPE.
BOTH SHORT.

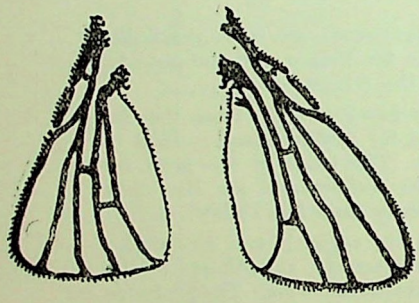


FIG. 3.
SMOOTH-WING TYPE,
UNEQUAL LENGTH.

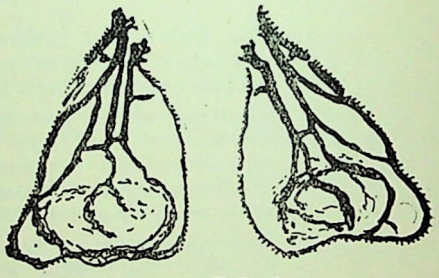


FIG. 4.
TYPICAL EXTREME
RUDIMENTARY.

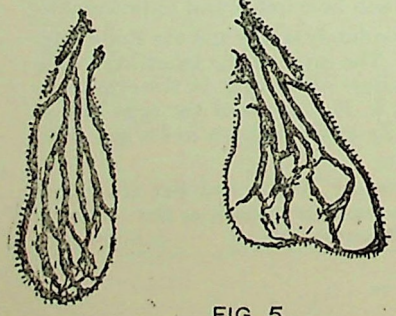


FIG. 5.
ONE WING TWISTED.

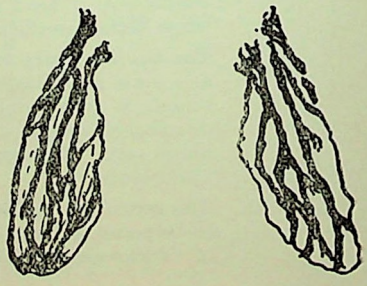


FIG. 6.
BOTH WINGS
TWISTED.

ACKNOWLEDGEMENTS

The author desires to express his sincere appreciation and gratitude to The Peking Union Medical College for granting him the privileges and facilities of the research laboratory of the Department of Biology in the Premedical School for his investigations, to Dr. C. Packard, the head of the department, under whose direction the work was carried on and to Dr. A. H. Sturtevant of Colombia University, New York City, for the identification of the Peking strain of *Drosophila melanogaster* and one of the mutant characters as "Extreme Rudimentary."

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BIOLOGICAL NOTES AND REVIEWS

RECENT PUBLICATION OF THE AMERICAN MUSEUM OF NATURAL HISTORY UPON NEW CHINESE ANIMALS.

The following papers on China have appeared as a result of the American Museum of Natural History's three expeditions in China. They are presented in the order issued and bear the serial numbers given to the series by the Museum:—

1. New Chinese Fishes, John Treadwell Nichols, Proc. Biol. Soc., Wash., Vol. 31, pp. 15-20, May 16, 1918. See this Journal Vol. 1, pp. 177-178.

2. Description of a New Species of Serow from Yunnan Province, China, Roy Chapman Andrews, Am. Mus. Novitates No. 6, March 24, 1921.

Capricornis osborni Andrews, from Huiyao (20 miles from Teng-yüeh) Yünnan, distinguished from other related forms by its coal-black body and head, short black mane and greater amount of black on lower part of legs.

3. Birds of the American Museum of Natural History's Asiatic Zoological Exploration of 1916-1917, Outram Bangs, Bull. Am. Mus. Nat. Hist., Vol. 44, pp. 575-612, December 30, 1921. See this Journal Vol. 1, p. 176.

4. Description of a New Loach from Northeastern China, Henry W. Fowler, Novitates No. 38, May 25, 1922.

Lefua andrewsi Fowler, from Shing Lung Shan, Eastern Tombs: differs from *L. costata* (Kessler) in having a broad and well-defined lateral band of dusky to blackish, which is reflected out on the median caudal rays. In *L. costata* the scarcely evident lateral streak is replaced at the caudal base by a definite small, round, black spot, clearly defined and not reflected out on the median fin rays.

5. Discovery of Cretaceous and Older Tertiary Strata in Mongolia, Walter Granger and Charles P. Berkey, Novitates No. 42, April 7, 1922. The paper includes a geologic column for the Iren Dabasu basin.

6. Protoceratops andrewsi, a Pre-ceratopsian Dinosaur from Mongolia, Walter Granger & William K. Gregory, Novitates No. 72, May 4, 1923.

Found east of Artsa Bogdo on the Kweiwhating trail; probably Cretaceous; figures of the skull are included.

7. Later Sediments of the Desert Basins of Central Mongolia, Charles P. Berkey & Walter Granger, Novitates No. 77, May 52, 1923.

This paper includes a map of the region and a more detailed geologic column for the region as a whole.

8. Baluchitherium grangeri, a Giant Hornless Rhinoceros from Mongolia, Henry Fairfield Osborn, Novitates No. 78, May 25, 1923.

A map showing the localities of the three Asiatic species of rhinoceroses belonging to the new subfamily *Baluchitheriinae* Osborn, many

excellent figures and a restoration drawn to scale with an Indian rhinoceros, make the paper of educational value.

9. Description of a New Cyprinoid Fish from China, Henry W. Fowler, Novitates No. 83, July 25, 1923.

Chela nicholsi Fowler, from Ningkuo, Anhwei. This genus is confined to south China and the Indian region.

10. New Chinese Bats, Glover M. Allen, Novitates No. 85, August 28, 1923.

Five hundred specimens were collected, the following species are reported :—

Rhinolophus blythi calidus Allen, from Yenping, Fukien,
,, *episcopus* Allen, Wanhsien, Szechuen.
,, ,, *caldwelli* Allen, Yuki, Fukien,
,, *rex* Allen, from Wanhsien,
Myotis chinensis luctuosus Allen, from Wanhsien
,, *frater* Allen, from Yenping, Fukien. "The more primitive condition of the American species [*M. volans*, of western North America] indicates that it was derived from the Asiatic bat."
Nyctalus velutinus Allen, from Futsing, Fukien, is close to *N. labiatus* Hodgson.
Miniotperus schreibersi parvipes Allen, from Yenping.

11. Titanotheres and Lophiodonts in Mongolia, Henry Fairfield Osborn, Novitates No. 91, October 17, 1923.

The following are described from the Irdin Manha beds, 23 miles south of Iren Dabasu :

Desmatotherium mongoliense Osborn, the teeth are figured.
Protitanotherium mongoliense Osborn.

A. P. J.

LECTURES IN BIOLOGY (With Atlas) : by Parker M. Bayne, M.A., West China Union University (*2nd Edition Revised and Enlarged*).

Students and teachers of biology in China will find in this work, which is almost entirely in Chinese, a most useful textbook. The fact that a second edition has been called for shows that it has found its place in this country, where of late years there is ample evidence of an increase in interest in the subject with which it deals. Years ago when the writer taught biology to Chinese, he found that they were not in the least interested, looking upon the classes as a waste of time. But then there was no such work as this, and many of the students had not enough English to render intelligible to them the available textbooks in that language. With such a book as we now have before us, the teaching and learning of biology must be greatly simplified, and Mr. Bayne is to be congratulated on its production. The Atlas, consisting of numerous very good woodcut illustrations, which accompanies the book, though in a separate cover, adds greatly to its value. One can say no more than that the work is just what is needed. Perhaps, for the help of teachers unacquainted with the Chinese written language, future additions might have the text in English side by side with the Chinese.

CHINA'S TEMPERATE FLORA THE RICHEST IN THE WORLD

A short but interesting article appeared in *The Times* recently dealing with the botanical wealth of Central and West China. It quotes the naturalist and explorer, Wilson, who spent a number of years in West China making extensive collections and large numbers of new discoveries; and who said in his book "A Naturalist in West China" that "The Chinese flora is beyond question the richest temperate flora in the world."

Since Wilson's time many other botanical explorers have visited these parts, notably Purdom and Farrer, both of whom are now dead, Capt. F. Kingdon Ward and Forrest. Touching the material sent to Europe by these explorers the article says :

"Years must elapse before a fraction of these new Asiatic plants can be appraised, but it is already clear that a high proportion is only of botanical interest and will avail gardeners nothing."

It goes on to discuss the effect of the British climate on plants introduced from China for horticultural purposes, which is mainly trying on account of its alternate spells of frost and warmth during the winter. The plants from the highlands of West China have much greater cold to endure, but it is not intermittant, and so the plants are not coaxed into sending forth shoots which are damaged by the next frost.

It has been proved beyond doubt that the highlands of Southern Tibet and along the Sino-Tibetan border constitute the headquarters of numerous families of flowering plants, amongst others those of the "lily, primrose, maple, vine, rose, bramble and plum : of gentians there are nearly 100 species." The rhododendron family also has its headquarters in this area, and not, as was supposed in the 19th Century, in the Sikkim-Himalayas. Hundreds of new species of these handsome-bloomed shrubs have been discovered.

FISH IMPALED ON TWIGS

A member of the Shanghai community who makes frequent visits to Henli reports a most interesting phenomenon. While examining some young trees that had been planted last autumn, he discovered several small fish neatly impaled on twigs. Most of these were cyprinids, but one was a catfish, and none were much over an inch or so in length. The pools along the shore of the creek and the edges of the creek were frozen. Our informant strongly suspects that this was the work of kingfishers, of which many occur in the neighbourhood. A native field collector whom we sent down to collect biological specimens in the district, also attributed the phenomenon to kingfishers ; but so far these birds have not been caught in the act. We would be glad of information bearing on this interesting occurrence.

KING CRABS REPORTED OFF SITKA IN THE BERING SEA

A recent report states that the king crab, formerly only found in merchantable quantities near Japan, has invaded the waters of Cook Inlet, Prince William Sound, off Sitka in the Bering Sea, in such number

that four canneries in Alaska are packing the giant shell fish. The king crab, it goes on to say, measures from three to five feet from tip to tip of the huge claws or pinchers, and weighs from four to twelve pounds.

This is evidently a mistake, the wrong name having been given to the crustacean in question. The king crab as known to naturalists is found only in tropical and semi-tropical waters, and is not a true crab, being more nearly related to the land scorpions and other members of the order *Arachnida*. It and its congeners are the modern representatives of the great Eurypterids of the Carboniferous age. A species found off the coasts of South-east China is known to science as *Xiphosura longispina*, another *X. polyphemus*, being found off the south-eastern coast of North America.

The animal referred to in the report mentioned above is evidently the Japanese giant crab (*Macrocheira Kaempferi*), a large species of spider crab, family *Maiidæ*, or some closely related species. It is a true crab and belongs to the order Crustacea. The record measurement across the claws, or chelae, it is stated, according to John N. Cobb, Dean of the College of Fisheries, University of Washington, of one of these crabs is that of a specimen caught in the net of some Japanese fisherman. It was 19 feet. This is even larger than the magnificent specimen recently loaned to the museum of the Royal Asiatic Society by Mr. H. H. Read, which measured 10 feet, 3 inches across the claws.

A FOSSIL CADDIS CASE

Under this title "Nature" (Vol. 112, No. 2822) publishes an account by T. D. A. Cockerell of certain fossil remains found in Tertiary rocks at Posiet on the eastern coast of the Primorsk Province, E. Siberia, which represent the case of a caddis-fly of the genus *Phryganea*, and which he has named *Phryganea Kryshtofovichi* as new, giving a figure in the text. As may be seen from this figure the case is spiral in structure, and according to the describer is composed of pieces of *Sequoia Langsdorfi*. The same authority also secured a wing of *Phryganea*, which he proposes describing elsewhere. As he points out, it is very interesting to find that the reactions and instincts of insects as known to-day are of such antiquity, and it is remarkable that species have existed almost unchanged for such an immense period of time as indicated in this instance.

OTTER NEAR QUINSAN.

An interesting record has been sent in of the occurrence of an otter near Quinsan, Kiangsu (not far from Shanghai). A party of sportsmen while proceeding by boat along a creek in this vicinity on January 27 saw a large animal slip into the water from the bank and swim away. From its size, colour and appearance, above as well as under the water, they identified it as an otter. The members of the party are familiar with the mink (often called the yellow weasel in these parts), the only other animal it could have been, and stated that it was too large and of too dark a colour to have been a mink.

SHOOTING AND FISHING NOTES.

TRAPPING GAME

Several local sportsmen have reported seeing large numbers of traps of various designs set out in the Hai Yen district, on the Hangchow Bay, in which everything from rats to hares and pheasants are taken. One favourite trap, of which one sportsman informs us he must have seen about 500 during a few days' trip in the district, is in the form of a tunnel made of bricks with a heavy tile door at each end. It is set in a runway, and, to prevent the quarry going round, stakes are stuck into the ground to form fences on either side of both openings which direct the animal or bird to the mouth of the tunnel. The doors are held open by a spring which is attached to a small platform inside the tunnel. When the quarry steps on this platform the catch is released and the doors fall to. Large numbers of ground game, especially bamboo partridges and pheasants, are caught in this way.

Another design of trap used is a large flat square stone propped up and baited, much after the manner of a figure-of-four trap. This sort of thing, of course, means further depredations amongst the already sadly decimated feathered game of these parts. Everything possible has been done to get the Chinese authorities to protect the game birds and animals of this country, but so far without any success, and this is only one more of the many abuses permitted here which would no tbe tolerated in any other civilized country.

SHOOTING

The regular week-end shooting trips which characterise the sports, man's life in Shanghai have been in full swing during the past months and many nice bags have been made.

A party of three guns shooting in the Tung Ting Lake district for a day and a half made the respectable bag of 11 wild geese, 32 ducks and teal, 4 pheasants, 4 quail and 3 woodcock. They had not expected to find geese and so were not prepared for them, or their bag might have been very much greater.

One well-known sportsman reports that birds are scarce, pheasants keeping to the open and getting up well out of range.

Wild boar hunters appear to have been very successful this winter, some magnificent specimens having been secured. There do not appear to have been as many deer shot this winter as last, however, probably because they were killed off rather badly last winter. The Shanghai game markets have not been so well stocked this year as last with these animals.

China New Year Holiday Shooting Trips.

The shooting in the Shanghai and neighbouring districts over the China New Year holidays was, on the whole, disappointing. The weather set in cold, and except for New Year's Day wet, with the result that game

birds could not be put up, while wild fowl were particularly shy and difficult of approach.

One party of two, however, had some very good sport with snipe and quail, in three days' shoot securing 30 couple of snipe and 20 brace of quail.

Big Game in Shansi.

Mr. J. J. Patterson, of Jardine, Matheson & Co., visited the wild sheep country of North Shansi during parts of January and February and secured a good bag of four rams of the species *Ovis commosa*, popularly known as the Argali or Mongolian big-horn sheep. He reports seeing a number of roedeer and one goral, which, however, he did not try to shoot for fear of disturbing the sheep. The latter are very wild, and far less numerous than they used to be in the district visited.

H.M.S. "Bee's" Bag

The following notes from the shooting book of some of the members of the crew of H.M.S. *Bee* have been sent to us by Surgeon Commander L. F. Strugnell. Only the results of some of the best day's shooting are given :

Date	District	No. of Guns	Days	
Nov. 25	Shansi	4	1	8 pheasants, 20 quails, 1 woodcock, 1 hare
Jan. 9	Kiukiang	3	½	7 pheasants
Jan. 12	Tatung	5	½	12 pheasants, 10 snipes, 2 quails, 1 deer
Jan. 13	,,	2	½	10 pheasants
Jan. 14	,,	2	½	7 pheasants, 11 snipes, 5 quails
Jan. 21	Nanking	3	1	16 pheasants, 1 hare, 1 teal, 1 snipe

Small Bore Shot-Guns

The following notes regarding small bore shot guns have been sent us by a correspondent. We quote his letter:—

"Having recently arrived in China, with a view to a prolonged visit, I am much interested in finding that small-bore guns are becoming increasingly popular here, just as they are in England and America. As the spring snipe shooting begins at the end of April, just when it is getting a bit warm, it is only common sense to use as light a gun as possible. The smallest effective shot-gun is the .410, chambered for 2½ inch cases. I have lately used one of these miniature weapons a good deal on rabbits and woodpigeons in England, and it is quite astonishing how deadly they are. My own was so full choked that I avoided using it much on fast flying birds, for the killing circle was so very small. For shooting sitting woodpigeons from a hide, it proved itself nearly as effective as a 12-bore up to a range of 30 yards. At this distance I have repeatedly killed woodpigeons stone dead, and everyone knows what tough birds

they are. A double .410 with the right barrel cylinder and the left slightly choked would be a very different affair, and would be a very charming little weapon for quail and snipe.

"However, most people will vote the .410 too small for such work, and feel a desire for a somewhat bigger gun. To these the 28-bore can be confidently recommended. I have seen this bore used with the greatest success both in England and India. It must be remembered, however, that miniature shot-guns leave no margin for careless loading. A carelessly loaded 12-bore cartridge with indifferent wadding will kill birds if they are not too far away, for the reason that it holds more powder and shot than are absolutely necessary for the job it has to do. When, however, you come to the small-bores, the shot pellets are very much fewer in number, and it is essential that the highest possible percentage of them should be effectives. For this reason cartridges for small gauge guns should be loaded with the best possible wadding, and the white felt over-power wad should be as thick and tight fitting as possible. In order to obtain the hardest and closest possible shooting in my .410, I used to load the cartridges myself. The load and wadding used was as follows :

"Twelve grains of Schultze, thin grease proof card wad, seven-sixteenths inch white felt wad of very best quality, thin card wad, three-eighths of an ounce of chilled Belgian No. 6 shot, thin card, and light turn-over.

"The mention of Belgian shot serves to emphasize the importance of using shot, the pellets of which are all even in size. You cannot expect good shooting with shot of irregular sizes. I found the Belgian No. 6 so much more even than English shot, that I gave up the latter for my .410. Tatham's shot is also good, but I believe English shot is better now than it was a year ago.

"One of the fallacies regarding small-bore guns is that they are harder to shoot with than a 12-bore, because the pattern is so small. This is not at all the case with small-bores regulated to throw an open pattern ; the difference between the size of the killing circle as compared with that of a 12-bore is not sufficiently great to worry about, while the superior handiness of the little gun far more than makes up for it. Anyone taking to a small-bore after a 12, will almost invariably find his shooting quickened and improved."

FISHING

Fishing has not been indulged in by Europeans in China up to the present to any considerable extent for the simple reason that it has always been considered impracticable. It has been argued that the intensive methods of fishing adopted by the Chinese must result in an almost complete annihilation of the fish of the creeks, canals, streams, rivers and ponds that abound on every hand, and that such fish as escape and survive long enough to be worth fishing for must have become much too wary to be taken by the angler bent on sport.

This, however, has been proved a mistaken idea, and lately excellent sport has been enjoyed by ardent fishermen, especially with the fly.

It has been found that certain species of fish occur which readily take the fly and when taken on a light rod and line afford good sport. Chief amongst these are the so-called rainbow carp (*Opsariichthys bidens*), which is very plentiful in certain streams in the Hangchow district. It receives its name from its brilliant colours during the spawning season. The little fish known to local anglers as the knife fish, and to science as *Hemiculter leucisculus*, also takes a fly, as do many other larger species, notably the culters.

Fishing Clubs.—A fishing club, limited to seven members, has been formed by some Shanghai sportsmen, and a pond has been rented, staked to prevent the Chinese netting it, and stocked. An experiment is being carried out at the present time to see if the Mandarin fish (*Siniperca chuatsi*), a species of bass, can be reared successfully in this pond. Other fish known to exist in it are the knife-fish, already mentioned, the Chinese ide (*Ctenopharyngodon idella*), the so-called silver fish (*Hypophthalmichthys molitrix*), several species of culter, and the predacious serpent head (*Ophiocephalus argus*). The last-named has all the faults of the pike and none of the virtues, that is to say, it devours large quantities of other fish, itself offering nothing in the way of sport.

In connection with this fish Mr. Lorden, whose article on fishing appears elsewhere in the present number of this journal, relates that he recently had a small artificial lily pond in his garden drained. It was made only a couple of years ago, but some seven or eight large serpent heads were taken out, some weighing up to 4-lbs. These had completely exterminated all the other fish in the pond, notably knife-fish and gold fish, which was the reason for draining the pond.

A fishing club is also in the process of formation at Swatow, where some local enthusiasts have hired some ponds which they are stocking. We wish them success.

Sea Bass Fishing with Fly.—Mr. Lorden reports having had very good sport last summer at Wei-hai-wei and Pei-tai Ho fishing for sea-bass (*Lateolobrax japonica*) with fly and light rod off the rocks. The method was to paddle quietly about in a *sanpan* just off the rocks and cast continually where the surf was breaking, and the sport enjoyed was fully up to salmon fishing. The average weight of fish caught was about 4-lbs., but one weighing 11-lbs. was taken. This bass is of a fine silvery colour spotted with black. Another unspotted variety was taken, which looked more like the sea-bass of British waters, while occasionally rock-bass would also be caught. Neither of the two latter were as sporting as the spotted variety.

THE SOLAR CHRONOMETER

A DESCRIPTION OF A SUN-DIAL EVOLVED IN CHINA FOR USE IN CHINA

BY

THOS. T. H. FERGUSON.

When in Peking in 1893 the writer of these lines was asked by Sir Robert Hart whether he could set up and properly orient a sun-dial in the Inspector-General's garden which will be remembered as an important feature in the social life of Peking during those days. The task was duly performed, but its execution led the writer to a further study of the very fascinating subject of gnomonics with a special view to its applicability in China under modern conditions of time-regulation. The result was an instrument which combined as many as possible of the points held to be essential in a really *practical* device for quickly obtaining the sun's dictum on the time of the day, not for the sake of momentary information, as one would consult a clock or watch, but in order to *check* that clock or watch and set it right for the next few days or so. This instrument having since been brought out* and put to a satisfactory test in many places in China in the course of several years, it may interest the readers of "The China Journal of Science and Arts" to have a description of it and at the same time to rub up their knowledge, in an elementary way, regarding the sun's functions as a time-keeper.

We shall not insult our readers by advancing the information that the sun's apparent daily course in the heavens is due to a rotation of the earth round its axis, but start with reminding them that this rotation of the earth is an absolutely regular and uniform motion—that is, in the supposition that Einstein had not existed and we were still allowed to rest in that blissful state of security in which Galileo and Newton had allowed us to dwell in happier days.

Supposing, therefore, the earth to have stopped for a moment in its annual trip round the sun, so that both sun and earth were stationary bodies, the earth merely continuing its axial rotation, it is evident that the apparent daily motion of the sun would be absolutely (with apologies to Professor Einstein) uniform and an ideal measure of time. Such is in fact the condition of the earth, practically, with respect to the stars, and the resulting time—sidereal time—thus became the principal measure of time for that professional night-bird, the astronomer. Unluckily, however, the sun is not situated in this ideal manner and from time immemorial every sun-dial has accordingly registered its silent, unremitting protest against his erratic behaviour.

For not only does the earth circle round the sun and thereby cause an apparent retrogression of the latter body amongst the stars, but as this

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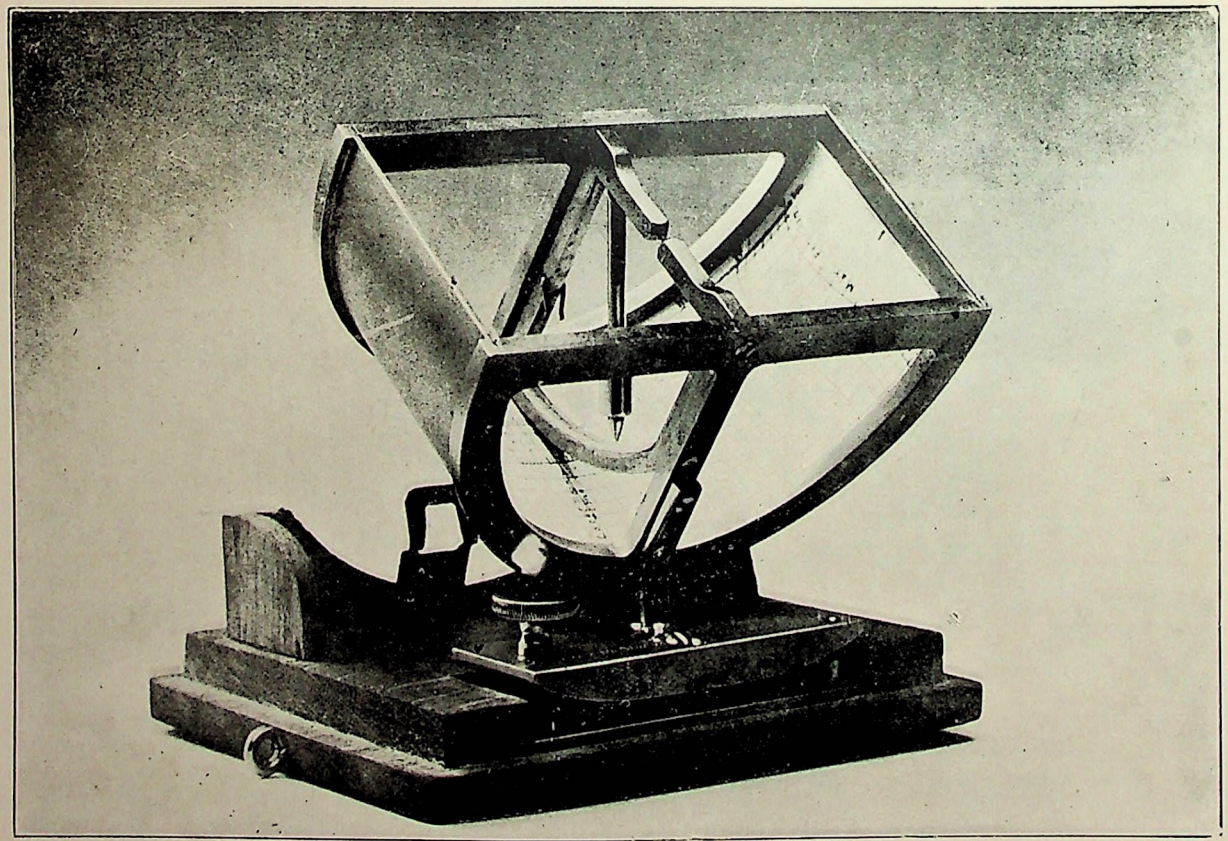
* By Messrs. Hirsbrunner & Co., Shanghai.



The Solar Chronometer which gives "Mean Time" by direct reading, is adapted to all Latitudes, may be oriented without the aid of a Compass, and may be used to give the True North.

circling takes place in an oblique plane on an elliptic course and with varying speed, the sun's apparent course amongst the stars is far from uniform, so that the daily difference between sidereal and solar, or apparent, time also varies quite appreciably. Hence mankind, feeling offended at the notion of a time which does not elapse at a uniform rate, has had to invent a more reliable sun, called " mean sun," which accompanies the real sun in its course among the zodiacal constellations as a sort of pacemaker that accomplishes the total circuit in exactly the same time as the real sun, but does so at a perfectly uniform rate. This gives us a practical measure of time which is the one used in civil life, navigation, etc., and is known as " mean time." As explained above, this time generally does not agree with the apparent time shown by the sun. Four times in the year they are in exact agreement ; on other dates mean time is either far ahead or behind apparent time. The difference may amount to as much as $16\frac{1}{2}$ minutes.

Every day, therefore, has its correction—called the equation of time for that day—which enables the time by the sun to be translated into " mean time," the time which a reliable clock must show. The indications of any ordinary sun-dial, therefore, have to be corrected in the first place for this equation of time, and, as the latter varies daily, and it takes the average observer quite a little while to pick it out of the calender or table engraved on the dial and make quite sure in his mind whether the equation of time has to be added to or subtracted from the reading of the dial (two observers generally arriving at different conclusions in this respect), we have thus stumbled upon the first and main drawback of the old-fashioned sun-dial, viz. the necessity of mentally applying the equation of time for the day at every one of its readings.

But the old sun-dial has other weaknesses as well. One, which did not count in the days when people generally looked upon their dwellings as something more than temporary accommodations, is its stationary character. To be of any use nowadays, something more portable is required, but here our troubles commence ! Who is going to do the setting up, which the optician's assistant used to do so neatly for us, carefully levelling the support, orienting the style, looking puzzled, orienting again and finally cementing everything in place and leaving the device to do its work hereafter, for better or worse, despite neglect or contumely—*Solis et artis opus*. A portable sun-dial would have to be capable of being set up and oriented by anybody, which is no easy requirement to fulfill. To obtain the correct level is troublesome enough, but orienting is a good deal worse, in fact, it is doubtful whether one in ten of the old pedestal sun-dials has ever been oriented within one degree of accuracy.

With all this the list of disabilities which we are piling up against the old sun-dial as an apology for its virtual extinction is not exhausted yet. Portability also means adaptability to different latitudes and here again most of the existing types leave us in the lurch. Furthermore, civilisation has long ceased to allow each village to sport its own time, but has introduced the notions of " standard " or " zone " time, forcing all clocks in the country to keep time with the capital (as is the case in some

European countries) or with the times of some definite meridians, commencing with Greenwich and proceeding East and West by 15 degrees of longitude or full hours difference in time. Thus in the greater part of China we keep China Coast time, which is the time of the 120th meridian, East Longitude, or exactly eight hours later than Greenwich. A clock regulated to some such standard time will, therefore, not agree with the most reliable sun-dial unless the latter happen to be set up at that particular meridian, or else be constructed to show the required correction to bring it in line with the clock.

This may be satisfactory enough to the clock, but it is pretty rough on the sun-dial, which thus finds itself discredited through no fault of its own, or saddled with the handicap of another "correction." As to that masterpiece of legislative cosmo-necromancy, daylight saving, where and when that is introduced, the poor sun-dial may as well shut up shop altogether or confine itself to the retailing of mottoes pure and simple.

From what precedes the discerning reader has probably been able to gather the impression that there would still be a wide field of usefulness, especially in China, for a sun-dial as an independent means of regulating clocks and watches whenever the latter follow their inborn aptitude for showing such hopeless differences as to make it quite uncertain what is the right time without reference to the nearest Town Hall clock (if that be correct) or railway station, which may be miles away. First of all, however, the old sun-dial would have to be cured of its many failings and designed in such a way that :—

1. It gives "mean time," either local or "standard" or "zone" time, by *direct reading* ;

Furthermore it should be :—

2. "Universal" or adapted to all latitudes ;
3. Capable of being set up instantly anywhere, by the most inexperienced hand without levelled support ;
4. Capable of being oriented by its own indications, without the aid of a compass or known time ;
5. Portable and not likely to get out of order ;
6. Sufficiently reliable and accurate ;
7. Inexpensive.

Now it cannot, of course, be supposed that these desiderata have not had due consideration in the past and are not provided for in various existing designs. So far, however, only a few of the requirements named above are found in any one design. Thus the question of mean time has had attention in various forms of sun-dial, principally American, but they are not self-orienting or portable ; universal and portable sun-dials are sold by every optician, but they are small and quite unreliable, being oriented by a compass and quite innocent of the first notions of mean time. Universal, portable and self-orienting qualities are possessed by the suspended armillary dials of the 17th century, several of which can be seen in Kensington Museum, but here also the great desideratum of mean time is lacking, and so on. As far as the writer was able to ascertain,

the problem of combining all the features named above into something really useful and practical, still remained to be solved.

Such a solution is now advanced in the shape of the " Solar Chronometer " shown in the accompanying illustration. Its main part consists of a broad metal strip bent in the shape of a semi-circle and supported by two semi-circular frame pieces. The axis of the half-cylinder thus formed is occupied by a metal rod which is cut away in the middle to such an extent as to be virtually divided into two pointed rods placed opposite each other with points just touching. This touching point, which we shall call the shadow-point, is therefore situated both in the axis of the cylinder and in its centre. An imaginary plane passing through that point perpendicular to the axis of the cylinder would intersect the inner surface of the cylinder in the shape of a semi-circle. As this imaginary plane will eventually have to be set up parallel to the earth's equator, we shall call it the equator-plane of the instrument, and the circle it cuts on the inner surface of the cylinder, the equator-circle. The aforesaid metal rod is the polar axis of the instrument, as it takes up the same position relative to the equator-circle as the earth's polar axis does with respect to the earth's equator. Through the polar axis we may now pass a vertical plane, which divides the semi-cylinder into two symmetrical halves, and which may be called the meridian. In the instrument the position of this plane is determined by a metal frame piece cast in the shape of a graduated arc, above which a freely suspended pendulum moves with its sharp point close to the graduations, indicating on the latter in degrees and fractions the inclination which the polar axis, or, what is the same, the axis of the cylinder, has at any moment. Incidentally it is also used to determine whether the " meridian " is in a perpendicular position or not. The cylinder with its frame is furthermore attached to a ball and socket joint with a screw clamp, by means of which it can be adjusted and fixed in any desired position.

To use the instrument, it must be set up in such a way that the pendulum shows a perpendicular position of the plane of the meridian and at the same time indicates an inclination of the polar axis equal to the latitude of the place. This double function does away with all need of preparing a level support for setting up the instrument. The next thing is to orient the polar axis to the true North. How this can be done without extraneous aid will become clear by considering what would happen in case the instrument was really set up in the right orientation. The " polar axis," " meridian," and " equator " would then all correspond in position with their namesakes in nature, and the path of the shadow of the touching points along the inner surface of the cylinder would be a reversed picture of the sun's apparent daily path through the heavens.

The reader knows (or will not resent the reminder) that at the vernal and autumnal equinoxes (21 March and 23 September) the sun rises and sets exactly in the East and West, no matter at what spot on the earth one may be, and follows a circle which coincides with the plane of the equator, i.e., a plane passing through the centre of the earth (or what is the same from an astronomical point of view—the eye of the observer) perpendicular to the polar axis, and therefore inclined to the horizon

at an angle equal to the complement of the latitude, or 90 degrees *minus* the latitude. This angle is shown by the meridian altitude of the sun on those days, which explains why at a lower latitude the sun mounts so much higher, and *vice-versa*.

But this is straying away from the subject. On March 21 and September 23, therefore, we know the sun to trace out an equatorial circle in the skies so that the shadow-point in the instrument will follow the equator-circle there if the latter should have been marked out visibly on the inner surface of the cylinder and, what is more, it will not depart from that circle on those dates. As any wrong orientation of the instrument would cause the shadow to depart from the circle, we have at once a means of effecting the orientation on the dates mentioned. To be able to do so on any other date, it is merely necessary to mark out the shadow paths for those dates as well.

Taking for instance the solstices June 21 and December 23 we shall find on those dates that the shadow paths will lie in circles parallel to the equator circle, but situated at such distance on either side of it that the angle subtended between any point on one of the solstitial lines and the nearest point on the equator, from the shadow-throwing point as centre, is about 23½ degrees. It is then said that the sun has a declination of 23½ degress, north or south. These being the extreme positions, all other date lines will fall in parallel circles between the shadow lines of those dates and can be easily calculated and placed in position in the instrument. For the instrument here described, the lines were drawn for ten-day intervals and printed on two sides of a strip of cardboard, one side containing the half-year from June 21 to December 23—*shortening* days for North Latitude—and the other side the remaining half-year—*lengthening* days. This strip of cardboard is slid into a grooved space in the instrument where it is kept firmly pressed against the inner surface of the cylinder. We have now all we need for setting up and orienting the instrument. To do so, the cylinder is simply turned up to such an inclination that the pendulum points to the latitude of the place and then the whole instrument slewed round until the shadow-point is on the line corresponding to the date of observation. Incidentally the contrivance thus represents an astronomical compass (and is actually adapted for use as such) enabling the true North to be found with a very fair degree of accuracy and the local error of the magnetic compass thus determined.

We were, however, not looking for a surveying instrument but for a simple means of calling the sun to aid in determining which of those disagreeing clocks and watches is right. It is the correct time we want, to set our best watch by. With the " Solar Chronometer " set up as described, this is a very simple matter. We know that at apparent noon the sun is in the meridian and that the shadow will then fall perpendicularly below the polar axis. For each hour it will move on by fifteen degrees, having to do the complete circle of 360 degrees in 24 hours. The whole space of the cardboard dial can thus be divided up into hours and their sub-divisions by drawing lines at right angles to the date-lines. These lines would, however, only give apparent time, whereas we have postulated that an up-to-date sun-dial must show mean time. This is rendered

possible in our case through using a shadow throwing *point* and not a line as is done in most other sun-dials. While in the latter the gnomon or style is purposely designed in such a manner that the position of its shadow shall not alter on any date of the year, the shadow-spot in the Solar Chronometer has been purposely asked to trace out a different line every day. For now we are able to shove the hour-marks on each date line ahead or back just as much as the difference between apparent and mean time for that day amounts to and thus enable the shadow spot to point out mean time direct. The hour lines thereby acquire a peculiar wavy appearance and are printed in that shape on the cardboard dial which thus becomes really a little graphical ephemeris of the sun's position at any moment on any day in the year.

So far we have got our sun-dial to be portable, universal, self-orienting, independent of any levelled support and reading mean time. We had, however, promised to make it perform another *tour de force* in giving, if desired, not the local time but the time of the meridian which happens to be ruling the country or *zone*. This is a comparatively simple matter. Zone time at a place means a constant difference, fast or slow, as compared with local mean time. This difference depends upon the difference in longitude, East or West, between the place and the standard meridian. In the Solar Chronometer a constant difference in reading is easily brought about by shifting the position of the cardboard dial at right angles to the trend of the hour-lines. A little scale at the centre of the dial, showing how much to shift it for any given difference in longitude, completes the trick and brings our sun-dial thoroughly up to the mark, all excepting some provision for daylight saving legislation which, as may be inferred from an earlier remark, this sun-dial looks upon as a piece of aberration in which no self-respecting instrument is bound to follow up the human notion.

SOME SHANSI WATERS, CHEMICALLY EXAMINED

WITH NOTES REGARDING WATER ANALYSIS IN GENERAL AND ITS INTERPRETATION.

BY

E. T. NYSTRÖM

Contribution No. 7 from the Nyström Institute for Scientific Research in Shansi.

Synopsis.

1. Introduction and Reasons for this investigation.
2. The problem of water supply in Shansi. Climate and Rain Fall.
3. General Remarks concerning inherent qualities of different natural waters. Geological influence on same.
4. Degrees of Hardness.
5. Water for Industrial Purposes. Water purification.
6. Water Analysis and its special difficulties.
7. Methods used in our investigation. Methods discussed.
8. The taking of our samples.
9. Description and analyses of Waters from :—

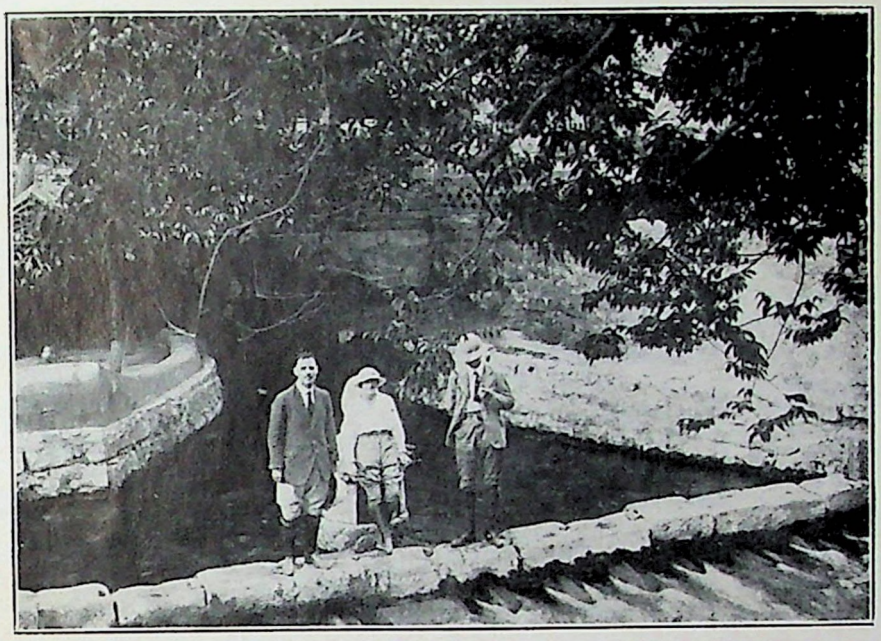
Division I. Taiyuanfu and immediate surroundings
II. Western border of Taiyuan plain
III. Eastern border of same.
IV. Waters along the Cheng-T'ai railway

10. Summary and discussion of results.

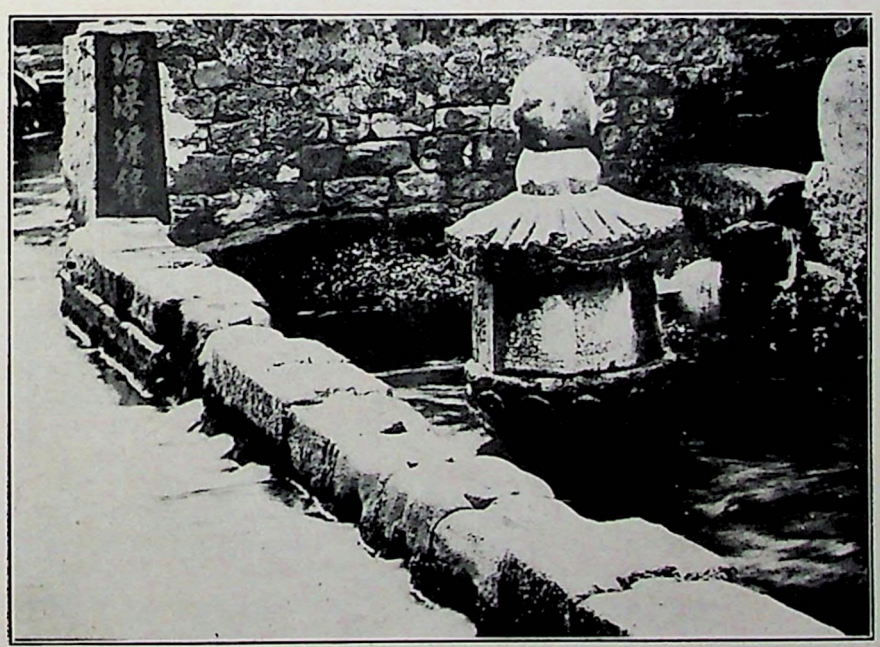
Introduction.

This investigation was carried out in the Chemical Department of Shansi Industrial College, Taiyuanfu, by kind permission of the Principal, Mr. S. R. Li. The samples of water which have been analysed have been gathered in the central parts of the province of Shansi. It is my intention to extend this research also to the more outlying districts of the province. But the samples examined have the advantage of coming from the most important part of Shansi : either from the capital Taiyuanfu or from the central plain adjoining same, or along the Shansi railway, including the area where the anthracite mines of Pao Chin Mining Company are situated (at Yang Ch'uan).

This paper includes some notes regarding the inherent difference in theory and practice between natural waters of various types, also a description of our methods of analysis with a view to furnishing guidance and advice to other scientists who would eventually undertake similar investigations in other parts of China.



The main spring in Chin Ssŭ. To the right are the holes which direct 7/10ths of the water into an irrigation canal.



Where the water from the main spring at Chin Ssŭ is divided in three and seven parts.

Reasons for Initiating this Investigation.

The *raison d'être* of these analyses was the desire to arrive at some conclusions as to the question whether or not some of the important sources of water supply in Central Shansi are suitable not only for human consumption but also for present and future industrial needs. In view of the fact that the problem of water supply in a semi-arid country like Shansi has always been keenly discussed and seeing that certain improvements in this line have lately taken place, it is about time that not only the quantity but also the quality should be taken into consideration, and the present examination is believed to be a step in the right direction.

The desirability of such analysis is enhanced by the thought of the probable future of this province, which, though suffering from the drawbacks of bad communications and of being a considerable distance from the coast (220 miles or 370 km. from the Eastern border to the Gulf of Chihli), yet harbours hopeful possibilities in the form of undisputed wealth of certain mineral resources. If it is true that the pillars of industry are coal, iron, limestone, fireclay, sulphur and salt, it is equally certain that all these are present in Shansi though it must at once be admitted that these " pillars " are not of uniform dimensions. The iron ore resources are large in the aggregate, but difficult of exploitation, being present in the shape of scattered nodules which preclude the use of modern mining methods. The sulphur combined with iron to form pyrites is also only found in scattered deposits of inconsiderable average thickness, the salt is won by evaporation of salt lakes or leaching of salty ground and is rather local in occurrence. However, the three remaining kinds of raw materials are present in almost unlimited quantity : fireclay, limestone and coal. Above all in imprtance comes the coal of which the Geological Survey of China estimates the reserves in Shansi to be 2,370 million tons of anthracite and 3,460 million tons of bituminous coal, Shansi easily leading in comparison with all other provinces in China. The output was estimated in 1916 to be 1,616,000 tons.

Taking the pros and cons into consideration and remembering the fact that along Shansi to the East lies the vast and populous plain of Chihli which lacks these resources, it is not too optimostic to declare that this province has undoubted industrial possibilities. Water as a rule is not counted as "natural resources," but, with the local scarcity of supply, its presence and quality become more than ever vital considerations for present or future promoters of industrial propositions. And, therefore, it seems to me to be a *sine qua non* to obtain at least a rough idea of the question of water supply not only quantitatively but also qualitatively.

The Problem of Water Supply in Shansi.

For people living in a country of small and unevenly distributed rainfall the question of water supply assumes an importance difficult to imagine for inhabitants of well-watered lands. The climate of Shansi belongs to the category of continental extremes of heat and cold. Although Taiyuanfu lies at a latitude of 38° N., i.e., that of Sicily, yet winter temperatures of zero Fahrenheit (17.78° C.) are by no means uncommon. The usual yearly total of rainfall is about one-half of the world's average

(which is 750 millimetres), and, what is worse, is most unevenly distributed and some years very inconsiderable in quantity, causing famine or semi-famine conditions.

In this connection it might be of interest to publish here some observations of the Government Observatory in Taiyuanfu, where observations are taken at regular intervals several times daily and have now been carried on for more than ten years. These figures have been obtained and tabulated through the kind efforts of my assistant Mr. Y. C. Pien. We give here the figures for the last five years, i.e., 1918, 1919, 1920, 1921 and 1922.

1918.

FAIRLY NORMAL YEAR.

Month	Average temperature °C.	Rain in mm. (snow reduced to equivalent in water)
January ..	–7.78	—
February ..	–3.03	5.4
March ..	4.82	99.6
April ..	11.74	11.17
May ..	16.05	40.4
June ..	22.34	6.2
July ..	24.57	37.4
August ..	21.90	120.2
September ..	15.10	31.1
October ..	9.16	7.7
November ..	–0.04	32.7
December ..	–7.97	30.40
	Total rainfall ..	332.27

1919.

NORMAL YEAR.

Month	Average temperature °C	Rain in mm. (snow reduced to water)
January ..	–8.61	38.50
February ..	–2.96	—
March ..	4.77	18.40
April ..	13.35	—
May ..	20.56	25.57
June ..	22.53	61.80
July ..	24.81	180.25
August ..	24.01	59.01
September ..	17.52	43.18
October ..	9.29	23.58
November ..	1.00	0.6
December ..	–5.89	—
	Total rainfall ..	450.89

1920.

PARTIAL FAMINE CONDITIONS

BECAUSE SUMMER RAINFALL BELOW NORMAL

Month	Average temperature °C.	Rain in mm. (snow reduced to water)
January	–6.47	1.4
February	–5.70	11.1
March	3.47	10.0
April	12.33	2.9
May	18.81	15.5
June	22.44	75.1
July	26.03	48.3
August	23.62	44.3
September	18.65	82.1
October	12.23	39.1
November	4.22	0.0
December	–3.58	31.6
	Total rainfall ..	361.4

1921.

DRY YEAR. RAINFALL BELOW NORMAL. PARTIAL FAMINE.

Month	Average temperature °C.	Rain in mm. (snow reduced to water)
January	–10.21	21.7
February	–2.62	—
March	3.21	15.5
April	10.58	11.6
May	17.95	21.3
June	21.98	26.6
July	25.05	74.1
August	21.65	70.9
September	17.56	24.0
October	11.60	17.7
November	1.61	—
December	–5.12	—
	Total rainfall ..	283.4

1922.

NORMAL RAINFALL.

Month	Average temperature °C.	Rain in mm. (snow reduced to water)
January	–7.75	2.2
February	–1.24	0.3
March	3.50	7.9

Month	Average temperature °C.	Rain in mm. (snow reduced to water)
April	12.98	37.1
May	17.98	45.4
June	24.34	6.9
July	24.80	173.3
August..	23.71	52.4
September	16.74	35.4
October	11.46	8.2
November	4.61	1.8
December	–3.81	0.0
	Total rainfall ..	370.9
Average rainfull for these five years ..		359.8 mm
Average for the three " normal years " ..		384.7 mm

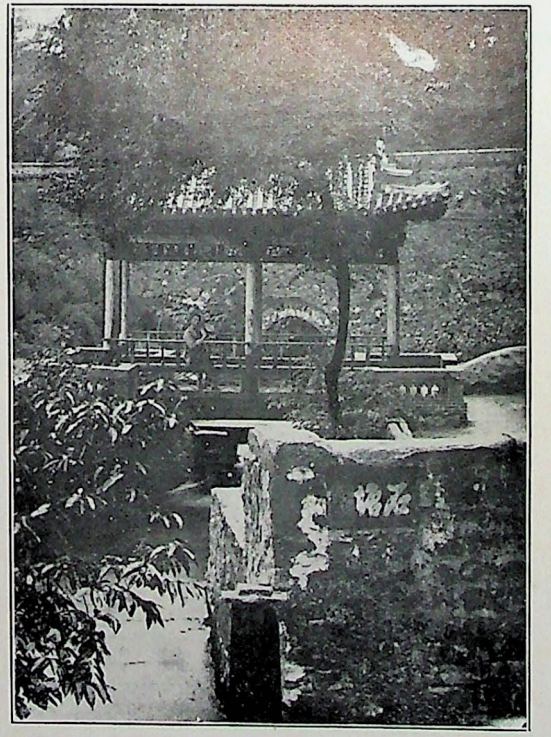
A glance at these tables will show at once both the extreme conditions of temperature (note the *average* of January, 1921 : – 10.21°C. and July, 1920 : +26.03°C.) as also the unfortunate erratic nature of the rainfall, not only within the course of the year itself, but also in different years. The average rainfall for these five years was 359.8 mm. or 14.17 inches, or for the three "normal" years : 384.7 mm. or 15.16 inches. For comparison it might be stated that the rainfall in Peking is supposed to average 24 inches per year, and in the south-eastern provinces of China about 100 inches yearly, and for the whole world about 750 mm. or 29.53 inches. Although the climatic conditions are by no means comparable it might also be mentioned that few places in England (Western Division) have a rainfall of less than 35 inches.

Under such conditions of insecurity it is self-evident that the farming population of Shansi is always anxiously casting about for any available sources of water-supply. Much attention has been given to the construction of irrigation canals utilizing not only the normal flow from rivers and springs but also the floodwaters coming down in July and August. Many of these canals have lately been improved. A great deal of water is drawn from wells for agricultural purposes, notably where the water level is not too low down (on the plain of Taiyuan this level is generally 20 to 30-ft. below the ground). In latter years, through the encouragement of the enlightened governor His Excellency Yen Hsi Shan, a new departure has opened up increased possibilities in the question of water supply. Certain investigations have been done with a view to constructing large dams to store river and spring-water (especially the project of a dam at the debouchement of the river Fen Ho on to the Taiyuan plain), but apart from these plans which have not yet matured, a great deal of actual improvement has taken place in the form of the sinking of numerous artesian wells of which the number must now approach or even exceed fifty.

The International Famine Relief Committee has also participated in this work by sinking some experimental steel-cased artesian wells of larger



The "Stone Flute Mouth" or "Wash-Ear Pavilion" at the Chin Ssŭ main spring. The name originates from the pleasant sound of the water.



The southern channel representing 3/10ths of the Chin Ssŭ main spring. This spring emerges to the right in the foreground.

diametre (4-in. to 6-in.). The usual artesian wells constructed by local effort are holes of about 3-in. diameter lined with bamboo tubing and go down to a depth of about 300-ft. or 100 metres. The simple machinery and material as well as the cheapness of labour allow these wells to be constructed at about $300.00 each. In many cases, notably in the western and north-western parts of Taiyuanfu and also outside the city, the water rises through its own pressure producing a self-flowing well, but unfortunately the pressure is small and the flow is slow and seems to decrease gradually. The water might in favourable cases rise to about one metre (3-ft.) above the ground. The artesian well water, though rather hard (see analyses below), is very limpid and quite fit for human consumption.

The greatest water supply of the Taiyuan plain, apart from the very erratic river Fen Ho, is the truly enormous spring at Chin Szu temple, 23 km. (46 li) S.W. of Tai-yuan Fu, which is of great local importance and irrigates many square miles of rice-fields. (See analysis No. 13) Chin Szu is called "the foremost spring of Shansi," but springs nearly equal in output are found near the eastern border at Niang Szu Kuan (analysis No. 20) and smaller springs, yet of considerable local importance, are found scattered here and there, as for example the spring at Yuen Ho, Pei Ho Liu station (analysis No. 15). They are all used as much as possible for agricultural purposes. The water supply from these springs is fairly constant though not undiminished during dry years. It is outside the scope of our paper to enter more fully into the quantitative side of the question, but we propose now to give some general statements regarding the qualitative nature of water supply as influenced by various geological and other factors.

General Remarks About Quality of Different Natural Waters.

That natural waters, though they may be as limpid and clear as one could wish, may yet differ in inherent qualities is a fact too well known to be emphasized. They may be "hard" or "soft" according to the nature of the ground through which they have been percolating. The purest natural water is rain-water, and, among springs and rivers, those which come from areas of granites and crystalline rocks: the worst (hardest) those which emanate from young calcareous sediments.

A very clear account of the various characteristics of waters differently originated is found in that excellent and up-to-date work of J. R. Partington: A Text Book of Inorganic Chemistry, pages 206 to 208, and this description is reproduced here:

"The presence of the bicarbonates of calcium and magnesium produces what is called *temporary hardness*, i.e., such water destroys soap without producing a lather but is 'softened' by boiling. . .

Hard and Soft Water.

"The different varieties of hard soap consist of the sodium salts of three organic acids derived from fats: Oleic acid $C_{17}H_{33}CO_2H$, palmitic acid $C_{15}H_{31}CO_2H$, stearic acid $C_{17}H_{35}CO_2H$. Soap is, therefore, sodium oleate $C_{15}H_{31}CO_2Na$, sodium palmitate $C_{17}H_{35}CO_2Na$, sodium stearate $C_{17}H_{31}CO_2Na$.

"These salts are soluble in water, but are slightly decomposed by the latter, giving caustic soap :

$$C_{15}H_{31}CO_2Na+H_2O \rightleftharpoons C_{15}H_{31}CO_2H+NaOH$$

* * *

"The calcium and magnesium salts in hard water cause a larger waste of soap that corresponds with the production of the calcium and magnesium salts of the fatty acids. . . The slimy precipitate of calcium salts carries down with it some of the soap and renders it useless. It also adheres tenaciously to the skin or fabric and interferes with washing. The water does not acquire the smooth feeling characteristic of a *soft water* (free from dissolved calcium and magnesium salts) which is intensified by traces of alkali from the excess of soap, but retains its harsh feeling until a large excess of the soap has been added (*hard water*). . .

"Temporarily hard waters deposit a crust or *scale* of calcium carbonate when boiled in kettles or boilers and this interferes with the transmission of heat. It dissolves in hydrochloric acid with effervescence. . .

"Temporarily hard water may be *softened* by the addition of exactly the right amount of lime either in the form of lime water or milk of lime (Clark's process 1841). Calcium bicarbonate is precipitated as carbonate by adding an equivalent amount of lime :

$$Ca(HCO_3)_2+CaO_2H_2=2CaCO_3+2H_2O$$

* * *

"The precipitate is allowed to settle and the softened water is run off for use. It may be filtered through a bed of coke.

"A different kind of hardness is that due to the presence of the sulphates and chlorides of calcium and magnesium, derived from the soil. These are not precipitated on boiling and cause what is called *permanent hardness.* The water may at the same time possess temporary hardness. If such waters are evaporated in boilers gypsum ($CaSO_4.2H_2O$) is deposited as a very hard, crystalline scale which seriously impedes the transmission of heat. This scale does not effervesce with hydrochloric acid unless carbonates are also present. Such water causes waste of soap in laundry work for the same reason as temporarily hard water. Permanently hard waters are softened by adding a mixture of caustic soda and carbonate (soda-ash or else washing soda $Na_2CO_310H_2O$) when both temporary and permanent hardness are removed.

$$CaSO_4+Na_2CO_3=CaCO_3+Na_2SO_4 \text{ (soluble)}$$
$$Ca(HCO_3)_2+2\,NaOH=CaCO_3+Na_2CO_3+2H_2O$$

* * *

"Hardness is not known to be injurious in water for drinking purposes (*potable water*)—in fact the presence of bicarbonates gives the water a very refreshing taste.

River Water.

"The purity of the water depends on the nature of the soil. Thames water, flowing over soil rich in limestone, contains about 157 mgr $CaCO_3$ per litre*

"Trent water flowing over soil containing gypsum has a tenure of 300 mgr $CaSO_4$ per litre. The calcium sulphate of the Trent water at Burton is of value in brewing. The waters of the Dee and Don draining the Aberdeen granite area contain only traces of dissolved calcium salts *Spring* and *deep well* waters differ from river water only in having undergone filtration through porous strata . . . the dissolved mineral impurities usually increase. . . This type of natural water is probably the best for drinking purposes."

The writer begs to disagree somewhat with the statements in the last few lines. It is not to be questioned that rivers lose a considerable part of their temporary hardness through escape of carbonic acid by exposure to the air. This is amply proved by our analyses (see Fen Ho analysis, No. 11), and, as for the suitability of springs for human consumption, this may be true in many cases but it would be erroneous to say that the Chin Szu and Niang Szu Kuan springs produce good potable waters (see the large tenure of gypsum proved by analyses No. 13 and 20).

The Chemiker Kalender passes the following judgment on different waters and these figures may be compared aptly with the results of our analyses exhibited below :—

	Pure Water	Drinkable Water	Suspicious Water	Bad Water
Total hardness (recalculated by the writer to mgr $CaCO_3$ per litre) ..	45-135	135-270	>270	>1000
Hardness after boiling (permanent hardness) ..	18- 45	45-116	116-180	>180 to 190
Sodium chloride (salt) mgr per litre	<27	<66	<165	>165
Chlorine mgr per litre ..	<15	<40	<100	>100
SO_3 mgr per litre	2-5	5-30	>30	>50
$CaSO_4$ calcium sulphate mgr per litre	3-8	8-51	>51	>85
Organics (mgr oxygen absorbed per litre).. ..	<1	>2	3-4	>4

It is urged again to compare these figures one by one with those of of the Shansi waters.

In this connection it might be useful to mention that the modern way of expressing results (the method followed in this paper) is in milligrammes (mgr) per litre, not in degrees, etc., which is confusing. But for the sake of completeness and because such degrees are still often seen in

* Compare Fen Ho, analysis No. 11.

technical literature a comparative table of degrees of hardness is given below :

English Degrees grains $CaCO_3$ per gallon	French Mgr. $CaCO_3$ per 100 c.c.	German Mgr. CaO per 100 c.c.
English	French	German
1.25°	1.79°	1°
1	1.43	0.8
0.7	1	0.56

(French degrees multiplied by 10 will give mgr. per litre).

To establish further standards of comparison and interpretation of the analyses of Shansi waters it is of interest to give the following particulars of European waters :—

The River Pollution Commission of Great Britain gives as the average of 589 samples (all results in mgr. per litre) :

	Chlorine	Hardness	Total Solids
Rain Water ..	8.22	3	29.5
Upland Surface ..	11.3	54	96.7
Deep Well ..	51.1	250	432.8
Spring	24.9	185	282.0

Compare with Shansi Waters.

Below are analyses of water from the water works of some German cities showing how the figures may differ :

Wurtzburg	Total Solids	782 mgr. per litre
Hannover		580 ,,
Leipzig		155 ,,
Wiesbaden		82 ,,

Again it is requested to compare these values with those of the Shansi waters.

It may be added that modern cities take their water supply generally either from ground water or rivers. Deep ground water is almost sterile. One hundred and fifty litres per day is generally considered sufficient per head of population.

More than 400 mgr. chlorine per litre (combined with common salt, NaCl) gives taste. The average of chlorine in Sweden is 20 mgr. per litre.

William P. Mason in his " Examination of Water " maintains that a total hardness of 40 to 70 mgr. $CaCO_3$ per litre is best for general consumption. Anyhow it should be less than 350. He calls waters having a hardness of 30 to 50 " very soft," 50 to 100 " moderatley hard," 100 to 300 " hard " and over 300 " very hard." Compare again with the Shansi waters.

(To be continued).

SCIENTIFIC NOTES AND REVIEWS

PALEOPATHOLOGY: an Introduction to the Study of Ancient Evidence of Disease, by Roy L. Moodie, PH.D., University of Illinois, 1923.

A careful examination of fossils from those of the Proterozoic Era to those of the Cenozoic has led to the discovery of evidences of injury and diseases in the ancient animals of which they are the remains. In the present handsome work, we have a comprehensive exposition of the science called Paleopathology, which treats of pathology as evidenced by these fossils. Starting with the statement that " Disease, for the purpose of discussion in paleopathology, may be defined as any deviation from the healthy or normal state of the body which has left a visible impress upon the fossilized or mummified remains," the author proceeds to assemble a mass of data which he discusses at length, drawing what conclusions he may therefrom. Thus it becomes evident that disease (not mentioning bone-fracture and such conditions) is of great antiquity, as also is parasitism.

A considerable amount of space is devoted to bone fractures and lesions as evidenced by fossil remains of animals from the reptiles of the Mesozoic to the large mammals of the Recent eras.

Geological bacteriology is dealt with in Chapter IX: Opisthothonos and allied phenomena among fossil vertebrates in Chapter X. The former is strongly suggested by the positions assumed by many creatures whose remains have been found.

Probably the most interesting part of the book is that—from Chapter XII to the end—which deals with ancient human pathology. Here we have an abundance of evidence of a very diversified nature, from ancient medical instruments to diseased conditions of bone. The latter show that many of our modern diseases are of great antiquity. Probably the most interesting Chapter is the last (XV) on the diseases of the Ancient Peruvians, the Megalithic predecessors of the Incas, who amongst other things had learnt the art of trephining. This, apparently, was also practiced in Neolithic times in Europe. Ancient Peruvian pottery shows in the figures of humans that form its ornamentation that the terrible disease known as *Uta*, as well as goundou or gundu—which is known to-day in Africa and Malaysia, but not in Peru—were very prevalent in those times.

The work is profusely illustrated throughout and is a very valuable contribution to science. Medical men in China should find it particularly interesting, while the data it contains may well throw light on the connection that is presumed to exist between the ancient—and, indeed, present—inhabitants of South America and Asia.

AN EARLY CHINESE CULTURE: by J. G. Andersson, PH.D., Bulleting of the Geological Survey of China No. 5, 1923.

Readers of " The China Journal of Science and Arts " will remember an extremely interesting paper by Dr. Andersson, which appeared in the

September issue under the title " A Prehistoric Village in Honan." The above paper reprinted from the Bulletin of the Geological Survey of China, is a much more detailed and technical account of the remains unearthed from this Neolithic village site, which have thrown a flood of light upon the prehistory of the Chinese. One of the remarkable things connected with this ancient site of human habitation is the association of fine pottery with stone implements. This parallels the cases of the discoveries of the Pumpelly expedition in Anan, and others in Europe, were similar polychrome ware was found in late Neolithic and the Aeneolithic sites.

A strong point made by Dr. Andersson in connection with the stone implements found in the Yang Shao site and elsewhere in North China is that many of them bear close resemblance to iron implements in use to-day amongst the Chinese, the inference being that the latter have slowly evolved from the former through the bronze age to the present, which in turn suggests that the Chinese have occupied the region, present Honan, South Shansi, and South Shensi continuously from Neolithic times. Indeed, this is a hypothesis that is more and more coming to be accepted by students of archæology and ethnology in China. Certain features of the " site " suggest relationship with Neolithic sites in other countries, notably the shape of pockets dug into the substratum which resemble those of the Achenheim site at Elsass, called " Killerguben " (cellar-pits) and described by Forrer. Nevertheless the stone implements of China are very distinct and typical, consisting mainly of knives with holes through them, that strongly resemble the blades of present day grass-cutters, adzes, axe-heads, arrow heads, and lance-heads. Very fine bone needles were also found in the Yang Shao site, as well as armlets and sling stones of burnt clay.

Some of the pottery is very interesting, foreshadowing, as it does, some of the three legged incense pots of the bronze period, which continue to be made even to the present day. The decorations on the pieces of polychrome pottery resemble nothing found in China to-day, and for the most part are very crude and meaningless. One specimen strongly suggests an attempt to depict hills and clouds. The hills, however, may be only the part of a frilled pattern encircling the vessel.

ESSAYS ON THE CENOZOIC OF NORTHERN CHINA: by J. G. Andersson, PH.D., Memoirs of the Geological Survey of China, Series A, No. 3, March, 1923.

This series of essays written by Dr. Andersson deals with his researches and those of his colleagues and associaties in regard to the Cenozoic* deposits and strata of China. Altogether some seven essays are given, namely:

1. Some notes on the Nanking " Volcanoes."
2. The Eocene Deposits of Yuan Chu Hsien, S. Shansi.

* Pertaining to or designating the era extending from the close of the Mezozoic (or Middle Life) to the present, and including the Tertiary and Quarternary periods.

3. Some Vertebrate Deposits of Inner Mongolia.
4. On the Occurrence of Fossil Remains of Struttrionidae in China.
5. Deposits of Calcareous Boze and Tufa at Tabon Arshan, Inner Mongolia.
6. Some Peat-bogs in the Peking Plain.
7. Review of the Cenozoic Deposits of North China.

These give a very comprehensive survey of the era in question as displayed by the work of the Geological Survey.

The volcanic cones which Richthofen described as existing to the north of Nanking—notably at Fang-shan—appear to be something quite different. They represent the remains of Mesas of basalt which overlaid the substratum of gravel. Richthofen assumed that the latter were of later date, manifestly impossible in the light of these more recent investigations. On the other hand, the basalt along the border of China and Mongolia, which Richthofen reported to be overlying the *loess*, characterized by Dr. Andersson as a fantastic theory, are proved to be of a much earlier date.

According to Dr. Andersson's investigations, the Eocene area in China is confined to the Yuan Chu Hsien district in South Shansi. It lies in part in a trough caused by faulting in the Proterozoic Red Sandstone and Diabase and part in a trough between the Ordovician Limestone and the Gigantopteris Beds, a fault occurring between the latter and the Eocene deposits.

The Proterozoic deposits lie to the north and south of the Eocene deposits, the Gigantopteris Beds to the east and the Ondovician Limestones to the west of the series of valleys in which the Eocene deposits area exposed. The latter are partially overlaid by *loess*. Fossils of the Eocene deposits consist mainly of fresh-water and terrestrial mollusks, several species of *Planorbis* being present, as well as *Physa*, *Euclulus*, *Ceratodes* and *Eupera*.

The discovery of remains of the beaver in deposits in Inner Mongolia is very interesting, showing, as it does, that this area was once humid and forested. In the Pleistocene deposits of this area *Elaphus* and *Rhinoceros* are to be found : in the Pliocene and late Miocene we have *Castor* and other rodents, *Cervavus*, *Struthiolithus*, amphibians, fishes and fresh-water mollusks. In the Red Clay are to be found *Aceratherium*, *Hipparion* and *Artiodactyla*, the whole closely resembling the *Hipparion* fauna of North China which exists in the clay at the base of the *loess*. *Talpa* (mole), *Lagomys* (pika), *Castor* (beaver), *Lepus* (hare), *Dipus* (jumping rat, or jerboa) and *Cervavus* are all to be found in deposits at Ertempte. All except the beaver and *Cervavus* persist in this area to-day.

The *Struthionidae* (ostriches) are well represented in Cenozoic deposits of North China. The prevalent species is *Struthiolithus chersonensis*, numerous fossil eggs of which have been found. These are very large, ranging from 173 to 186 m.m. in length, and representing a bird considerably larger than the modern ostrich of Africa. A single pelvis discovered at Paote Hsien seems to be the only authentic specimen of the bird itself unearthed so far.

In the "Review of the Cenozoic Deposits of Northern China," Dr. Andersson goes over the ground very thoroughly, describing the faunas and floras of the different periods contained therein according to locality. It would seem that this ancient life of North China was closely similar to that of Europe, though differing in some particulars. For instance *Elaphurus* or David's deer, which has only very recently become extinct in China, does not occur in Europe, while certain of the plants and invertebrates of the two areas are different. What are known as the Hipparion beds—prevalent in S. Shansi and Honan—are the most interesting.

The fact that, up to the date of the writing of these essays, no human remains of Palæolithic man had been found does not prove that such did not exist. Recent discoveries strongly suggest that pre-Neolithic man did exist in North China, and we venture to predict that in time the whole series from earliest man to recent will be found in this ancient land.

PALÆONOTOLOGIA SINICA: Ser. D, Vol. I, Fasc. 1; Geol. Survey of China, 1923.

The present issue of this series is devoted to a study of "The Cave-deposits at Sha Kuo T'un in Fengtien" made by Dr. Andersson, whose energy fills us with admiration. The latter consists of a very careful consideration of the discoveries made in a cave near Sha Kou T'un in Fengtien province, Manchuria, of remains of Neolithic man, and, taken in conjunction with the description of the Yang Shao site in Honan, greatly advances our knowledge of pre-historic man in China and neighbouring regions. Many artifacts were found in the cave, some of which are closely similar to those from Yang Shao, notably the adzes and axe head. Arrow heads, on the other hand, are more primitive, and suggest Palæolithic man. Some small figures might almost be taken to be the forerunners of figurines as found amongst primitive Tungus of to-day, which throw light on the figurines belonging to pre-historic man in Europe. They were toys for children, and have no further significance. The pottery of the cave is distinctly different in design from that of the Yang Shao site, and is less well decorated.

SOCIETIES AND INSTITUTIONS

THE CHINA JOURNAL OF SCIENCE AND ARTS

A new impetus has been given to the activities of this Society by the carrying out of the decision announced in the last number of this journal to hold monthly meetings of the Society in Shanghai.

The first meeting was held on Saturday afternoon, January 26, in the beautiful concert hall at No. 445 Avenue Joffre, where Messrs. Arthur and Theodore Sopher entertained the Society very generously, providing tea and other refreshments. This was no small undertaking as there were over one hundred present.

Mr. Arthur de C. Sowerby, president of the Society, made the inaugural address, choosing as his subject "The Progress of Science in China." He referred briefly to science in ancient China as discussed by Dr. H. Chatley, the vice-president of the Society in the last journal of the North China Branch of the Royal Asiatic Society, after which he went on to outline the present position of science in this country discussing the subject under the following four headings :—

1. Universities and Colleges where instruction in Science is given.
2. Societies, native and foreign, which have for their object the furthering of the interests of science.
3. Institutions where scientific research is being carried out.
4. Scientific field explorations.

From the disclosures made it might be gathered that in spite of the fact that the Chinese mind has always been trained along classical matters rather than scientific lines, art and literature having been glorified and promoted throughout the ages at the expense of science, the position of science to-day in China is extremely satisfactory, and, by reason of the work being carried out in the universities and schools, research stations, scientific societies and explorations in the field, promises to be even more so in the future.

After refreshments had been served, Dr. J. Oppenheim delivered an extremely interesting lecture upon "Birth and Death Ratios in China." While engaged upon certain investigations in regard to biochemical structures of the human blood serum amongst the Chinese, Dr. Oppenheim and his assistant, Dr. Liang Ba Chiang, were lead to enquire into the proportion that exists between males and females amongst the Chinese. They obtained the rather startling results that (1) amongst the Chinese the excess of males of about school boy age is greater than in any other people in the world for which statistics are available, the ratio being 115.6 (2.5) males to 100 females ; and (2) Instead of the excess of males over females tending to decrease with age, owing to a higher mortality amongst males, as in other countries, the excess increased, owing to a higher mortality amongst females, till at the matrimonial age of between 15 and 26, the ratio is 125.6 (2.9) males to 100 females.

It was found that the ratio of boys to girls as stated above was confirmed by similar investigations carried out by Dr. Gray and Dr. Lennox,

independently of each other, in Peking, and by Government investigations in Singapore amongst the Chinese there, the ratios being as follows:

Gray—117.7 males to 100 females.
Lennox—119.1 (1.2) males to 100 females.
Singapore—115.1 (0.4) males to 100 females.

The causes suggested for the higher mortality amongst girls was that girls being less desirable to the Chinese parent than boys, they received less care in infancy and altogether lived under harder conditions than their brothers.

Various other interesting phases of the subject were discussed. The lecturer wound up by emphasizing the difficulty of obtaining accurate data in regard to births of children in China, and pointed out that the only really reliable way of carrying out such investigation would be to enlist the help of all medical men in China, getting them to send in particulars of obstetrical cases that come under their own observation. He suggested that some such institution as the "China Society of Science and Arts," the "Chinese Missionary Medical Association," or the "Peking Union Medical College (Rockfeller Foundation)" should undertake to send forms to all medical men (and women) in China, in order to get reports upon as many child-birth cases as possible.

The president then announced that a "Medico-biological Section" of the "China Society of Science and Arts" was being formed, Dr. F. Reiss acting as honorary secretary, with the object of carrying out medical and biological research in connection with medical matters, and establishing, if possible, a laboratory for such work for members in Shanghai. When formed, this section, it was hoped, would take up the matter brought forward by Dr. Oppenheim. It was emphasized that this section was in no way intended to rival or compete with already existing medical societies and associations, but to co-operate with and assist them in every way possible.

Mr. G. E. Sokolsky then gave an illuminating and highly interesting account of secret societies in China and their relation to the present disturbed condition of the country in general, and to the bandit problem in particular. It was shown that many of the so-called bandits were members of certain powerful secret societies whose aim was to establish a sound, strong, *Chinese* government in China, and to curtail and control the activities of evilly disposed, officials and militarists; to whose selfish and ruthless machinations the present state of chaos is really due. The speaker did not deny the existence of numerous bandits whose aims were purely selfish, but these he said were considered as enemies by the people, while the others were looked upon more in the light of patriots and saviours of their country. Mr. Sokolsky deplored the fact that the "China Society of Science and Arts" had not provided for a "Political and Social Science Section," which he considered one of the most important subjects of the day, far more important than the natural sciences or the arts.

The president in reply said that the society and its official organ, THE CHINA JOURNAL OF SCIENCE AND ARTS, had purposely avoided the subject of politics, as it was felt that therein lay many pitfalls, considering

the present state of affairs in China ; but he fully approved of the idea of encouraging investigations into the social life and conditions of the Chinese, and their effect on the political life of the country. He, therefore, asked Mr. Sokolsky if he would undertake to organize a Political and Social Science Section of the Society.

Votes of thanks were passed to the hosts of the society and the lecturers, after which the meeting adjourned.

It was decided to hold meetings of the society at the same place and time on the last Saturday in each month.

The next meeting will be held on Saturday, February 23, at 5 p.m., at No. 445 Avenue Joffre.

Members of the Society or subscribers to the Journal who wish to join the Medico-biological Section are requested to send their names to Dr. F. Reiss, 14 Kiukiang Road, Shanghai. Those wishing to join the Political and Social Science Section should send their names in to Mr. G. E. Sokolsky, 40 Route de Grouchy, Shanghai.

SECOND MEETING.

At a well-attended meeting, the second of the series, of the "China Society of Science and Arts," on February 23, Dr. Herbert Chatley and Mr. Jabin Hsu delivered very interesting lectures, the former taking for his subject the "Mystery of Cohesion," and the latter "Gems of Chinese Literature." Dr. Chatley for the past 13 years has been investigating the intricate subject of the force that holds things together, which is called Cohesion and which, while related to the force known as gravity, is considerably greater and cannot be expressed by Newton's well-known formula. In the course of his investigations he found that the force of cohesion is more akin to magnetic force or the attraction between two electrically charged bodies, and by a process of mathematical calculation he has devised a formula to express this force in relation to the mass of the atoms and the distance between them. In the course of his address upon the subject he mentioned many most interesting points, explaining something of the composition of the atom and defining electricity as ions (i.e., the ultimate particles of which atoms are composed) dissociated from any atom, that is, in a free state.

Mr. Jabin Hsu surveyed the Chinese Classics, explaining something of the history of China at the time they were written or gathered together by the great sage Confucius, and quoting some of the more choice passages, some of which he had translated himself. He succeeded in giving his audience a clear idea of the greatness of mind of the ancient Chinese philosophers and the beauty of their writings, bringing his discourse to a close with a reference to China's need of officials who studied and carried out the ancient teachings of their country, which extolled the rights of the people and condemned corruption and oppression. He also hoped that through the medium of the "China Society of Science and Arts" a better understanding between Europeans in China and the Chinese might be arrived at. Foreigners know all too well of the faults and failings of the

Chinese people, and much too little of the better side of their national culture, past and present.

Between the two lectures was an interval during which tea was served, and those present were able to indulge in a little social intercourse and so become better acquainted. The meeting was held at 445 Avenue Joffre, the home of Messrs. Arthur and Theodore Sopher, who acted as hosts to the Society.

THE MEDICO-BIOLOGICAL SECTION

The Medico-biological Section of the China Society of Science and Arts was formed on Monday, February 18, at a meeting held in the directors' room of Edward Ezra & Co. through the courtesy of Messrs. Arthur and Theodore Sopher at 14 Kiukiang Road, Shanghai. After Mr. Arthur de C. Sowerby, president of the Society, explained the general scope of the organization and the plan which provided for the creating of various sections dealing with special subjects, the doctors present voted to form a Medico-biological Section. Dr. F. Reiss, who took the initiative in calling the meeting, was elected Honorary Secretary with Dr. Ruth Leonard as assistant.

A committee, composed of Prof. A. Bary, M.D., Dr. Ruth Leonard and Dr. E. Hibert, was appointed to draft a constitution. The next meeting of the Section will be held on Monday evening, March 10, at 9 p.m., when Prof. Bary will give a lecture on "Contemporary Views on Mental Diseases." The place of meeting will be announced later.

The question of obtaining a laboratory for research work and other features of the Section's proposed activities were discussed. The general opinion of those present was that the work of the group could be made extremely interesting and profitable. Several speakers called attention to the necessity of medico-biological research in China and of the possibility of accomplishing worth-while results. The following were present:—

Mr. Arthur de C. Sowerby, Dr. F. Reiss, Dr. Ruth Leonard, Prof. A. Bary, Dr. S. D. Joffick, Dr. G. F. Bume, Dr. B. Paukstat, Dr. E. Hibert, Dr. R. R. Immerman, Dr. S. P. Huang, Dr. S. S. Shpilberg, Dr. T. Podpakh, Dr. K. Panek, and Mr. Verne Dyson, Honary Secretary of the Society.

In conclusion it was emphasized that the Medico-Biological Section is in no way intended to rival or act in competition with already existing medical societies and associations in China, but to co-operate with them as far as possible, and the Society is desirous of having as many members of other medical associations in the Section as possible.

The Section adopted the following as its chief aims:

1. To carry out medical and biological research work in China.

2. To establish, if possible, a laboratory for such work in Shanghai for members of the Section.

3. To appoint specialists in various medical subjects to prepare brief extracts of various articles appearing throughout the world in their own special lines, which extracts will help medical men engaged in other lines to keep *au courrent* with medical progress in the world.

4. To have lectures delivered in various languages, especially English, French and German, as there are many medical men in Shanghai who are familiar with but one of these languages.

Applications for membership should be addressed to Dr. F. Reiss, 14 Kiukiang Road, or through the China Journal of Science and Arts, 102, The Ben Building, Shanghai.

THE SHORT STORY CLUB

The January meeting of the Short Story Club was held on the evening of the 21st at the home of Mr. P. L. Bryant, 40 Avenue Dubail, with over ninety per cent. of the membership present. The membership roll of thirty was closed for the present season. The club constitution was read by Dr. A. H. Swan, chairman of the executive committee, and adopted. The constitution has been transcribed in old English letters in an artistic leather-bound book. Initial letters are illuminated in red after the style of the old English manuscripts. This pleasing effect was obtained through the artistic efforts of Mrs. Swan.

Mr. J. L. Butts, managing editor of the *China Press*, was the guest of honour and gave an address on "The Mixed Court as a Source of Literary Material." Mr. Butts is very well known to Shanghai through his writings which appear regularly on the front page of the *China Press* under the caption of "Smiles from the Mixed Court." Another strong feature of the programme was "The Ultimate Alibi," a fiction story, which was read by Mr. P. L. Bryant, its author. It is a clever story with a Shanghai setting. The club also placed its hearty approval upon "The Flowery Pagoda," and several other short poems read by Mrs. John Warner Brown, one of several members of the club who write both poetry and fiction.

Mr. Verne Dyson, president of the club, called attention to the book of short stories which the club purposes to issue in the coming spring, and reminded the writers of the closing date for receiving manuscripts which is midnight of April 15. It was announced that the next meeting of the club would be held on February 11 at the home of Mrs. M. T. (Olivia) Price, 42 Rue Robert Frelupt. Two or three fiction stories, written by club members, will be read, and Mrs. Price will tell her guests of the production of her three-act play, "The Flower Candle Wife" which attracted considerable attention in New York City some months ago.

MEDICAL CONFERENCE.

The National Medical Association of China held its fifth biennial conference at Nanking from February 7 to 12, commencing with a

reception on Thursday evening (7th) held in the Gymnasium Hall of the South Eastern University.

A very interesting programme was arranged, and between fifty and one hundred delegates, mostly Chinese, from all parts of China attended. Lectures upon various important topics, especially prevalent diseases in China, were delivered in the mornings, followed by open discussion on the part of the delegates. In the afternoons, the delegates made trips to various places of interest in and round Nanking, such as the Ming Tombs, or were entertained in other ways.

In the Gymnasium Hall of the South Eastern University an exhibition was held. At this various foreign business firms dealing in drugs, medicines, medical supplies, etc., had stalls, while a special feature were "health exhibits" prepared by some of the delegates. Medical books and publications were also placed on view.

To judge from the nature of the papers delivered and the subjects they dealt with, the science of Medicine is in a very healthy state in China. The national Medical Association of China has some 500 fully qualified members.

ROYAL ASIATIC SOCIETY (NORTH CHINA BRANCH)

There have been three meetings of the Society so far this season. On October 25 a lecture was given by Dr. H. Chatley on "The 'Dead Hand' in China;" on January 19 a lecture was given by Professor S. M. Shirokogoroff on "Who are the Northern Chinese?;" and on February 12 Dr. H. Gordon Thompson gave a lecture entitled "With Pereira on the Tibetan Border," a full report of which was published in the *North-China Daily News* on February 13. It is hoped that Dr. H. F. Illingworth will give a lecture on "Economic Entomology" at an early date.

W. STARK TOLLER,
Honorary Secretary.

THE QUEST SOCIETY.

1923-1924 Session.

Third meeting.

Mr. H. P. Shastri gave a lecture entitled "Occultism under the Searchlight" dealing with the futility of magic in India.

Fourth meeting.—January 28.

Professor A. Bary spoke on "Psychology and Medicine" and explained the present position of psychoanalysis and psychotherapy in medical practice.

Fifth meeting.—February 18.

Professor S. Shirokogoroff gave a lecture on "Shamanism among the Tungus" and described the rôle which the shamans play in relieving mental strain and even mental disease amongst a highly excitable people.

Sixth meeting.

It is hoped to have a lecture on March 17 by Dr. F. Reiss on the subject of "Sex-Education."

HERBERT CHATLEY,
President.

THE SHANGHAI CHEMICAL SOCIETY.

A meeting of the above society was held on Friday, February 15, at 5.15 p.m., in the Winter Garden Café, when about 18 members attended. This was the first ordinary meeting of the session. Owing to the absence of the Secretary from Shanghai and the difficulty of finding a suitable meeting place it has been impossible to hold a meeting before.

The proceedings opened with a short address by the president who also read a paper on the "Manufacture and Examination of Chinese Egg Products," which proved very interesting, a lively discussion ensuing. This paper was followed by a most interesting discourse on "Cohesion and a General Review of the Hypothesis as to Molecular Force" by Dr. Herbert Chatley, who has done a considerable amount of investigation in regard to this subject.

Tea was served during the meeting which gave an added attraction to the proceedings.

J. DALTON, A.I.C.,
President.

EDUCATIONAL NOTES AND INTELLIGENCE

YENCHING UNIVERSITY, PEKING

Yenching University, the Peking Christian University, represents the recent union of the three Christian colleges of Peking and vicinity. The Methodist Peking University, founded in 1888, first combined with the North China Union College of Tungchow, an institution founded as an American Board Mission boarding school in 1867 and later, as a college, supported also by the American Presbyterian and London Missions. In 1920 the North China Union Women's College became an integral part of the University as its College of Arts and Sciences for Women.

The University is incorporated under the laws of the State of New York, with the right to grant literary degrees. Its control is vested in a Board of Trustees appointed by the four constituent Mission Boards, with headquarters at 156 Fifth Avenue, New York City. The trustees elect the members of a Board of Managers composed of Chinese, British and American residents in or near Peking, who administer the affairs of the University.

The requirements of the Women's College for a degree are identical with those of the Men's College and Theological School. The financial support of the women is separate, and the College is administered by its own Dean, but its academic policy is determined by that of the whole University. There are 101 students coming from 16 different provinces, and there is a teaching staff of 16 ; some of the members of the Women's College faculty teach at the Men's College, and some of the men give courses at the Women's College, while students of either institution are free to elect work in either. The relation is one of flexible co-education and affiliation.

Both the Men's and Women's Colleges are occupying temporary quarters inside the city wall, but over 100 acres of land have been secured for the future site outside the northwest gate of the city on the road leading to Tsing Hua College and to the Summer Palace. Buildings are being erected rapidly, and by September, 1925, it is expected that the University will be able to move to its new quarters. Thereafter it will be possible to accommodate many more than the present 522 students crowded into the temporary quarters.

While twenty-four major departments offer a wide variety of courses, it is the vocational work of the University which is especially stressed. Dean Timothy Ting-Fang Lew heads the strong School of Theology, with a three-year course entered after Junior year of college. The premedical work of the Peking Union Medical College is given in the University, and a two-year course in business training is offered. The vocational specialties of the Women's College are Music and Home Economics. The latter department has been established by Dean Ava Milam of Oregon State Agricultural College, released from her duties in America for the purpose of laying down the lines upon which this pioneer work should be started in China. Women students also receive specialized preparation for Social

Service, Theological work and Education, in connection with the Men's College and the School of Theology.

Four departments may be singled out for special mention :

Department of Agriculture.

The Department of Agriculture of Yenching was first established through the vision and statesmanship of Mr. S. C. Chiu of Peking. Over 200 acres of desirable land at Nan Yuan, seven miles south of the city, have been made available by him for the use of the Department. It is here that the last two years of the regular course are given, and the summer work required of all. Courses are given under the four divisions of the Department as follows :

Agronomy—4.
Animal Husbandry and Dairying—8.
Poultry Husbandry—3.
Horticulture—2.

Courses in " Problems of Chinese Country Life " and in " Sources of Agricultural Information " are also offered.

Stress is laid upon the art as well as the science of farming. The school is so arranged that the student shall become proficient in all the fundamental farm operations, and these must be accomplished in an efficient manner before any degrees, diplomas or certificates are granted. The aim is to give thorough scientific training to :

1. Practical farmers.
2. Men of Christian character who will be fitted to go out and teach the science of agriculture in the field as well as at the teacher's desk.

Regular students receive the B. S. degree. A short course is also offered, and special students are admitted when it is felt that they can profit by the work given.

An Agricultural Experiment Station and extension work are also featured. Recently samples of North China wheat were sent to England for experimental purposes, and a shipment of small lemon trees to West China.

The China Famine Fund Commission has shown its confidence in the work of the Department by its grant of the use of Gold $225,000 for at least ten years, subject to its review.

Department of Sociology.

The Department of Sociology offers nineteen courses to undergraduate and graduate students, and has instituted a two-year graduate course of prefessional training for social work. It is particularly notable for its close and constant contact with the other forces working for social welfare in the city. The staff of the Department is a co-operative group composed of representatives from the Y.M.C.A., Y.W.C.A. and the Peking Union Medical College as well as teachers from the various departments of the University.

The varied activities of this large group of people who are so closely connected with social movements and enterprises in Peking make it possible to bring the students into close contact with the real problems of Chinese social life. Among the activities in which the teaching group are engaged, the following are found :—social and industrial surveys, surveys of charitable agencies, studies of family standards of living, prisoners' aid work, conducting a public health centre, supervision of playgrounds, the promotion of civic and mass education, supervision and organization of boys' and girls' club work, and the promotion of the local community service groups. Very large opportunity is given to Yenching students to receive practical laboratory training along these and other lines. The emphasis of the Department is nothing short of the creation of a new and much needed vocation of social work.

Department of Leather Manufacture.

The five-year course includes thorough scientific instruction in the chemistry, histology and bacteriology of leather, and in addition much actual experience in the art of tanning leather in the most modern way. One of last year's student, being too impatient to finish the full course, has established a tannery in Tientsin and is operating it with success.

Of the 174 semester credits demanded fo the entire course, 34 are in technical leather courses, 10 in leather shop work, 4 in inspection trips, 60 in physical science, biology, chemistry histology, etc., and the rest in general University courses.

The most important service of the Department to the community as yet is that of retanning furs. Professor Vincent has worked out the technic whereby the furs found in North China may be retanned so as to be odorless, and with an increased durability of several hundred per cent. The demand for this work has so taxed the Department as to make it self-supporting.

Department of Education.

The Department of Education aims at preparing students to become teachers and administrators in the elementary and secondary schools of China. At present it offers a two-year and a four-year course, leading to a Junior College and a University Certificate in Education, respectively. These courses are practical and professional in nature. Observation work is required of all students, and at the new site it is hoped to have a practice school where practice teaching may be required. A student majoring in the Department and working for a certificate is expected to begin with courses in Introduction to Education and Educational Psychology, and later to pursue the specialized work.

Over fifty students major in education. The staff at present consists of seven full-time instructors, including two in charge of the Kindergarten work. The Department is especially fortunate in its head, Dr. H. S. Galt, whose acquaintance with all types of educational work in China extends over a period of twenty-three years, and whose command of the Chinese language has made it possible for him to maintain an intimate contact with Chinese educators in elementary and secondary school systems, as well as with those in institutions of a higher grade. Pro-

fessor E. L. Terman has been on leave of absence for the first semester in order to work with the Chinese National Association for the Advancement of Education as Psychological Director of its Survey of Government and Mission schools.

SUMMER INSTITUTE FOR SCIENCE TEACHERS IN PEKING.

Under the auspices of the National Association for the Advancement of Education, a Summer Institute for Science Teachers is to be held at Tsing Hua College from about July 10 to August 8, 1924, with a view to getting college and a few middle school science teachers together in order to discuss better methods of instruction and similar questions. It is felt that there is need for a better knowledge of science in China in order that the Chinese people may take a more important place among modern nations, and this can only be brought about by a more thorough training of science teachers throughout the country. Amongst other things, it is planned to offer intensive courses of college grade in Biology, Physics, and Chemistry, with special emphasis on laboratory practice in these subjects and on the methods of teaching them to students in the early years of college and to students in normal and middle schools. Syllabi of the courses, with references by topics to standard text-books and laboratory directions for the experimental work will be provided free of cost to members. Members are requested to bring with them such standard text-books and laboratory manuals as they may have on the subject they are to pursue. Tsing Hua College is ideally situated, five miles from the city of Peking, near the Western Hills and the Summer Palace. The grounds, living accommodation, classrooms and laboratories are most favourable for such a Summer Institute, and those who attend may be assured of comfort and pleasure, as well as of the best of opportunities for professional growth.

The estimated necessary expenses of each member of the institute are as follows :

Room, Board and service (hot water and lights, Chinese food, members to provide their own bedding, soap and towels)	$10.00
With foreign food otherwise as above approximately	1.50 per day
Laboratory fee	2.00
Breakage deposit (unused balance to be returned)	3.00

(No tuition or matriculation fee will be charged)

Fees as above are due and payable on registration. Enquiries should be directed to the Secretary, Mr. N. Gist Gee, China Medical Board of the Rockefeller Foundation, Peking.

EDUCATIONAL CONFERENCES

The eleventh annual meeting of the East China Christian Educational Association was held in Shanghai on January 30, 31, and February

1. Various phases of Christian education were discussed at the meetings, such as Test for College Entrance, the Normal Schools, the Training of Teachers and Educational Hygiene, etc. The meetings were well attended and it is hoped good results will accrue.

A Conference of Christian Colleges and Universities was held over the Chinese New Year holidays at Ginling College, Nanking. The main feature of the proceedings was the formation of an association to be called "The China Association for Christian Higher Education." The officers of the council elected for this important body consist of the following :—

President : Dr. Harold Balme (Shantung Christian University).
Vice-president : Mr. Francis Wei.
Secretary : Miss Jean Dickinson.
Treasurer : Dr. C. H. West.

Group committees were also elected for various special lines of educational activity, and the results of their investigations are to be gathered together and made available for all concerned. Biological teaching called forth considerable interest, and various specialists have been appointed to draw up lectures in their own lines, based on Chinese types of animals, so as to suit the needs of laboratory work in this country. From these a comprehensive text-book of biology for the Chinese may be compiled.

The conference was a marked success and considerable progress in higher education amongst Christian Colleges and Universities in China is expected as a result.

FIRE AT THE SOUTH EASTERN UNIVERSITY, NANKING.

A devastating fire occurred at the South Eastern University, Nanking, last December, with the result that the whole of the central block of buildings, containing the library, scientific apparatus and biological collections, was completely gutted. The loss was a very severe blow, as it is reported that the insurance did not cover the total value of the property. The spirit of the University has risen above the calamity, however, and already the faculty, students and friends of the institution have raised some $85,000 to repair the loss sustained. It is intended to raise a sum of $500,000 in order to rebuild the university on an even larger and more adequate scale than before. The South Eastern University is entirely under the management of Chinese, the staff consisting of highly qualified Chinese trained, for the most part, in foreign countries.

BOOKS AND PERIODICALS RECEIVED

Contes et Légendes du Bouddhisme Chinois, translated from the Chinese by Edouard Chavannes : Editions Bossard, Paris, 1921.

Trois Mystéres Tibétains, translated with introduction and notes by Jaques Bacot : Editions Bossard, Paris, 1921.

Fables Chinoises, translated by Edouard Chavannes : Editions Bossard, Paris.

L'Evolution de la Chine, by André Duboscy : Editions Bossard, Paris, 1921.

Légendes Cambodgiennes, by G. H. Monod : Editions Bossard, Paris, 1922.

Sodanga, ou les Six Canons de la Peinture hindoue, by Abanindranath Tagou : Editions Bossàrd, Paris, 1922.

De L'Expression des Vœux dans l'Art Populaire Chinois, by Edouard Chavannes : Editions Bossard, Paris, 1922.

Hymnes a la Déèsse, translated from the Sanscrit with introduction and notes by Jean Buhot : Editions Bossard, Paris, 1923.

Sous Less Manguiers, Legendes du Bengale, by Tapanmohah Chatterji : Editions Bossard, Paris, 1923.

Mahayana Doctrines of Salvation, by Dr. Stanislav Schlayer : Probsthain & Co., London, 1923.

Exercises in Translation : English-Chinese, Chinese-English, by J. B. Grant and Tai Fu Kiu : Macmillan & Co., Ltd., London, 1923.

Yang Kuei Fei by Shy Chiung (Mrs. Wu Lien-teh), Commercial Press, Ltd., Shanghai, 1923.

Picturesque China, by Emst Boerschmann : Fisher Unwin, Ltd., London.

Letters of a Shanghai Griffin, by Jay Denby, Kelly & Walsh (2nd Edition).

Butterfly Lore, by H. Eltringham : Oxford University Press, Humphrey Milford, 1923.

Natural History, Vol. XXIII No. 6 (Nov.-Dec.), 1923.

New Zealand Journal of Science and Technology, Vol. VI, Nos 1, 2, and 3 (May, August and October), 1923.

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1. Report of Three Years' Cotton Improvement Work.

11. Observations on the Betravior of Cotton Plants especially during Acclimatization, by J. B. Griffing : University of Nanking, 1923.

And Economic and Social Survey of 102 Farms near Wuhu, Anhwei, China, by J. Lossing Buck : University of Nanking Agriculture and Forestry Series, Vol. 1, No. 7. Nanking, 1923.

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Science, June-August, 1923.

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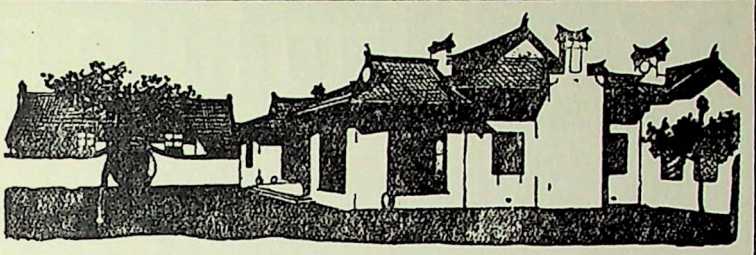
The Annals and Magazine of Natural History, Ser. 9, Vol. XII, Nos. 71-2 (November and December), 1923.

On a Collection of Reptiles and Batrachians from the Island of Hainan, by Malcolm A. Smith : Journal of the Natural History Society of Siam, Vol. VI, No. 2. (October), 1923.

Narrative of a Journey to the Interior of Hainan, by Malcolm A. Smith : Journ. Nat. Hist. Soc., Siam, Vol. VI, No. 2 (October), 1923.

NOTICE: "Yang Kwei Fei" by Madame Wu Lien-teh, which appeared in serial form in the pages of this journal has now been produced in book form, and it may be ordered through the office of the journal at 102 The Ben Building, 25 Avenue Edward VII. Price $3.00 (Shanghai Currency).



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HIRTH ANNIVERSARY VOLUME. Presented to FRIEDRICH HIRTH, Professor of Chinese, Columbia University, New York, in Honour of his Seventy-fifth Birthday, by His Friends and Admirers, 1923. £3 15s. net.

The work contains 28 original and scholarly contributions dealing with Chinese Art and Civilisation. Among the contributors are JOHN C. FERGUSON, AGNES E. MEYER, Sir AURIEL STEIN, and A. WALEY.

CHU HSI: THE PHILOSOPHY OF HUMAN NATURE (HSING LI). Translated from the Chinese, with valuable Notes by J. PERCY BRUCE. 8vo, pp. XVI+444. Price £1 16s.

The first translation of Chu Hsi, who is considered the greatest of all Chinese, ranging next to his master, Confucius himself.

CHU HSI AND HIS MASTERS: An Introduction to Chu Hsi and the Sung School of Chinese Philosophy. J. PERCY BRUCE. 8vo, pp. xvi+336. Price £1 4s.

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I-LI; or, BOOK OF ETIQUETTE AND CEREMONIAL. Translated from the Chinese, with full Commentary by J. STEELE. 2 Vols. Illus. 1917. Price 30s. net.

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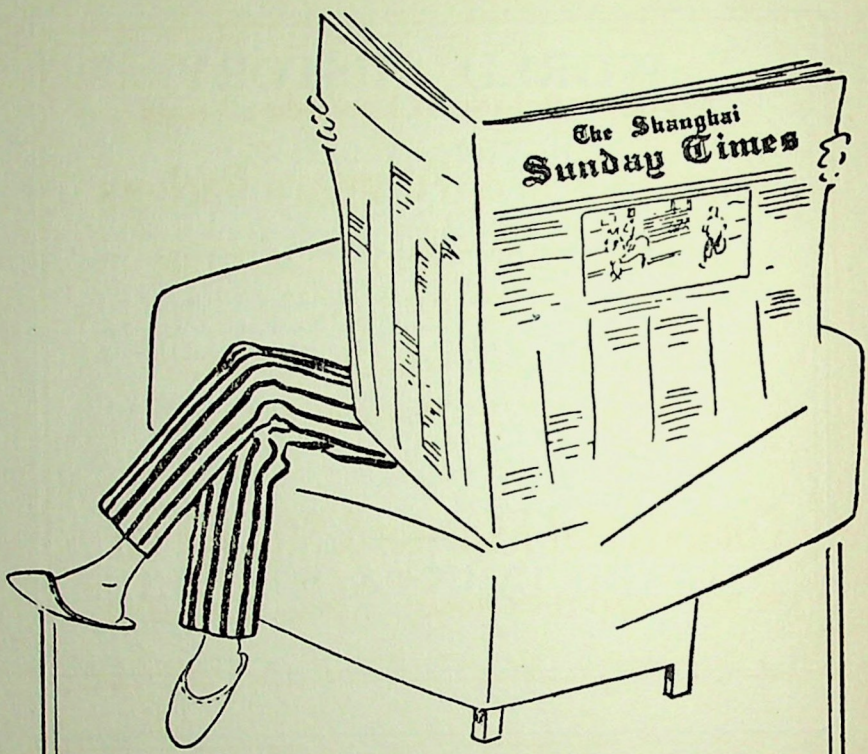

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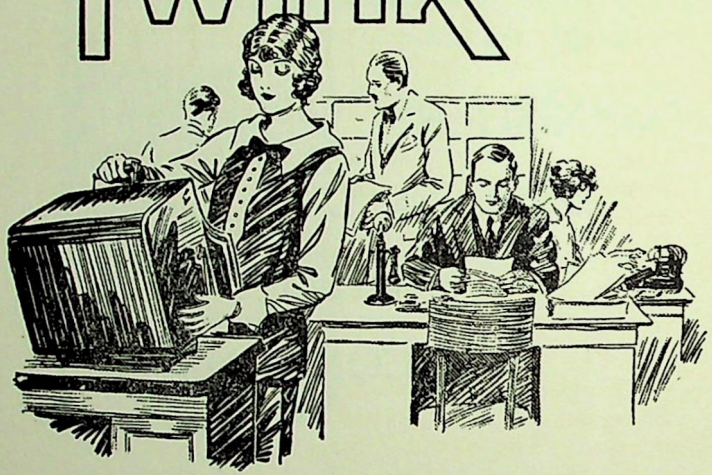

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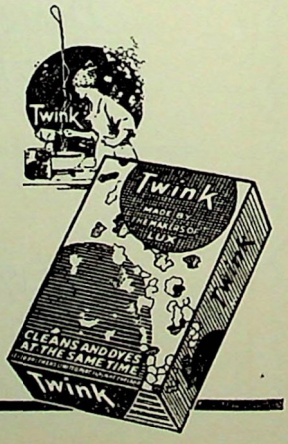

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