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of the

WEST CHINA BORDER

RESEARCH SOCIETY

Vol. III

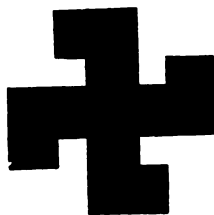


1926-1929



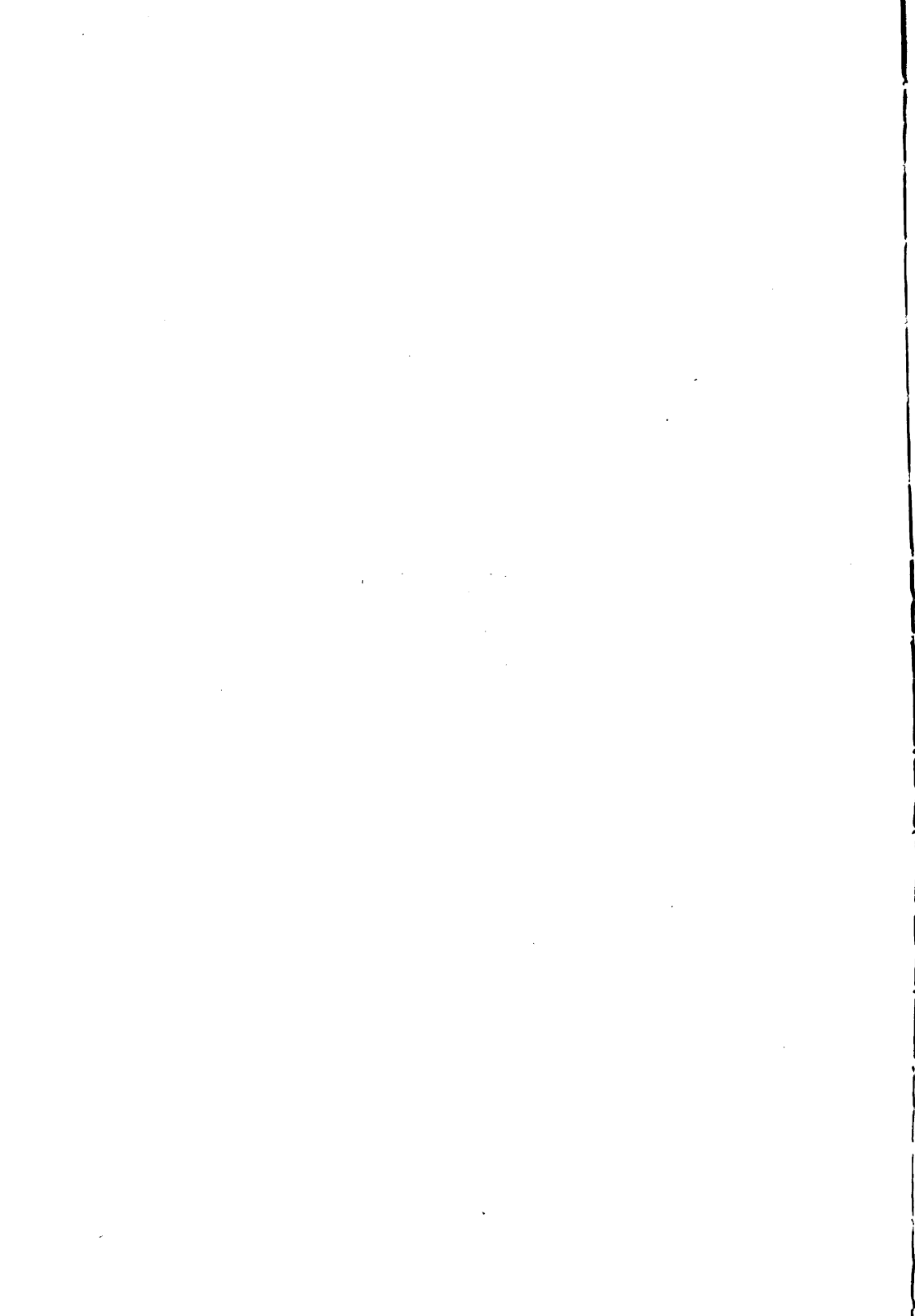
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1926-1929



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Exch
The Society
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In Memoriam

Clifford Morgan Stubbs, M.A., B.Sc.

November, 1888—June 1, 1930

Dean of the Faculty of Science

and

Professor of Chemistry

in

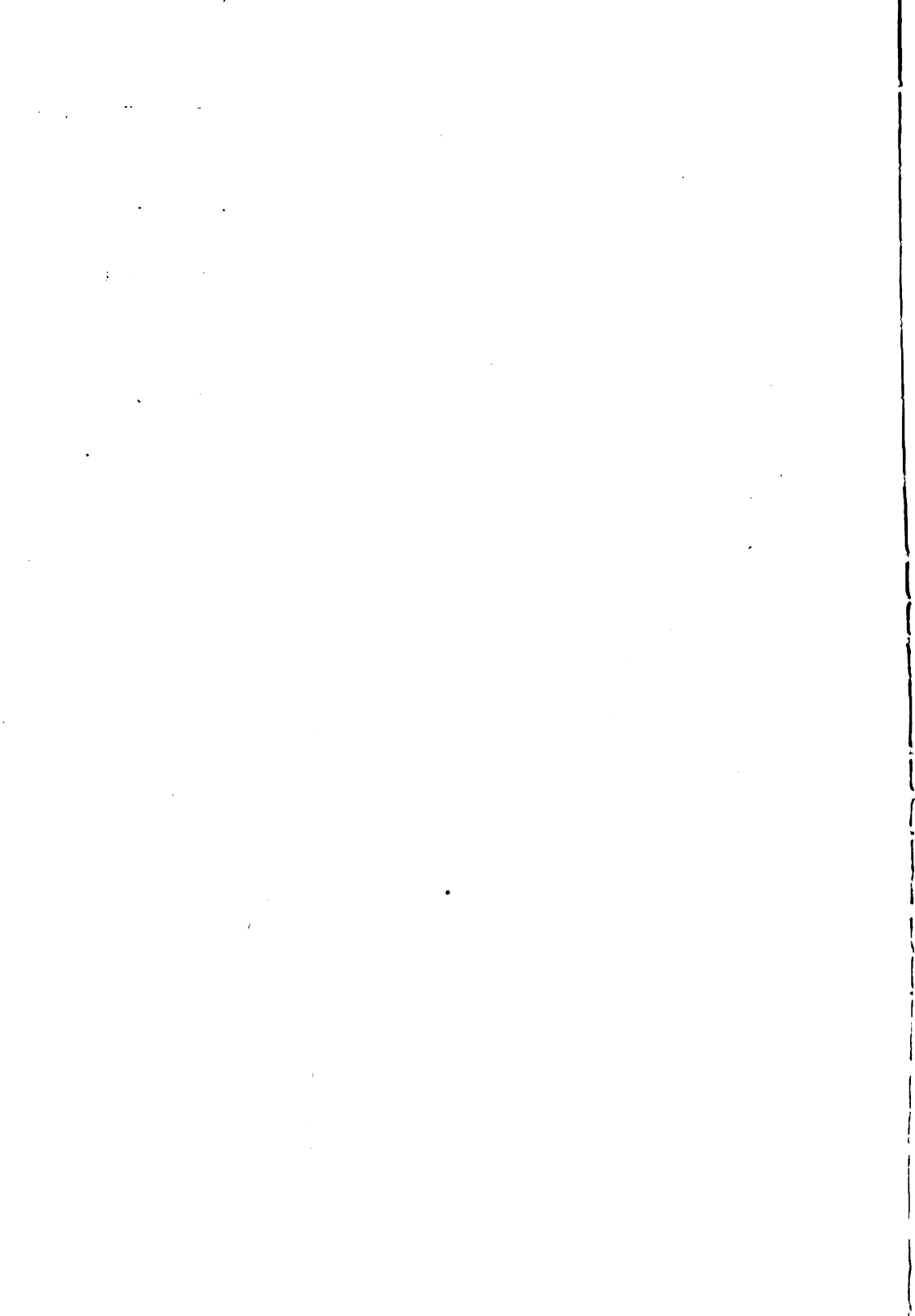
The West China Union University.

Member of the

West China Border Research Society

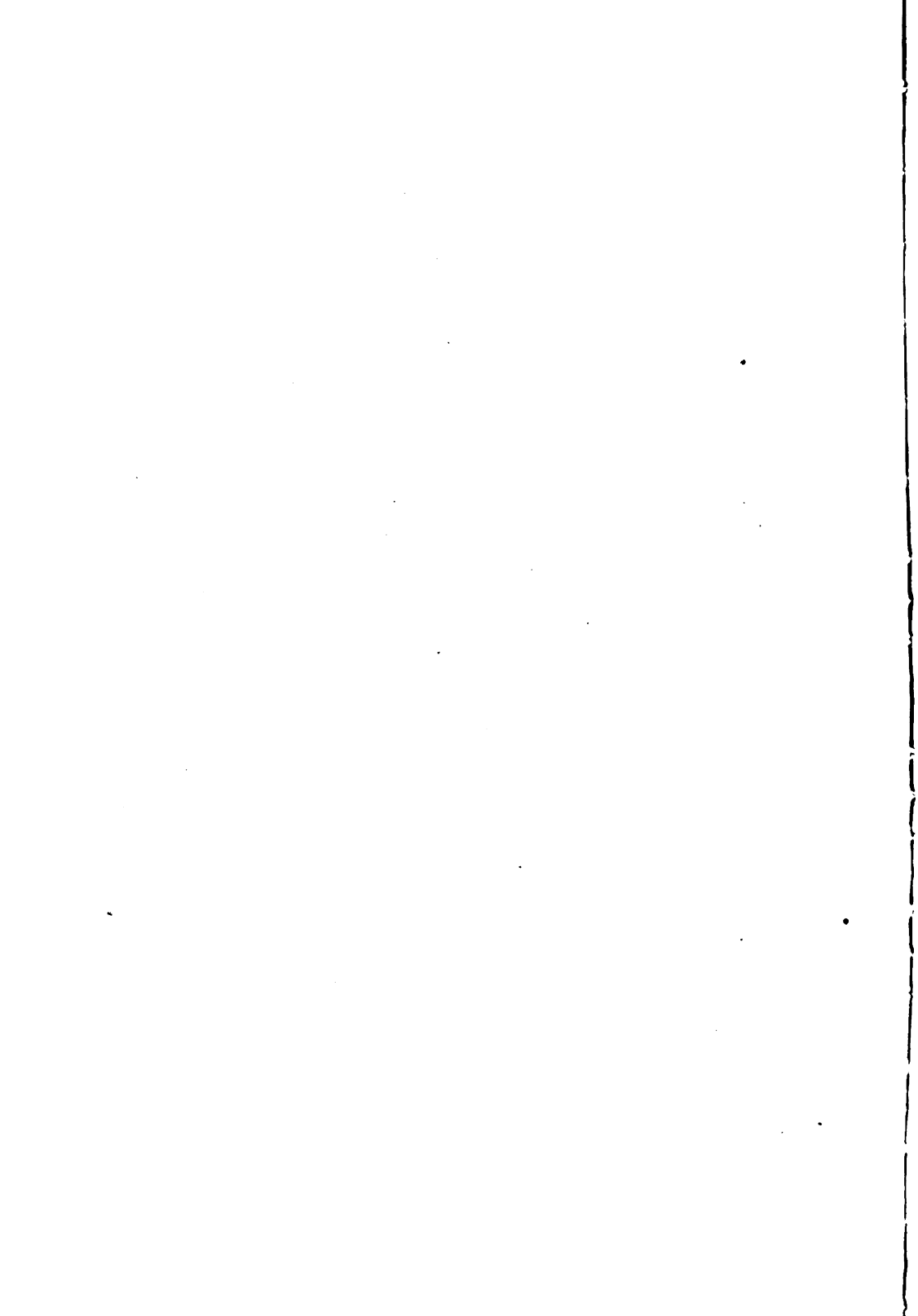
Friend, Missionary, Teacher,

Scientist.



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FOREWORD

The West China Border Research Society was organized in 1922 by a comparatively small group of men who were interested in promoting investigation into the life and customs, the religion and sociology, the ethnology and anthropology, and other problems related to the various aboriginal races that inhabit the border lands of Western China. Members of the Society were pledged to travel, at least once every three years, into the tribal regions, and to there investigate some phase of the life of the district. The first two numbers of this Journal, covering the years 1922-23 and 1924-25 respectively contained several reports of such studies.

The increasing state of lawlessness and banditry in the border regions of West China, however, has rendered travel into the aboriginal tribes country more and more difficult and precarious. It was found impossible to expect the members of the Society to visit those places as regularly and as frequently as originally planned. The scope of the Society's activities was therefore enlarged to include the study of all problems peculiar to the land and life of Western China, either Chinese or Aboriginal. But members are asked to concentrate upon those problems which are especially related to this part of the country, leaving to others the study of those phases of China's civilization which are the common heritage of all her peoples.

The results of this change of policy will be seen in the type of some of the papers published in this number of The Journal. Although we still have reports of various phases of tribal life, the programme printed below shows that the majority of the papers read before the Society during the 1928-29 season were concerned with problems nearer home. The Summer of 1929, however, has again seen several of our members on the trail, and no doubt our next issue will contain reports of their latest investigations.

During the 1928-29 season the Society has held a series of open meetings in Chengtu, which were attended by large and apparently appreciative audiences. The papers presented at these meetings were usually prepared in a semipopular style, and consequently such as are reproduced in this Journal have been either rewritten or very largely revised.

The publication of this volume of the Journal has been greatly delayed beyond the expected date, largely because the Revolution of 1927 caused most of the members of the Society to leave West China. Consequently some of the papers now printed have been in the hands of the editorial committee for a considerable length of time. With a return to more normal conditions, however, and the presence of the majority of our members upon the field we hope that future issues of the Journal will appear at more regular intervals.

Chengtú, Sze.
Dec. 31, 1929

PROGRAMMES OF SOCIETY MEETINGS.

Since the last volume of The Journal was issued the following open meetings of the society have been held, or are planned:

- Nov. 20, 1926 Work of the Society. W. R. Morse.
- Dec. 29, 1926, Survey of Twenty-five Farms on Mt. Omei. H. D. Brown.
Barometric Readings of Chengtu. D. S. Dye
- Nov. 17, 1928, Chinese Drugs in Relation to Climate and Health. (*Illustrated*) S. H. Liljestrang.
- Dec. 15, 1928, The Grass Country and Its People. (*Illustrated*) T. E. Plewman.
- Jan. 12, 1929, Chengtu County Irrigation Project. (*Illustrated*) D. S. Dye and S. H. Soper.
- Mar. 9, 1929, The Principles of the Practice of Chinese Medicine. W. R. Morse.
- Mar. 23, 1929, Birds of the University Campus. Jane B. Dye.
- Apr. 6, 1929, Survey of Fifty Chengtu Plain Farms. H. D. Brown, A Study of Chengtu Schools. Alice B. Brethorst.
- Apr. 20, 1929, A Study of West China Wools. W. G. Sewell.
- May. 4, 1929, Some Dietary Studies in Szechwan. Mary C. Agnew. Oral Pathology of Szechwanese R. G. Agnew.
- Sept. 28, 1929, A Bird Collector on the Western Border of Szechwan. H. Stevens.
- Nov. 9, 1929, Tibetan Medicine. W. R. Morse.
- Nov. 30, 1929, Physical Measurements of West China Union University Students. Y. T. Hu.
Observations of a Pathologist in the Tribes Country. (*Illustrated*) R. G. Agnew.
- Dec. 14, 1929, The Northeast Gateway of Szechwan (*Illustrated*). D. S. Dye.
- Jan. 4, 1930, Among Hei Shui Robbers (*Illustrated*). T. E. Plewman.
- Feb. 14, 1930, Some Problems in the Study of Chinese Religions. D. C. Graham.
- March 14, 1930, A Thousand Miles by Camel, or Through Unknown Deserts. J. H. Edgar.
- March 29, 1930, Dentistry in Szechwan. A. W. Lindsay.
- April 12, 1930, Studies in Szechwan Buddhism. H. G. Brown.
- May 10, 1930, Metabolism in West China L. G. Kilborn.

SOCIETY MEMBERS.

The following is the present membership of the Society :—

Officers, 1929-30

President,—D. S. Dye

Vice-President,—T. Torrance

Treasurer,—O. G. Starrett

Secretary,—L. G. Kilborn

Executive Committee,—The officers along with A. W. Lindsay

MEMBERS :—

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Batang :—M. H. Duncan, B. A.

Tchienlu :—J. H. Edgar, F.R.G.S., (Honorary)

Kiating :—J. A. Lovegren, B. S.

Suiifu :—D. C. Graham, B.D., M.A., Ph.D.

Absent from China on Furlough :—R. G. Agnew, B.A., L.D.S., D.D.S., M. C. Agnew, B.A., A. B. Brethorst, M.A., H. D. Brown, B.A., M.Sc. (Agr.), Ph.D., E. R. Cunningham, M.D., C.M., R. Cunningham, (Honorary), S. H. Liljestrand, Ph.B., M.D., W. R. Morse, B.A., M.D., L.L.D., F.A.C.S., F.R.G.S., S. H. Soper, B. A.

All communications should be addressed to Dr. L. G. Kilborn, Secretary, West China Border Research Society, West China Union University, Chengtu, Szechwan.

WEST CHINA BORDER RESEARCH SOCIETY

EXTRACT FROM BY-LAWS

Fees. The annual fees shall be \$5.00 Szechwan currency for each resident member, except when absent from the field. The Society may, in addition to the annual fee, levy assessments not in excess of \$5.00 Szechwan currency a year. Corresponding members shall pay the annual fee of \$5.00 and not be subject to assessments.

The Journal of the West China Border Research Society is published at irregular intervals, usually once in two years. Reports of investigations into "the country, peoples, customs and environment of West China, especially as they affect the non-Chinese," are accepted for publication. Authors are presented with fifteen copies of reprints of articles published. Additional copies may be obtained at cost if written request is sent with the manuscript.

Members are entitled to two copies of the Journal, and may place upon the mailing list the names of institutions or individuals interested in the object of the Society.

All communications, manuscript, etc., should be addressed to Dr. Leslie G. Kilborn, Secretary of the West China Boarder Research Society, Chengtu, Szechwan, China.

AN ACKNOWLEDGMENT

Grateful acknowledgment is made of the work done by Mrs. R. G. Bower in redrawing the various illustrations submitted for publication in this issue. As all the figures have been printed from engravings made on wood blocks by a Chinese engraver, this necessitated a laborious redrawing on fine tissue paper. That her work has been well done is evidenced by the figures printed.

SOME BIRDS COMMON TO WEST CHINA AND THE LOWER YANGTSE VALLEY.

A. P. QUINTIN.

Of the eight hundred birds found in China, I have collected about one hundred and thirty in Szechwan. North China is reported to have about forty species peculiar to itself, and South China about one hundred and fifty species that are not known to occur elsewhere. The West is supposed to have about sixty species peculiar to itself. These are not dealt with in this article, for it is my purpose to merely list those birds which I have found to be common to both West China and the lower Yangtse valley. I have a growing collection of birds mentioned by neither Baker nor by Gee and Moffett, and these are in all probability peculiar to the West. I hope to describe these in a later paper.

Nearly all the birds mentioned in the following list are now in the cases of the San Yoh Shae in Kiating, and are free to the inspection of all bird-lovers.

The books made use of in this study are:—Baker's "Two Hundred Common Birds of the Lower Yangtse Valley" and Gee and Moffett's "Birds of the Lower Yangtse Valley."

	GEE AND MOFFETT	BAKER
	<i>page</i>	<i>number</i>
Order—Colymbiformes. The Loons and Grebes		
Family—Podicipedidae. The Grebes.		
Eastern Little Grebe (<i>Podiceps Minor</i>) Found in the Omei River, at Tang Fang, in February, 1926. Difficult to shoot.	9	200
Great Crested Grebe (<i>Podiceps Cristatus</i>) My specimen is immature, with no crest or ruff.	11	—
The Eared Grebe (<i>Colymbus Auritus</i>). Shot in the Ya River, February, 1926. Ear tufts quite marked. Size 12-13 inches. Iris red.	12	—

	GEE AND MOFFETT	BAKER
	<i>page</i>	<i>number</i>
Order—Ciconiiformes. Stork-like Birds.		
Family—Pelicanidae.		
One shot by D. Graham near Suifu, species not defined.		
Family—Phalacrocoracidae—The Cormorants.	13-14	—
The West China cormorants rarely attain the 35 in. given by Gee. In the Spring, during the breeding season, soft white feathers appear about the neck.		
Family—Ardeidae—The Herons.		
Grey Heron (<i>Ardea Cinerea</i>)	16	142
Pond Heron (<i>Ardeola Bacchus</i>)	17	148
Little Bittern (<i>Ardetta Sinensis</i>) Younger birds bluish slate in color.	18	—
Cinnamon Heron (<i>Ardetta Cinnamomea</i>)	19	149
Black-crowned Night Heron, (<i>Nycticorax Griseus</i>) Their cries at night are supposed to be the cries of the nine headed bird, so much feared in Szechwan.	20	151
American Egret 50 in. Yellow bill. Greenish black legs. This cannot be the <i>Herodias Alba</i> . My bird was taken in mid winter and hence has none of the rare plumage of this beautiful species.	—	—
Lesser Egret (<i>Herodias Intermedia</i>) Bill yellow.	22	145
Little Egret (<i>Herodias Garzetta</i>) Bill black.	22	146
Cattle Egret (<i>Bubulcus Coromandus</i>) The neck is a tawdry yellow as well as the bill.	22	147
Family—Ciconiidae—The Storks	22	—
I have seen only one, which I took to be the <i>Ciconia Nigra</i> (Black Stork). It was about 40 in., bill and legs red, wings black, body white. I was not able to shoot it.		

	GEE AND MOFFETT	BAKER
	page	number
Order—Anseriformes—Goose-like Birds.		
Family—Anserinae—Geese.		
Lesser White-fronted Goose (<i>Anser Erythropus</i>)	26	155
Contrary to Wilson, I was able to shoot this bird near Kiating. Generally he is right in that geese do not light about Kiating.		
Family—Anatinae—River Ducks.		
Mallard Duck (<i>Anas Platyrhynchos</i>)	29	160
Yellow Nib Duck (<i>Anas Zonorhyncha</i>)	30	—
Green Winged Teal (<i>Anas Crecca</i>)	31	161
Pintail Duck (<i>Dafila Acuta</i>)	34	159
Ruddy Sheldrake (<i>Casarca Rutila</i>)	34	158
Distinguish from sheldrake.		
Mandarin Duck (<i>Aix Galericulata</i>)	34	—
The most beautiful of all ducks, called in Chinese the "Yuan Yang".		
Shoveller (<i>Spatula Clypeata</i>)	34	—
Upper and lower mandibles large and hollow, hence the name.		
Sub-Family—Fuligulinae—Sea Ducks		
Golden Eye (<i>Clangula Glaucion</i>)	35	—
This sea duck is regularly found around Kiating in the Winter.		
Sub-Family—Merginae—The Mergansers		
Merganser (<i>Mergus Castor</i>)	37	164
Red-breasted Merganser (<i>Mergus Serrator</i>)	38	165
(Order—Falconiformes—Falcon-like Birds)		
Family—Buteonidae—Kites, Eagles, Hawks.		
Sub-Family—Milvinae Kites, etc.		
Black-eared Kite (<i>Milvus Melanotis</i>)	45	141

	GEE AND MOFFETT	BAKER
	page	number
Sub Family—Circinac—The Harriers		
Hen Harrier (<i>Circus Cyaneus</i>)	48	130
Marsh Harrier (<i>Circus Aeruginosus</i>)	48	128
Sub-Family—Accipitrinae—The Sparrow Hawks.		
Sparrow Hawk (<i>Accipiter Nisus</i>)	50	132
Order—Galliformes—Fowl-like Birds		
Family—Turnicidae—The Bustard Quails		
Sub-Family—Perdicinae—Quails and Par tridges.		
Common Quail (<i>Coturnix Communis</i>)	53	171
Very small, about five inches, found near Kiating on grassy flats.		
Bamboo Partridge (<i>Bambusicola Thoracica</i>)	55	170
Sub-Family—Phasianinae—Pheasants		
The two pheasants mentioned by Gee and by Baker are not found in West China. Wilson gives us information about the eight or ten varieties of West China. We hope to describe those we have found in a later paper.		
Order—Gruiformes—Crane-like Birds		
Family Rallidae—Rails, Coots, Gallinules		
Indian Water Rail (<i>Rallus Indicus</i>)	60	173
Gee says 13 inches, Baker 8 to 9 in. My specimens are about 9 in. high.		
Moorhen (<i>Gallinula Chloropus</i>)	61	175
Coot (<i>Fulica Atra</i>)	65	178
Order—Charadriiformes—Plover-like Birds		
Family—Charadriidae—Plover, Snipe, e.c.		
Grey Lapwing (<i>Microsarcops Cinereus</i>)	68	—
Just above Kiating on the Ya banks.		
Lapwing (<i>Vanellus Cristatus</i>)	69	185
Much more common than the grey.		

	GES AND MOFFETT	BAKER
	page	number
Green Sandpiper (<i>Totanus Ochropus</i>)	70	193
Common Sandpiper (<i>Totanus Hypoleucos</i>)	71	195
Woodcock (<i>Scolopax Rusticola</i>)	72	188
Pintail Snipe, Lesser Spring Snipe (<i>Gallinago Stenura</i>)	74	189
Swallow Plover (<i>Glareola Orientalis</i>) Half swallow, half plover, a dainty bird.	—	180
Little Ringed Plover (<i>Charadrius Monor</i>)	77	182
Family—Laridae—The Gulls and Terns		
Sub-Family—Larinae—The Gulls		
Yellow-legged Herring Gull (<i>Larus Cachin-</i> <i>nans</i>)	81	—
Common Gull (<i>Larus Canus</i>)	82	199
Family—Columbidae—Pigeons, Doves.		
Spotted Neck Dove, Chinese Turtle Dove (<i>Turtur Chinensis</i>)	87	167
Blue Pigeon, Eastern Turtle Dove, (<i>Turtur Rupicola</i>)	88	166
Order—Cuculiformes—Cuckoo-like Birds		
Family—Cuculidae—The Cuckoos		
Common Cuckoo (<i>Cuculus Canorus</i>) Seen in the woods of Mt. Omei. This bird lays its eggs in the nest of the little redstarts.	91	120
Indian Cuckoo (<i>Cuculus Micropterus</i>) This is the screamer of the Summer nights, though some think it is the next mentioned bird.	92	121
Hawk Cuckoo (<i>Hierococyx Fugax</i>)	94	123
Family—Alcedinidae—The Kingfishers		
Little Blue Kingfisher (<i>Alcedo Ispida</i> <i>Bengalensis</i>)	96	117
Great Spotted Kingfisher (<i>Ceryle Lugubris</i>) Seen on the Ya and the Omei Rivers.	99	118

	GEE AND MOFFETT	BAKER
	page	number
Family—Upupidae—The Hoopoe		
Hoopoe (Upupa Epops)	101	115
The Chinese call him "yang ch'ioh tsi tih ma."		
Family—Strigidae—The Owls		
Long-eared owl (Asio Otus)	104	—
Whiteley's Owlet (Glaucidium Whiteleyi)	105	—
Family—Picidae—The Woodpeckers		
Yangtse Green Woodpecker (Picus Guerinii)	109	114
Spark-headed Woodpecker (Yungipicus Scintilliceps)	111	113
Order—Passeriformes—Perching Birds		
Family—Alaudidae—The Larks		
The Skylark (Alauda Arvensis)		
Seen in cages only.	115	95
Family—Motacillidae—Wagtails and Pipits		
Eastern Grey Wagtail (Motacilla Melanope)	126	40
Family—Timeliidae—The Babbling Thrushes		
Spectacled, Laughing Thrush (Dryonastes Perspicillatus)	131	8
Found at Beh Yang Ba, near Kiating.		
Brown Laughing Thrush (Trochalopteron Canorum)	132	10
Family—Pycnonotidae—The Bulbuls		
Chinese Bulbul. Black-headed Bulbul, (Pycnonotus Sinensis)	136	50
White-headed Black Bulbul (Hysipetes Leucocephalus)	137	52
Family—Muscicapidae—Flycatchers		
Luce's Paradise Flycatcher (Terpsiphone Incii)	144	71

	GEE AND MOFFETT	BAKER
	page	number
Family—Turdidae—The Thrushes		
Chinese Blackbird (<i>Merula Mandarinus</i>)	146	1
Daurian Redstart (<i>Ruticilla Aurorea</i>)	152	24
Plumbeous Water Redstart (<i>Rhyacornis Fuliginosus</i>)	153	25
White-capped Water Redstart (<i>Chaimarrhornis Leucocephala</i>)	—	26
Family—Hirundinidae—The Swallows		
Eastern House Swallow (<i>Hirundo Gutturalis</i>)	171	72
Sand Martin (<i>Cotyle Riparia</i>)	170	74
Family—Sittidae—The Nuthatches "Bill of a woodpecker and the tail of a titmouse."		
Chinese Nuthatch (<i>Sitta Sinensis</i>)	184	35
Family—Paridae—The Titmice		
Lesser Grey Tit (<i>Parus Minor</i>)	184	15
Family—Oriolidae—The Orioles		
The Black Naped Oriole, Golden Oriole (<i>Oriolus Diffusus</i>)	190	53
Family—Corvidae—The Crows and Magpies		
Collared Crow, Parson Crow (<i>Corvus Torquatus</i>)	192	99
Big Billed Crow (<i>Corvus Macrorhynchus</i>)	193	100
Eastern Book (<i>Corvus Pastinator</i>)	194	101
Pied Magpie (<i>Pica Caudata</i>)	196	104
Chinese Jay, South China Jay (<i>Garrulus Sinensis</i>)	199	107
Long-tailed Jay	—	108

	GEE AND MOFFETT	BAKER
	<i>page</i>	<i>number</i>
Family—Sturnidae—The Starlings		
Crested Minah (Aethiopsar Cristatellus)	200	96
Grey Starling (Spodiospar Cineraceus)	201	97
Silky Starling (Spodiospar Sericeus)	202	98
Family—Fringillidae—The Sparrows, Buntings, etc.		
Lesser Black-headed Hawfinch (Eophona Migratoria)	--	80
I have thought this bird might be the Melanura (Gee p. 207), 6½ in. long, but Baker makes the Melanura 8 in long. My specimen is about 6 in.		
Tree Sparrow (Passer Montanus)	209	78
Rustic Bunting (Emberiza Rustica)	215	85
Little Bunting (Emberiza Pusilla)	216	86

TWENTY COMMON BIRDS OF THE WEST CHINA UNION UNIVERSITY CAMPUS.

JANE B. DYE.

In giving this brief introduction to a few of the commonest of our campus birds a little explanation is necessary to show to what extent the statements are supported by actual observation and experience.

Chart one gives a record of observations made here on our Union University campus, at Chengtu, and shows the periods of time which these observations cover. Though considerable desultory work had been done before 1922, it was not till the Autumn of that year that I began keeping records in any systematic way. In the Spring of 1923 the work was interrupted by furlough, and after our return to West China regular recording of observations was not resumed until September of 1926. Just as my knowledge was beginning to be cumulative enough to be really interesting, another break came at the time of the evacuation of February, 1927. In September the work was once more resumed, and has continued since then without a break except for summer holidays and annual conferences. There still are six weeks during the middle of the summer, including most of July and August, for which I have no Chengtu observations recorded.

As far as the numbers on this chart are concerned, several factors need to be considered. In 1926 my own observational powers, as well as my ability to recognize and name what I saw, were perhaps not more than 50% of what they now are. Then during May, June, July, and August, it is not nearly so pleasant to saunter around as it is earlier, as one wishes to avoid the heat as much as possible. Then again, as the term draws to a close, school duties are frequently more exacting, and the time available for one's hobby is reduced to a minimum. So that Chartone gives an index, not only of numbers of birds, but also of weather conditions, gradual increase in experience of observing, and degree of preoccupation of observer.

The naming of what I have seen has been no easy task, as the best texts available for the study of West China birds are in French and German, and only one has pictures. Moreover, I have made no collection of specimens, and only a limited number of specimens collected by others has been available. For the twenty birds under discussion in this paper I have consulted all available references.

and believe that my designation is correct, except that in two cases an uncertainty re sub-specific name is indicated by a question mark. In nomenclature I have followed entirely the Peking Bird List. Although a total of more than 120 birds have been seen and recorded on and about our U. U. campus, for many of these I am temporarily using a name of my own invention. For others I have an approximately correct name, appropriated from a similar specimen in the Shanghai museum, or gathered from a more or less incomplete study of reference books.

In giving descriptions of these twenty birds I have attempted also to give something of their Szechwan distribution, in so far as I have been able to do this from my own observations. So a little further explanation is necessary to elucidate my references to places other than Chengtu.

The summer of 1919, from the last week in June to the first week in September, was spent at Chin Chen Shan, 90 li S. West of Kwanhsien. We stayed in a temple at an altitude of about 4000 ft. and made occasional excursions to the top of the mountain some 1500 ft. higher. During those weeks I made continuous and careful notes of birds seen. But as that was the beginning of my systematic bird work the knowledge on which I could build was limited, and observational powers and methods of note keeping were not well developed.

In the Spring of 1923 a 100 mile trip was made eastward to Tungchwan, Feb. 1-14, and eight days were spent there attending meetings and making observations of birds as opportunity offered. On March 24 of the same year we started for furlough, arriving in Chungking on April 7. Notes were kept en route to Chungking, and some observations were also made and recorded during our eight days stay there.

Again in the Spring of 1927 the evacuation necessitated a trip to the coast. Notes were made quite consistently from the time we left Chengtu by boat, Feb. 11, during a short stay in Chungking, (Feb 23—March 1) throughout a five months stay in Shanghai, until our return to Chengtu in September. The return from Chungking to Chengtu was by direct route overland.

In Spring of 1928 a trip was made to Kiating, Jan 2—Jan 27, and during the ten days stay in that place observations were made and recorded as opportunity was afforded between meetings of conference. Again in the Spring of 1929 a similar trip was made to Yachow, Jan 26—Feb. 15, and observations made there from Jan. 29 to Feb. 11.

During two or three different summers more or less consistent notes have been made at Beh Lu Ding, 45 miles northwest of Chengtu, at an altitude of approximately 6500 ft. Penghsien, on the way to B.L.D., is on the plain, some 600 ft. higher than Chengtu. Si Wen Chang and Heh Wo Dzi, at the foot of B.L.D. have an altitude of approximately 3000 ft.

The most extensive trip was made during the summer of 1929, from July 9 to Aug. 21, during which timely husband and I followed the "Old North Road" from Chengtu to Hanchung in Shensi, and returned by a slightly different route. Places passed through, and their altitudes, were approximately as follows:—In Szechwan:—Hanchow, 1400 ft., Mienchow, 1400 ft., Weichen, 1600 ft., Tzu Tung, 1450 ft., Wu Lien, 1600 ft., Chien Chow, 1550ft. Chien Men Kwan, 3200 ft., Chao Hua, 1400 ft., Kwang Yuan 1400 ft., Chou Tien Kwan (pass), 2500 ft., and Chao Chang Ba, 2200ft.; in Shensi: Lin Chiang Chow, 2500 ft., Wu Din Kwan (pass) 3500 ft., Mien Hsien, 1500 ft., and Hanchung, 1450 ft. Returning from Kwang Yuan we came through Mei Swee Pu, 1100 ft., U in Lin Pu, 2500 ft., and Sintientsi, 2600 ft., Paoning, 1000 ft., Tungchwan, 1000 ft., Chung Chiang 1100 ft., Lien Shan, 1300 ft., and Chengtu 1500 ft. More than 100 birds were recorded on this trip. We had the thrill of finding some of our winter birds in their summer haunts. And of course the trip widened considerably our knowledge of the distribution of our common Chengtu birds.

Chart 2 gives one an idea of the time distribution of these twenty common birds, and also of their relative frequency. The Tree Sparrow was recorded every day for which observations have been recorded, while the Grey Wagtail has been recorded only 122 days out of a total of 322. These figures are the averages of records made during different years. It can be seen by reference to Chart one that the figures for the Autumn months represent a much wider range of observation than do those of the Spring months. For the two months of July and August I have as yet no complete records. For the lack of figures for the crow and rook an explanation is made later.

Books used for reference, with my abbreviations for them are as follows:—

- Pek. List. *Chinese Birds* 2 vol. Bulletin of the Peking Society of Natural History. By N. Gist Gee, Lacy I. Moffett, G. D. Wilder.
Peking Society of Nat. History 1926.
- D. and O. *Les Oiseau de le Chine* 2 vol.
By L'Abbe Armand David, M. C. and M. E. Oustalet. Paris 1877.
- LaT. *A Handbook of the Birds of Eastern China*, Parts 1-4.
By J.D.D. LaTouche,
Taylor and Francis, London. 1925-27.
- We. *Zoologische Ergebnisse der Walter Stötznerschen Expedition nach Szetschwan, Osttibet, und Tschili, auf grund der Sammlungen und Beobachten Dr. Hugo Weigolds.* In 4 parts.
Leipzig 1922-24.

- G. and M. *Birds of the Lower Yangtse Valley.*
By Gee and Moffett. Shanghai 1917.
- D. *A Manual of Palaertic Birds.* 2 vol.
By H. E. Dresser London 1902-03
- W. and H. *List of the Birds of Chili Province,* with notes
by G. D. Wilder and H. W. Hubbard. Journal of the
North China Branch of the Royal Asiatic Society.
Vol LV. 1924.
- R. *A Collection of Birds from the Provinces of Yunnan
and Szechwan, China,* made for the National Geograph-
ic Society by Dr. Joseph Rock.
Classified by J. H. Riley. Washington 1923.

In giving the following notes on our 20 most common birds I have not attempted a description of each, as descriptions are available in several of the above listed texts. Although I have followed the nomenclature of the Peking List, I have given in parentheses names given in other texts wherever they differ from the Peking List.

1. CHINESE TREE SPARROW.

Order: Passeriformes

Family:—Fringillidae

Sub-family —Fringillinae

PASSER MONTANUS (?)

Pek. List. 1006, p. 342. D. and O. 490 p. 240. LaT.
290 p. 328. G. and M. p. 209. D. 430 p. 293. W.
and H. 46 p. 174.

This is by far the commonest bird of the Chengtu plain, at least in the neighborhood of human habitations. It does not, however, reach the altitudes of our summer resorts. At a height of 3500 ft., near the northern border of Szechwan, we found one straggler, and so seemed to be getting above its range. Otherwise we found it quite plentiful all the way from Chengtu to Hanchung, in Shensi.

Here on the Chengtu plain I have observed practically no variation in the plumage of these birds. At Hanchung there seemed to be greater variation, and my observations in Shanghai lead me to believe that there is considerably more variation there. Perhaps our Szechwan variety deserves a special subspecific name. At any rate, none of the names given in the Peking list seems quite suitable, and I have merely indicated by a question mark that a third name is needed.

2. CHINESE MAGPIE.

Order: Passeriformes.

Family:—Croitidae.

PICA PICA SERICEA.

Pek. List. 895 p. 305. D. and O. 537 p. 373 (*Pica Caudata*)
 LaT. 8 p. 13. We. Pt. 1, p. 3. G. and M. p. 196. W. and H.
 7, p. 168.

Whether one is especially looking for birds or not, one is quite sure to see this every day of the year here on our campus. They do not reach the altitude of our summer resorts, but are common in all lower altitude sections. I recorded one this summer at the highets altitude we reached, 3500 ft., in N. Sze., and all the way along to and in Hanchung.

Altho so common, one frequently sees but one, or at best, not more than two or three, in a place. During the autumn months, however, they do collect in flocks of twenty or more on roofs, or in single trees.

They begin to build here about Christmas time and the young birds begin to appear in May and June. We were surprised to see a pair of magpies stand by and merely scold helplessly while a crow pulled to pieces a nest which had just reached completion.

3. BIG-BILLED CROW.

Order:—Passeriformes.

Family:—Corvidae.

CORVUS CORONOIDES?

Pek. List. 890 p. 303. D. and O. 528 p. 367 (*Corvus Sinensis*)
 We. Pt. 1 p. 2 (*Corvus machrorhynchos*).
 G. and M. p. 193 (" " *levaillanti*).
 D. 603. p. 422 (" ").
 R. 236 p. 62 (" " *Intermedius*).

I am not sure which subspecific name should be given to the common crow of the Chengtu plain. Whether Dr. Wiegold's *Tibetosinensis* was found as far to the east of Szechwan, and as low, as this, I am not sure. I hope in time to be able to test out this point by getting the actual weight of a number of specimens.

For some time I was misled in the identification of our common crow by the fact that none of the books mentioned anything but the rook as ever having been found here. Moreover, the first, and for some time, the only, specimen which I succeeded in procuring was a rook, and so confirmed my supposition that only rooks were to be seen on this plain. When finally a specimen brought in from our

own garden proved to be a crow, I began to observe with fresh eyes, and found that the more common bird, at least around our gardens and homes, is the Big-billed Crow. Perhaps the reason the books fail to mention it is that it is so common it is just taken for granted!

As a result of this, I do not have figures in chart No. 2 for crow and rook comparable to those given for the other birds. However, I have inserted them as numbers 2 and 3 in my list as I believe this is approximately the place where they belong.

4. EAST ASIAN ROOK.

Order:—Passeriformes.

Family:—Corvidae.

CORVUS FRUGILEGUS PASTINATOR.

Pek. List. 863 p. 304. D. and O. 531 p. 369 (Frugilegus Pastinator). LaT. 6 p. 9. We. Pt. 1, p. 2. G. and M. p. 194. D. 609. p. 427. (Corvus Pastinator). W. and H. 5 p. 167.

During the autumn months large flocks of these may be seen every afternoon returning from the fields to the large rookeries in the city. One of these rookeries is at the Confucian temple near the South Gate. During the duller days of later Autumn and early winter they frequently are seen making their way city-wards soon after dinner. From December to April one sees numbers of them feeding on our campus.

Penghsien seems to be an even greater rook center than Chengtu, and I believe the same may be said of Yachow. Tungchwan is also a great gathering place for these birds. We saw flocks of what I believe were these at Hanchung, in Southern Shensi, but missed them from Tzu Tung, (four and one half days beyond Chengtu), to Mienhsien one day this side of Hanchung), —i.e. through the mountainous section of northern Szechwan and southern Shensi.

5. BLACK-EARED KITE.

Order:—Falconiformes.

Sub—Order:—Accipitres.

MILVUS LINEATUS.

Family:—Aquilidae.

Pek. List. 137 p. 39. D. and O. 21 p. 16. (Milvus Melanotis). We. Pt. 3. p. 62. (Milvus nigrans lineatus). G. and M. p. 45 (Milvus Melanotis). D. 753 p. 536. (Milvus Melanotis) W. and H. 280 p. 208. R. 36 p. 10.

These birds, by far the largest found in Chengtu, may be seen almost any day soaring well above the haunts of men and of all other birds. It is especially common over our rivers where all sorts of refuse can easily be picked up from the surface of the water.

I have recorded this in all places visited in Szechwan, except on two or three higher mountains. I have seen it several times at Beh Lu Ding. At Hanchung they came into the garden and very close to the house, seeming rather more bold than with us. Moreover they seemed somewhat lighter in color on the average. We have some very light ones here, but also numbers which are very dark.

6. CHINESE SPOTTED-NECK DOVE.

Order:—Charadriiformes.

Sub-Order:—Columbae. *STREPTOPHELIA CHINENSIS CHINENSIS*.

Family:—Columbidae.

Pek. List. 339 p. 103. D. and O. 559 p. 386 (Turtur
Chinensis). We. referred to in Pt. 3 p. 67. G. and
M. p. 87 (*Spilopelia chin.*) W. and H. 367 p. 222. ✓

So far as my own limited observation goes, I would say that this is the dove, not only of our university campus, but also of the Chengtu plain. The Eastern Turtle Dove—*Orientalis*—we found quite common among the hills most of the way from here to Hanchung, and especially between Tungchwan and Sintientsi,—but we did not see or hear it on this plain either going or coming. I have seen *Orientalis* hung up in the Chengtu markets, but believe it had been brought in from the hills.

The Spotted-neck Dove is very common here on our campus, often cooing from our ridge poles, and building under the vine-covered eaves of our houses. We found it quite common in most of the sections reached this summer, especially in the Mission compounds at Kwangyuan, Haachung, and Paoning. Among the cedars on the hillside at Sintientsi we saw and heard only *Orientalis*, and none of these.

An appropriate Chinese translation of and note of this bird is "djin deh kuh". While *Orientalis*'s call the Chinese give as "go go djae djae" (big brother and sister), only "go go" is not in the first tone, but low and guttural.

7. CENTRAL CHINA GREY TIT.

Order:—Passeriformes.

Family:—Paridae.

PARUS MAJOR ARTATUS.

Pek. List. 861a p. 289. D. and O. 402 p. 278 (Parus Minor). LaT. 19 p. 23. We. Pt. 1. p. 11. G. and M. p. 184 (Parus Minor)

This little fellow is one of the commonest small bird residents here on our camps. During the winter months, however, it is not always easy to distinguish it from its cousin, the Green-backed Tit (*Parus Monticolus Monticolus*).

This tit I have found to be common in every place where I have kept careful records—Kiating, Chungking, Tungchwan, Yachow, Chin Chen Shan. I believe it does not get as high as Beh Lu Ding, but is there replaced by the Green-backed variety. En route to Hanchung we found this, or a very near relative, most of the way. On the wooded hillside at Sintientsi, specially, a number of them, both young and mature birds, were seen.

8. CHINESE BULBUL.

Order:—Passeriformes.

Family:—Brachyopidae.

PYCNONOTUS SINENSIS SINENSIS.

Pek. List. 595 p. 191. D. and O. 217. p. 140 (*Ixus Sinensis*). LaT. 91 p. 92. We. Pt. 3 p. 30. G. and M. p. 136.

This is one of our very common bird residents. During the Spring months, especially, one can see and hear numbers of them any day. The bird is also very common in Tungchwan, Kiating, and Chungking. One does not find it at the mountains in the summer, though it does go to the foot of the hills, both at Beh Lu Ding and Kwanhsien.

We met the bird only occasionally on our journey to Hanchung daily from Chengtu to Wei Chen, then at Kwang Yuen, and two days beyond there, also in the Mission compounds at Hanchung, Paoning, and Tungchwan. Through the hills of North Szechwan we found the Yellow vented Bulbul (*Aurigaster Andersoni*) far more common than this one, also the Finch-billed Bulbul (*Spixus Semitorques*). (Of these two, the latter is also resident here in Chengtu, but I have never seen the Yellow vented one here.)

9. CHINESE BLACK THRUSH.

Order:—Passeriformes

Family:—Turdidae.

PLANESTICUS MERULA MANDARINUS.

Sub-Family:—Turdinae.

Pek. List. 645 p. 207. D. and O. 229 p. 148. (Merula Sinensis). LaT. 98 p. 100 (Turdus merula mandarinus). We. Pt. 3 p. 48 (Turdus merula mandarinus). G. and M. p. 146 (Planesticus mandarinus).

From the first week in November till the end of June this is one of our commonest birds. During July, August, September and October only a very occasional one is seen. I have recorded the bird both at Kiating and at Yachow in January and February, but failed to find it at Tungchwan and at Chungking in those same months. On our Hanchung trip I recorded several seen and heard in Mienchow, July 12, one at Chien Chow July 17, and a possible one near Tungchwan Aug. 16. Where the bird spends its summers I do not know I have never seen it either at the mountains or near the foothills.

Though one of our most wonderful songsters, it is also somewhat of a pest. I have been told by the keepers at the Liu Pei Yuin gardens that this bird is the worst enemy of the fruit,—apples, grapes, etc.

10. WHITE-BROWED LAUGHING THRUSH.

Order:—Passeriformes.

Family:—Timalidae.

DRYONASTES SANNIO SANNIO.

Sub-Family:—Timaliinae.

Pek. List. 495 p. 162. D. and O. 287 p. 192 (Garrulax Sannio). LaT. 58 p. 55. We. Pt. 3. p. 25 (Janthocinclia Sannio Sannio.) G. and M. p. 132.

This is one of our commonest bird residents, and I have recorded it also at Tungchwan, Kiating, Chungking, but have no record of it at Yachow. On Hanchung trip we found it all along in Northern Szechwan, and over the border into Shensi, but did not record it at Hanchung, or on the plain one day this side of that city. Did not see it at all in Mission compound gardens during our trip. It seems to prefer a bamboo clump, or undergrowth in an open place, often near habitations. Here on our campus it seems to be most common in or under our hedges, and is frequently seen crossing from hedge on one side of the road to that on the other with a peculiar sort of running jump. There are usually from three to eight of them together. Often they are the last birds which one hears calling just at dusk.

The Chinese call this the "Tu Hwami", in contradistinction to its cousin, the "Gin Hwami", which is a very popular cage bird.

11. RED-HEADED TIT.

Order:—Passeriformes.

Family:—Paridae.

AEGITHALOS CONCINNA CONCINNA.

Pek. List. 881 p. 299. D. and O. 423 p. 293 (Acredual concinna). LaT. 34 p. 33. We. Pt. 1. p. 17. G. and M. p. 187.

This is the smallest of our common birds, measuring a little less than four inches, of which a full one third is tail, so that the plump little body is very short indeed. Gee and Moffett gives this as a five inch bird, but David has the interesting statement that a Szechwan specimen was 20 m. n. shorter than his other specimens. However, I find no subspecies listed.

I have recorded the bird at Chungking, Kiating, Tunghwan, Chin Chen Shan and Yachow, also last summer at Sintientsi, and between that and Chengtu. We did not find it in the hills of Northern Szechwan nor Southern Shensi, nor have I seen it at Beh Lu Ding.

One always sees the bird in flocks, frequently in company with other small birds. They start to build here about the end of February, and the small birds appear about the middle of April. A common place to find the nests is in the vines around the verandahs of our campus houses.

12. BLACK-BACKED WAGTAIL.

Order:—Passeriformes.

Family:—Motacillidae.

MOTACILLA ALBA HODGSONI.

Pek. List. 484b. p. 157. D. and O. 430 p. 298
(Motacilla Hodgsoni). We. Pt. 3 p. 56. D. 296
p. 199. R. 196 p. 53.

Altho a number of wagtails appear here during the year, this is by far the most common one. Along our river, on the dykes between paddy fields, on our roads and the ridge-poles of our houses one sees it bobbing along. During breeding season it is not quite so much in evidence, nevertheless it may be counted as one of our common birds during any month of the year.

The black moustache seems to be the best field mark for distinguishing this bird from the white-faced one. When the young birds appear in June they are just a dull grey over head and mantle, with a small beginning of a grey smudge on the breast. At that time face and forehead are all alike grey. I have not yet decided whether

this bird has a white-faced stage in the Fall of the first year, before the black moustache develops. Certainly the backs are not yet fully black in the first autumn.

I have recorded this bird at Tungchwan, Chungking, Kiating, Yachow, and all points in between. On trip to Hanchung I recorded what I thought were these, most of the way, though not actually at Hanchung. Some which were seen closely were clearly white-faced but if Hodgsoni is white-faced during its first summer, then even those may have been of this variety.

13. GREAT RED-BACKED SHRIKE.

Order:—Passeriformes.

Family:—Laniidae.

LANIUS SCHACH SCHACH.

Pek. List. 832 p. 280. D. and O. 174 p. 95. Plate 75.
LaT. 171 p. 183. We. Pt. 3 p. 10. G. and M. p. 180.

This bird is one of our common campus residents, though there is considerable irregularity about its appearance. I have occasionally missed it for a month at a time, —after which it has returned to an old perch where it could be seen and heard practically every day. This bird I have recorded at Tungchwan, Kiating, Chungking, and all points in between. But I have no record of it at Yachow, nor at our mountain resorts. Moreover last summer we did not see it much farther north than this. An occasional shrike observed near the border of the province seemed to be a shorter tailed variety.

14. COLLARED CROW.

Order:—Passeriformes.

Family:—Corvidae.

CORVUS TORQUATUS.

Pek. List. 892 p. 303. D. and O. 530 p. 368. LaT.
5 p. 9. We. Pt. 1. p. 1. G. and M. p. 192.
W. and H. 4 p. 167.

There is a certain satisfaction in making the acquaintance of this bird, in that one has no doubt re its identification. They occur in smaller numbers than the crows and rooks, and one frequently sees only one or two in a place. But during Feb., Mar., and Apr., when the water in our streams is low, one finds 20 and 30 together turning

over the stones of the stream beds and feeding on what is found thereunder. David states that this is one of the most characteristic birds of China's fauna, and certainly I have found it common in every place where I have made records, even as high as at the foot of the Devil's Staircase at Beh Lu Ding. At Yachow, trees full of these come into the city to roost at night. On trip to Hanchung we found them, usually in pairs, in the fields as far as Chien Men Kwan, and then again in vicinity of Chao Chang Pa and Lin Chiang Chow just on the Szechwan-Shensi border.

15. DAURIAN REDSTART.

Order:—Passeriformes.

Family:—Turdidae.

PHOENICURUS AUROREUS AUREUS.

Sub-Family:—Phoenicurinae.

Pek. List. 684 p. 220. D. and O. 260 p. 170. Plate 26
(*Ruticilla Aureora*). LaT. 133 p. 139. We. Pt. 3 p.
42. G. and M. p. 152. D. 80 p. 52. W. and H.
198 p. 195.

This, too, is a satisfactory bird to study, as its identification is simple and its habits very regular. In five years I have had a variation of only six days in the date of its arrival in the Autumn-Oct. 8-13. In the Spring of '28 my last record of its appearance was on Apr. 2, and in '29 on Apr. 5.

During the summer it does not go far away. It is very common at Beh Lu Ding, and builds around our bungalows. The young birds appear there in August. I have one record of it at Chin Chen Shan. On our Hanchung trip we found it quite common north of Tzu Tung and Sintientsi, tho we did not see it either in Kwang Yuan or Hanchung. During winter months I have recorded the bird at Tunghwan, Kiating, Chungking, Yachow, and various places in between.

16. CHINESE BLUE MAGPIE.

Order:—Passeriformes.

Family:—Corvidae. *UROCISSA ERYTHORHYNCHA ERYTHORHYNCHA*

Pek. List. 897 p. 306. D. and O. 539 p. 375 Plate 83
(*Urocissa Sinensis*). LaT. p. 15. We. Pt. 1 p. 4.
G. and M. p. 198 (*Urocissa Sinensis*). W. and
H. 11 p. 169.

One wonders whether the name of this bird was chosen to match its tail in length! It is one of our fairly common residents. Especially during October and November one can see from one to five of them on our campus almost any day if one keeps ones eyes open. They are frequently seen in the compound gardens inside as well as outside the city.

The bird is quite common on the Chungking hills, and I have recorded it also at Yachow, and near Kiating. It seems to be primarily a bird of the low, somewhat wooded, hills. On our summer trip we recorded it occasionally almost all the way from Chengtu to Mienhsien, one day this side of Hanchung; also along the cedar-covered hillsides from Kwang Yuan to Sintientsi and Tungchwan.

17. CHINESE RED-HEADED BABBLER.

Order:—Passeriformes.

Family:—Timaliidae.

STACHYRHIDOPSIS RUFICEPS DAVIDI.

Sub—Family:—Timaliinae.

Pek. List. 536 p. 175. D. and O. 328 p. 224 (part)
(Stachyris Praecognitis). LaT. 74 p. 73. We. Pt.
3 p. 27. R. of 104 p. 30.

This little fellow wins its place as seventeenth on our list, not because it is so commonly *seen*, but because one *hears* it so frequently. Its piping note, or the shorter "phoe-be" distinguish it at once, and these notes one hears continuously right through the year. If one has time to stop and watch in the direction from which the sound has come, the bird's curiosity usually gets the better of it ere long, and it pokes its little red-crowned head out from the hedge or bamboo clump to see who the intruder may be. In this it differs from the Bush Warbler (*Horornis Fortipes Davidianus*) which is also a frequenter of our hedges, but which persistently refuses to allow itself to be seen.

I have recorded the bird at Beh Lu Ding, at Yachow, and also at Yo Chi below Kiating. On our summer trip I heard the piping a few times between here and Kwang Yuan, and the "phoe-be" note just once between Chao Hua and Kwang Yuan. My failure to record it elsewhere may be partly due to the fact that I did not previously feel sure enough of the note to make a record without seeing the bird.

18. EASTERN HOUSE SWALLOW.

Order:—Passeriformes.

Family:—Hirundinidae.

HIRUNDO RUSTICA GUTTERALIS.

Pek. List. 798 p. 264. D. and O. 193 p. 124 (Hirundo Gutteralis). LaT. 333 p. 392. We. Pt. 3 p. 31 G. and M. p. 171 (Hirundo Gutteralis). D. 389 p. 265 (Hirundo Gutteralis). W. and H. 211 p. 196 (Chelidon Rustica Gutteralis).

During the few months that the House Swallow is with us it is one of our very commonest birds. It arrives in February and can be seen first over the river. (In 1928 I recorded it first on Feb. 7, and in 1929 on Feb. 17.) From the beginning of March it spreads out over the fields and the city, and from that time can easily be seen every day until about the 20th of August. Their nests begin to appear in March right along our busiest streets. The Chinese consider it a good omen to have a swallow's nest over the door, and frequently a small shelf is put up as an invitation. Sometimes the invitation is accepted, though quite as often the shelf remains empty. In Chengtu the small birds leave the nests in May. But in Heh Wo Dzi, at the foot of Beh Lu Ding, we found a nest with small birds in it on July 11.

Most of my bird records in places other than Chengtu have not been made in swallow season. On trip down river to Shanghai in Feb. 1927, there were many of them over the river the day we started, Feb. 8, and for five days thereafter. Then on Feb. 22 I recorded one 60 li above Chungking. But none were recorded during the week's stay in Chungking. On trip to Hanchung we found them quite common all the way along, though often not so common as the Golden Rumped Swallow (*Hirundo Daurica Nipalensis*). At Chao Chang Pa, July 24, we saw a nest with four small birds. On return journey I have no record of the bird between Lin Chiang Chow, August 3, and Sintientsi, Aug 12. On August 21, the day we arrived at Chengtu, there were great numbers of what I believe were these lined up on wires for 50 li or more outside of Chengtu. I did not record them again after reaching here.

19. CHINESE DAYAL BIRD.

Order:—Passeriformes.

Family:—Turdidae.

COPSYCHUS SAULARIS PROSTHOPELLUS.

Sub-Family:—Phoenicurinae.

Pek. List 703a. p. 227. D. and O. 264 p. 174 (*Copsychus Saularis*). LaT. 142 p. 149 We. Pt. 3 p. 27 (*Copsychus saularis saularis*). G. and M. p. 152.

This is one of our residents, and appears on my records for every single month of every year for which I have Chengtu records. But the number of records per month varies considerably from year to year. In 1927 in October I recorded it 15 times, and in October 1929 three times. In Dec. of 1927 my number of records was 20, and in the same month in 1929, two. During the spring months, March, April, May and June the number of records is uniformly higher as it is then singing quite noticeably. The young birds, with their speckle breasts, appear during the first week in June.

I have recorded the bird at Tunghwan and at Yachow. On trip to Hanchung we found it pretty much all the way from here to Kwang Yuen, but not beyond that. On return it was heard at Kwang Yuen, seen in garden at Paoning and from there on to Chengtu. It seems to be fond of city gardens. We found it in mission compound gardens inside city at Mienchow, Chao Hua, Kwang Yuen, Paoning, Tunghwan, and Chung Chiang.

20. GREY WAGTAIL.

Order:—Passeriformes.

Family:—Motacillidae.

BUDYTES CINEREUS CASPICUS.

Pek. List 483 p. 156. D. and O. 439 p. 303 (*Budytes cinereocapillus*) We. Pt. 3 p. 56. (*Motacilla Cinereus Caspicus*). G. and M. p. 126 (*Motacilla melanope*). D. 302 p. 202 (*M. melanope*).

This is not nearly so common a bird with us as is the Black-backed variety, nor is it here in such numbers. However, one does frequently see one running along a ridge pole, or drain, or bobbing along by the riverside. It leaves us about the middle of May, and returns during September. My dates for arrival in Sept. vary from the 6th to 27th, and for departure in May from the 7th to the 11th.

The black throat of the male develops just before it leaves us for the summer, and is gone before it returns in the Fall. I have seen it only a very few times.

I have recorded this bird at Kiating and at Yachow. Moreover we found a few in their summer quarters on our trip to Hanchung along the streams of the mountain valleys for the first two days beyond the Szechwan. Shensi border.

With such limited experience one hesitates to attempt to draw any conclusions from observations which have been made. However, I will mention a few things which have occurred to me, making it very plain, however, that I know them to be only the opinions of an amateur.

The general geographical distribution of our Chengtu birds, as given in the Peking Bird List, is an interesting study. While of course twenty birds is not enough from which to draw conclusions, it nevertheless begins to seem quite evident that we are related ornithologically to Fukien, Kwangtung, and Hainan. In a few cases there seems to be a connection across to Burmah and India.

Re bird migration, two facts or theories begin to evolve. For one thing, several of the little fellows which leave us during March and April we find again at the mountains, showing that we have here a case of vertical migration within a radius of only a few tens of miles. While one cannot, of course, be ten-tenths sure that the Chengtu and Beh Lu Ding birds are actually the same individuals, nevertheless the evidence seems to point that way.

In the second place, I begin to suspect that this portion of the Chengtu plain is not in the direct line of any real bird migrations.

Altho my lists for March and April, and for October and November are some what longer than for other months of the year, I feel that they are not enough longer to indicate the passing of any real migratory horde. I suspect that in the hills either to the east or to the west of our plain a different state of affairs might be found to exist.

A fact which surprised me when I first began to study the birds of this locality was that it is not bright sunny weather which brings the greatest number around us, but rather the dull, wet, disagreeable days. In fact, the birds and the barometer seem to work together, low barometer, more birds; high barometer, fewer birds. My supposition is that on the brighter days the birds, especially the small warblers and tits scatter to the hills, whereas when it is cold and damp they come to lower levels and gather in about human habitations.

It seems a fact worth noting that in the list of the twenty commonest birds of this vicinity, five, or one quarter of the number, belong to the Corvidae. Moreover, these five common birds cover all the Corvidae met with in this section. Furthermore, I believe that these probably make up a full quarter of our total bird population, at least during some months of the year.

I have been asked whether this is an especially fine bird location. My opinion is that it is not. There is no really wooded section for miles around. Of water birds we do have, however, a goodly number. But to compare with Eastern U.S.A.:—If my memory serves me correctly, in Eastern Pennsylvania, a bird walk of two hours before breakfast in April or May would enable one to record from 60 to 90 birds. Whereas up to the present 39 is the greatest number recorded during any one day here, and I do not often record

more than thirty. I am hopeful, however, that as the trees on our campus increase in number and in size we may add to our bird population. The Golden Oriole was certainly here in greater numbers in 1929 than in 1926. I hope that this was a permanent, and not a temporary, change. Also let us hope that other birds will follow its example.

Chart 1. Record of Observations.

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Totals
1922	No days during which observations were made.									30	31	30	31	122
	Total number recorded observations									64	87	141	106	398
	Total number species recorded									13	24	27	24	
1923	Days	31												31
	Observations	84												84
	Species	22												
1928	Days									30	31	30	31	122
	Observations									264	349	332	425	1370
	Species									36	40	37	42	
1927	Days	31	10							17	31	30	31	150
	Observations	508	178							167	455	498	636	2442
	Species	48	34							32	45	37	40	
1928	Days		29	31	30	31	30	8	10	30	31	30	31	291
	Observations		745	838	618	536	446	139	178	468	596	627	628	5919
	Species		58	63	56	40	34	28	31	42	56	54	51	
1929	Days	25	13	31	30	31	30	8	10	30	31	30	30	269
	Observations	576	355	790	649	593	577	157	113	431	507	554	603	5302
	Species	54	52	58	57	45	32	33	25	46	44	50	49	

Chart 2. Twenty Common Campus Birds. Frequency Chart.

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
1. Tree Sparrow	31	29	31	30	31	30	8	10	30	31	30	31	322
2. Chinese Magpie	31	29	31	30	31	30	8	10	30	31	30	30	321
3. Big-billed Crow													
4. East Asian Rook													
5. Black-eared Kite	29	29	31	30	31	30	8	8	25	30	26	28	305
6. Chinese Spotted-neck Dove	15	23	31	30	29	27	8	9	27	25	22	22	268
7. Central China Grey Tit	25	29	31	30	22	22	3	6	22	26	25	23	264
8. Chinese Bulbul	13	19	26	30	30	29	8	9	21	26	26	21	258
9. Chinese Black Thrush	24	29	31	30	30	24	4	2	2	9	23	28	236
10. White-browed Laughing Thrush	14	24	29	27	24	17	7	7	26	16	17	21	229
11. Red-headed Tit	26	26	28	20	23	15	2	4	21	17	17	23	222
12. Black-backed Wagtail	22	21	25	15	10	14	5	8	28	21	20	24	213
13. Great Red-backed Shrike	12	23	19	15	26	14	7	10	29	19	17	16	209
14. Collared Crow	13	22	22	20	13	9	5	3	10	13	11	15	156
15. Daurian Redstart	26	29	28	3						18	23	28	155
16. Chinese Blue Magpie	16	16	11	12	13	10	2	4	14	20	17	14	149
17. Red-headed Babbler	16	12	17	16	11	22	4	5	8	10	13	15	147
18. Eastern House Swallow		16	31	30	31	30	7						145
19. Dayal Bird	5	14	20	18	19	17	8	5	5	9	7	9	132
20. Grey Wagtail	8	18	17	18	3				10	20	15	13	122

ALLEGED EDIBLE BIRDS' NESTS ON THE TIBETAN MARCHES

J. H. EDGAR

Some days ago a native of the wildest, unmapped portions of the Tibetan frontier country gave me unsolicited information which suggests the hitherto unsuspected existence in these regions of "edible nest" producing swifts. I pass this information on merely for what it is worth.

Location: About twenty-five miles from the town of Leng Ch'i, far up on high mountains are mysterious caves with an awesome and ill-omened lake situated in one of the expansive grottoes. Apparently, also, these caves are at different levels and separated by impassable cliffs. In most cases the interiors, as dark as midnight, are at times swept by erratic winds. The road from Leng Ch'i is very difficult and not free from danger.

The Birds: In these caves birds of the swift family construct their nests in the most inaccessible positions. They are visitors from the South, and apparently on arrival immediately build new nests or occupy old ones, and after rearing a family depart to warmer regions. The nests are said to be produced partly or entirely by saliva from the bird, and when finished are like the bowl or depression of a spoon. They vary in quality, but are collected, graded, and sold locally as a delicacy or a cure for consumption. They seem to of the same substance as the tropical product which they closely resemble, but probably owing to faulty preparation, prejudice, and it may be, local peculiarities, they are considered inferior to the supplies from the Dutch Indies.

The Collectors: My informant gave a rather terrifying account of the perils awaiting the collectors of such nests. The birds build on the walls of the underground cliffs, hence they are obtained by climbing up on ladders, or dangling over the cliffs attached to ropes. As the interior is pitch dark torches are necessary, but these are continually extinguished by the blustering winds or swarms of frightened animals. No doubt, too, the superstitious tendencies of the raiders are most powerfully stimulated by the darkness, strange sounds, and fantastic land forms.

Conclusion: My informant knows nothing about the accommodating creatures of Java or Borneo; but his accounts are so correct in details that it is difficult not to believe that in this wild

land we have swifts which produce nests little inferior to those exported from the tropics. If so, what is the explanation? Is it a case of local conditions forcing the bird to take advantage of a habit long abandoned in most regions, but which was at one time general? Or does it mean that "nest" building swifts confronted with an adverse climate solved a serious problem by migrating South? Those refusing to do so would die, while the others would survive, even although the influence of the old surroundings might draw them back again when the danger which expelled them was over. As the climate became more unfavorable the extent of the migration would increase. However, it seems to most of us that the Tibetan climate is advancing *from*, not *to*, a glacial age.



THE HAUNTS OF THE GIANT PANDA

J. H. EDGAR.

H. Stevens and I have just come overland from Tatsienlu to Muping, via the haunts of the panda. We had a rather tedious time in a land where desert heat and tropical humidity alternate. The land too, a mass of sawtooth peaks, precipices, box canyons, sombre forests, and pounding torrents, provides the wanderer with anxious and unpleasant problems at times. The alleged wealth of flora and fauna is evidently based on a misunderstanding of the activities of Father David, who collected for many years in many provinces of China, but did not spend more than eight or nine months in Muping, where he was employed by the French Government to collect natural history specimens. If I am not mistaken, however, he made the Giant Panda known to Science when at Muping. Stevens and I were camped for ten days in undoubted Panda country, and although not equipped for shooting large game, were able to locate the animal with some certainty. Our camp would be more than 30 miles further in than Kan Yang where the Roosevelt party made their quarters. The dividing line between the Tong and the Ya waters is an interesting scrap of "grass country," 13,100 feet above the sea. Travellers in these "Haunts of the Giant Panda" will find difficulty in obtaining suitable coolies; food also will be a problem; and an area in the centre about 60 miles across has no permanent population. Moreover, people affected by heights, narrow tracks, and improvised bridges should seek their pleasure elsewhere. Our Tibetan dog, "Pheasant" came to grief on two occasions on ledges which were safely negotiated by Stevens and myself.

I have recently been looking through the "Tribute of Yü" and was surprised to find the Panda, the P'i 熊, included in the tribute from Liang Chow 梁州; or part of the present Szechwan. The sentence runs as follows:

梁	碧	貢
州	熊	環
之	狐	銀
地	狸	鑲
山	縑	碧
林	皮	
爲	厥	
多		

So the Giant Panda, first known to Europeans some sixty years ago, figured in tribute more than 4000 years previously.

A COLLECTING TRIP TO WASHAN AND MOUNT OMEI.

DAVID C. GRAHAM.

During the months of July and August 1925, I made my third collecting expedition for the Smithsonian Institution, taking a trip to Washan and to the top of Mount Omei.

This was a Summer long to be remembered by the foreigners in Szechwan. Civil war raged throughout the Province. Brigands were more numerous than usual. Anti-foreign riots broke out in different parts of China, and it was feared that all foreigners would have to leave.

It was necessary for the missionaries travelling to Mount Omei to go together under one escort. In addition there were twenty cargo-boats carrying freight for missionaries and for mission institutions farther up the river. We travelled under the protection of two hundred and fifty soldiers.

On the first day the boat containing Mr. Randle's family turned tail, struck a rock, and nearly sank. On the third night we were across the river from a well-armed band of three hundred robbers. At Chien Wei we found enemy troops in possession, so that our escort had to return, and it was necessary for us to go on under the feeble protection of the local militia. Below Motsitsang, as a result of heavy rains in the central and western portions of Szechwan, the river suddenly rose,* so that travel was dangerous, and for a time even impossible. After several accidents, almost wrecking some of the boats, we crossed the river at Dao Si Kuan. We arrived at Kiating on the eleventh day, after the slowest and most dangerous trip from Suifu to Kiating that we have ever taken.

On July eleventh, with two hunters, two taxidermists, two netters, a coolie, and thirteen carriers, I started for Washan. On the next day a messenger from Shin Kai Si overtook me. He brought a letter saying the conditions were growing very bad down the river, that many British subjects were leaving, and that all foreigners might be ordered out of Szechwan. The foreign community of Shin Kai Si advised against my going on to Washan. I

*Note:—I believe that the high waters of the Yangtse and Min Rivers during the summer time are due primarily not to the melting of snow in Tibet, but to the heavy local rains.

therefore settled at Yang Ts'en P'u, intending to collect as long as I could.

On July fourteenth another letter came stating that conditions were improving, and that my foreign friends withdrew the request that I should not go on to Washan. I again headed for that mountain.

At Gin K'eo Ho it was exceedingly hot, and I have never seen bedbugs worse than they were in the temple where we spent the night. Half the town had been washed away by a recent cloudburst, which was so terrible that the natives said several dragons had been born in the vicinity. I killed two monkeys on the cliff above the town, and arrived at the foot of Washan on the eighteenth of July.

We spent a few days working the territory at the base of Washan, securing a good number of birds and insects, and some mammals and reptiles. On July twenty-third we went to the top of the mountain, where we remained three days.

Washan is nearly flat on top. On every side is a sheer precipice several thousand feet high, with only one road leading to the summit. This road goes along the point of a very narrow ridge, on each side of which is precipice a thousand feet or more in height. At one spot this ridge is very narrow, probably about three feet wide. In another place a chasm is bridged by placing poles side by side. To cap the climax, near the top are four long ladders. It is practically perpendicular at these points, and without the ladders one could not reach the top. The only building on Washan is a tumble-down temple that leaks badly when it rains. Most of the year there is no one living on the mountain.

We spent three days and four nights on the top of Washan. It was cold, but the surrounding were interesting and beautiful. This is probably the highest point in central Szechwan, and there is a wonderful view in all directions. To the west the snow mountains of Tibet are often visible. To the south the mountains of the Lolo country rise higher and higher. To the north is glorious Mount Omei. To the east are the plains of central Szechwan, which are among the most fertile spots in the world. The top of Washan is covered with thick forests of fir and rhododendron, with occasional bare spots carpeted with beautiful grasses and flowers.

August fourth found us back at Shin Kai Si with a fair catch of specimens, and with time to do three weeks more collecting on Mount Omei. I sent one hunter, a netter, and a taxidermist to work around Si Gi P'in, and with the rest of the expedition I started for the summit of Mount Omei. My plan was to go by short stages, working the territory as thoroughly as I could.

Our first stop was at Wan Nien Si. The next night found us at Ch'u Dien, which claims to be the first temple erected on the mountain. Here we remained two days. Then we climbed to the Golden Summit, from which we returned to Giu Lao Dong, and thence to Shin Kai Si.

Virgil C. Hart, in "Western China," says, "Mount Omei is a center of natural and artificial wonders, the like of which may not be found elsewhere upon the globe." Volumes could be written about these wonders, but in the space at our disposal, only a few things can be described.

Between Kiating and the Golden Summit there are nearly a hundred temples and monasteries, some of which are of great age and beauty. Near Omeih sien, at the Da Fuh Si or the Great Buddha Monastery, is a Goddess of Mercy that actually has one thousand arms and hands. This colossal idol is covered with gold, and, including its hands, is nearly one hundred feet high. In the Shen-chi monastery, at the foot of Mount Omei, is a bronze pagoda fifteen stories high, on the surface of which, according to Hart, are 4700 images of Buddha. There is a bronze bell over the gateway weighing over twenty thousand pounds. The Temple of the Crouching Tiger is situated near a beautiful mountain stream, and is surrounded by virgin woods of wonderful beauty. Wan Nien Si was probably founded in the Tsin Dynasty, in the year A. D. 265. It has a bronze image of P'ushien riding on a great bronze elephant, a Lama-king-tai or "Lama praying-tower," a spiral temple made entirely of brick and stone called "the revolving spire," Buddha's tooth, which is probably a fossil mammoth tooth, and the foot-prints of Buddha. Apparently Buddha was a very large individual.

At the Gieh Yin Dien we saw at nights the famous lights that are supposed to be the lights of the god P'ushien. We used the field glasses, and found that a few were lamps in homes in the valley below, but others were near, and on the side of the mountain. Possibly some were caused by glowworms, but most of them were doubtless phosphorescent lights due to decaying vegetation.

Standing on the Golden Summit, one sees about him the great temples and monasteries, some of them hoary with age. To the west are the snow mountains of Tibet. Looking eastward, he views the green, fertile plains of Szechwan. Below him is a precipice of six thousand feet, thought to be the highest precipice in the world. Buddha's Glory is one's shadow on the clouds below as he stands, with the sun behind him, on the edge of the precipice.

I visited the priests in various temples, and asked them many questions about the Buddhist religion.

The abbot at the Ch'u Dien gave an interesting explanation of idolatry. Of course a god is immaterial and invisible. However, the common people need images to help them mentally conceive of the gods. When one worships a god in front of his image, the god becomes present and reincarnated in the image, so that the image is the god. It is similar, he said, to the idea that wherever people worship Jesus he is present in their midst. The god becomes present in the image, so that the image is truly a deity.

At the Golden Summit I had the privilege of talking with one of the greatest Buddhist priests in all China, who was on a visit from

Peking. I first saw him worshipping at the shrine of P'ushien, and took his picture as he was prostrated before the god. Later I secured an interview. He knew of Timothy Richard and Gilbert Reid, for whom he had a high respect. He spoke of the idea of bringing all the religions of the world together, and said that the better elements of all religions could be embraced in Buddhism. He said priests were being trained to spread the Buddhist religion in Europe and in America. He did not oppose modern science, psychology, or philosophy, for to him Buddhism embraces all of these. He said that the Buddhism of East China and Japan was higher and more intellectual than that of West China, but that a Buddhist school had already been opened in Chengtu to teach the higher Buddhism, and in the near future similar schools would be opened in Chungking and other places. He believed that perfect truth and the original teachings of Buddha were identical, and, when rightly understood, Buddha's teachings were not only in harmony with modern science and philosophy, but also included many of the modern scientific and philosophical truths. For instance, he said that Buddha taught the existence of myriads of germs. This great priest was intelligent, ardent, and courteous, and Christian workers might well emulate his enthusiasm and faith.

Those who assert that the Chinese are not religious should reflect on the fact that Mount Omei is a holy land. In Europe or America, because of its mountain streams, its precipices and cliffs covered with green shrubbery, its virgin forests of evergreen trees, and its natural caves, Mt. Omei would probably be set aside as a national park or as a summer resort. In China it is a great religious center to which tens of thousands make pilgrimages every year to worship their gods. Among the Chinese, the beauties of the mountain arouse feelings of wonder and awe that naturally culminate in worship.

The return of our party to Suifu was fraught with unusual difficulties. We were caught in the tail of a great retreating army. Because of brigands, the only possible way to reach Suifu was by steamboat. There were only two small cabins for twenty-four foreigners. The steamer was commandeered, and was used to ferry the excited troops across the river. It was very hard to secure food. We finally reached Suifu on the fifth of September.

The summer catch was nearly fifty per cent larger than that of any previous expedition. There were seventy-five boxes of specimens, while the largest previous collection was a little over fifty boxes. From among these two new species of birds have been described. Considering the unusual difficulties that were faced, it is fortunate that we were able to make the expedition at all, and still more fortunate that the entire collection reached the United States National Museum in good condition.

NOTES ON SUNGPAN WOOL

W. G. SEWELL,

One of the many noticeable changes in Chengtu and probably in the province of Szechwan as a whole is the way in which wool is being used to supplement, and in part replace, the previously all-prevailing silk, ramie and cotton. Undoubtedly the first real introduction of woollen yarn to the province came through the Treaty Port of Chungking. It is interesting to notice how the importation of both piece goods and yarn has increased during the last ten years and, despite present unsettled conditions, there continues to be a steady increase. (See Table 1.)

TABLE 1.

Quantity and value of foreign woollen yarn and piece goods imported into Chungking.

Year.	Woollen Yarn.		Woollen Piece Goods.	
	Piculs.	Value Hk. Tls.	Value Hk. Tls.	
1918	41	11,335	4,442	
1919	31	9,080	19,008	
1920	4	480	10,009	
1921	21	5,278	53,130	
1922	174	31,297	85,141	
1923	146	22,572	169,605	
1924	431	58,900	367,324	
1925	233	36,319	325,034	
1926	657	90,640	465,215	
1927	1,138	148,013	589,992	

It is impossible to determine what proportion of the foreign imported woollen goods is used in Chungking, but a very considerable proportion must find its way to Chengtu and other cities in the province. The demand has not been satisfied by the imported goods, therefore other sources have been sought and the local product has been developed. This has been further encouraged by the excessive freight and taxes on the foreign goods. The object of the work reported in this paper has been to examine some of the properties of

local wool with a view to determining how far it is capable of replacing the imported yarn.

This local wool comes mostly from the grass lands of Anterior Tibet, the two main distributing centres being Tachienlu and Sungpan. That from Tachienlu finds its way out by Kiating and Suifu, some is consumed locally on the way, and the remainder is exported from Chungking and figures in Table 2. Of this exported wool a considerable amount is said to go to Japan and is later imported again as yarn and piece goods.

TABLE 2.

Export of Sheep's Wool from Chungking.

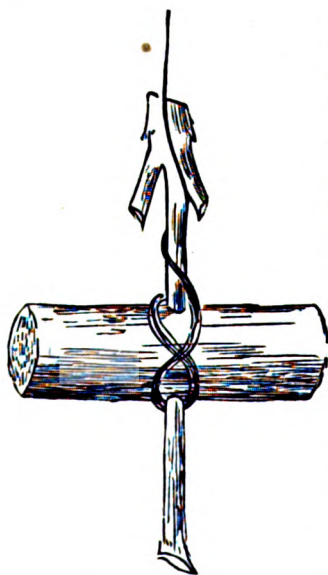
Year.	Piculs.	Value Hk. Tls.
1893-1902	16,519	(average)
1918	14,970	571,106
1919	21,526	437,624
1920	12,875	275,654
1921	4,333	66,586
1922	24,874	411,664
1923	8,816	197,302
1924	8,039	202,502
1925	2,498	79,111
1926	3,317	114,104
1927	8,844	251,434

Merchants do not declare on their export applications the place of production of the articles exported, but although in the absence of reliable data and the present condition of the province it is not possible to be quite certain it seems likely that the wool from Sungpan is used almost entirely within the province. The wool that arrives in Chengtu comes from this source. Hosie (1) estimates that in 1904 about 50,000 piculs, or 3,000 tons, of local wool entered Szechwan and of this 20-30% came in through Sungpan and thence to Kwanhsien from which place it was distributed. Hosie also mentions that the export of wool from Chungking from 1893 1902 averaged 16,519 piculs, or nearly 1000 tons, per year, but as Table 2 shows the export has considerably fallen off during later years either due to disturbed local conditions with the consequent difficulty of transport, or to increased consumption within the province, or to both reasons. The wool which was valued at 14 Hk. Tls. a picul in 1902 has risen in value to 28. 43 Hk. Tls. in 1927 with considerable fluctuations in between, the highest value reached during recent years being 38.15 Hk. Tls. per picul in 1918.

It is at present not possible to determine the quantity of raw wool exported from Tachienlu or Sungpan, nor is it possible to

estimate the amount imported into Chengtu. Taxes of varying amounts are levied on the wool but no record of any kind is kept of payments or quantities. It is a frequent sight to see long wheelbarrow processions of the wool coming into the South Gate of Chengtu from the river side. In 1904 the raw wool was sold in Chengtu for 1400 cash a catty, whereas in 1928 it cost from between 6000 to 7000 cash. As in 1904 there were 850 cash to the Szechwan dollar (1) whereas in 1928 there were over 7500 the price reckoned in silver is actually cheaper.

This present investigation is only concerned with wool such as can be bought on the streets at Chengtu. A study of the sheep themselves is called for when opportunity offers. Travellers and others more or less casually describe seeing large flocks of sheep grazing in the valleys and lower lands in the Sungpan district. Also at some times of the year small droves of the sheep enter Chengtu. These are mostly of the fat-tailed variety and are used both for their skins and meat.



The chief use of this wool in Chengtu is for making yarn for knitting into hose, hats, jackets, scarves, etc. The spinning is entirely done by hand, mostly by women and girls. A handful of raw unwashed wool is held in the left hand, a thread is started by rolling between the finger and thumb and twisted by means of a revolving weight. (See Illustration.) The weight is a piece of wood with a small piece of bamboo inserted at right angles, around a hook on which the thread is wound to prevent it slipping. As the bobbin turns round the thread twists and lengthens. When it reaches an inconvenient length it is wound round the wooden weight or bobbin and the process repeated. Finally the cross-stick of bamboo is withdrawn out of the hole and the ball of wool slipped off the wood. The yarn has a count of 9 yards per

dram on an average (100 metres weigh 22 grams.) It is coarse, uneven, usually dirty and wound with much too great a twist thus making its use difficult and its feel harsh. In consequence garments made with this wool are coarse and unpleasant to wear and are only

(1) "Szechwan. Its Products, Industries and Resources," by Sir Alexander Hosie.

used by those who cannot afford the softer imported yarn. Whereas the hand spun local yarn can be purchased for one dollar a catty, the foreign imported wool varies from about three and a half dollars up to six per catty, the exact price depending on the state of the market and the bargaining abilities of the purchaser. In view of the present large demand for yarn it is interesting to note that Hosie (*ibid.*) only mentions yarn incidentally in reference to the manufacture of artificial fur in Chengtu and the carpet industry at Suifu. Hosie gives as the chief use of the wool in Chengtu the making of this artificial fur and also felt for shoe soles.

For investigation several pounds of wool were purchased from three different parts of the city, care being taken to select representative samples. There were no outstanding differences between the different samples. The raw wool is exceedingly dirty and varies in colour from yellowish or brown to reddish. Mud and droppings are present to a great extent and are held together by the natural grease of the fibre. Such wool when scoured in the usual manner with alkaline soap solution (2% to 4%) at 40° C. lost 32% by weight. This loss represents not only dirt but also the natural fats of the fibre. A more careful analysis of the raw wool was made by drying at 105° C until constant weight was obtained in order to determine the proportion of moisture present. The suint, or water soluble wool fat (for the most part potassium salts of fatty acids) was dissolved out by cold water and weighed. Its colour was brownish red. The yolk, or cholesterol and other fats insoluble in water, was extracted by ligroin in a Soxhlet extraction apparatus. The wool was finally scoured free from dirt and the weight of the dry wool so obtained was determined. The results appear in Table 3.

TABLE. 3

	Raw Wool	Moisture free wool
Water	12.84	—
Suint	15.28	17.53
Yolk	2.61	3.00
Dirt	18.71	21.45
Wool fibre	50.56	58.02
	100.00	100.00

The moisture free pure wool fibre on exposure for 48 hours showed a regain of 17.18% of moisture. As already mentioned after ordinary scouring 68% of the wool remained, this it must be remembered besides containing moisture also contains some of the natural grease of the wool, the presence of which is essential if the fibre is to be used for textiles. In a country which uses man power and consequently has high freight charges it is interesting to note

that out of every three loads one man carries nothing but material which will be lost on scouring, and out of six loads one man carries nothing but dirt.

Not all of the cleansed wool can be used for better class textile purposes as it contains much coloured fibre of a reddish brown and black colour, some of it rather suspicious of a goatly origin. This coloured fibre is not hidden even on dyeing a dark brown and is useless except for dyeing blacks. The wool also contains a high percentage of kemps, or coarse hair like fibres, distinguished by their white straight appearance, the large medulla and the fact that the overlapping scales of the cuticle are fused. Table 4 shows, in round figures, the relative proportions of these fibres.

TABLE 4.

	Raw Wool	Scoured Wool
Dirt and grease	32	—
Coloured fibre	23	34
Kemps	20	29.5
Normal fibre	25	36.5
	100.00	100.00

The presence of these kemps is one of the most serious problems when the use of the wool for textiles is considered. It is their presence that renders the yarn harsh and unpleasant to the feel. By their white straight appearance they also render it unpleasing to the eye. After dyeing they stand out as being lighter coloured by reason of the air spaces in the medulla. The fusing of the outer scales causes a considerable loss in the felting power of the wool. For example squares were knitted using local wool and foreign imported knitting yarn. The two patterns were scoured in the same bath of soap and water at 60 °C. Whereas the foreign yarn shrank 70% of its size, the local wool, owing to the presence of the kemps, only shrank 32%.

The quality of wool even in one and the same fleece varies very much. The coloured wool grows in patches and is not distributed evenly over the sheep. By careful sorting the coloured fleeces could largely be eliminated. The kemps also vary greatly. For example in the case of the Welsh Mountain Sheep taking the lowest quality fleece, Roberts (2) states that the shoulder contains 2.2% kemp, whereas the rump contains 15.7%. Probably without much difficulty the kemps in the local wool could by careful sorting be cut down to less than 10—15% on the scoured wool.

(2) Brit. Research Assoc. for the Wollen and Worsted Industries, Publication No 59, June 1928.

Apart from the elimination of the coloured flocks and kemps the wool must be sorted if an attempt is to be made to use it for better class yarns. Sorting brings its own problems. Dr. T. H. Williams very kindly undertook a bacteriological examination of the wool and his report is of great value and interest. He found any number of pathogenic and nonpathogenic organisms to be present. He says "in addition to the ordinary pyogenic organisms and usual contaminations such as the *Bacillus Subtilis* there are found to be present *Bacillus Anthracis* and *Bacillus Tetani*, the organisms of Anthrax and Tetanus, both of which are spore formers and therefore very hard to eradicate." (3) In view of this report it seems very probable that any extensive sorting would lead to wool sorter's disease, especially as it is unlikely that proper precautions in the way of suitable sorting tables with downward draught of air to ensure the safety of the workers would be taken in West China at present. Probably the simplest thing would be to expose the wool for several days to the summer sun as anthrax spores are killed by exposure to direct sunlight for 6-12 hours.

From a consideration of the above facts, and from the physical measurements of the wool, which are to be published elsewhere, it is not possible to be very enthusiastic about the future of local wool. It can never be used for the highest class yarns but by careful scouring and with care in sorting, and especially if some care could be given to the sheep themselves, we can look for the development of a thriving industry within the province. If these matters are not attended to it will not be able to compete with imported wool except for the coarsest of yarns, and the product will be unpleasant to wear, unpleasing to the eye and difficult to dye. From certain enquiries and indications it is almost certain that the first movement to make use of the wool in a modern way will be through small home industries. Suitable carding and spinning machinery can now be obtained to use either electric or hand power. It would seem rational that such small factories should be situated at Yachow to tap the Tachienlu supply and also at Kwansien for the Sungpan wool. In both these places the water supply is suitable for the production of the needed power. Although eventually weaving factories may be looked for the present demand is for yarn which is knitted by hand or small hand knitting machines into socks, scarves, etc. In the future it seems probable that China will consume more and more wool but how far the sheep of Anterior Tibet will continue to meet the demand it is not possible to say though from those Chinese and foreigners who have visited or lived in Sungpan it seems that the limit of production has not by any means been reached.

The Chemistry Department,
The West China Union University,
CHENG TU.

(3) T. H. Williams, M.D., C.M.. Private Communication. 1929

THE SZECHWANESE USE OF THEIR WATER RESOURCES FOR AGRICULTURE.

D. S. DYE

Introduction: (a) *The source of the material.*

This paper is based upon personal observations carried on through a series of years. Most of these ideas have been presented before the Science Faculty of the West China Union University, or before the Society in the following reports:—

The Science, Art, and Philosophy of Chinese Fluvial Fans, 1921;

The Chengtu County Irrigation Project, 1928; and,

The Northeast Gateway of Szechwan, 1929.

The writer is indebted to Dr. Paul Nyhus of the U. S. Department of Agriculture for calling attention to the "Étude sur La Pluie En Chine," published in 1928 by the Observatoire De Zi = Ka = Wei, in his interview re the material of the first two of these lectures. The maps of rainfall-distribution contained in this bulletin are most stimulating "reading." Although these maps are not essential to an understanding of this paper, they are useful, in fact invaluable, in a study of the "Eighteen Provinces" in the light of the fundamental principles underlying this paper. The table of rainfall is made up largely of data obtained from this bulletin.

(b) *Collateral Reading.*

The reader who desires to do collateral reading is referred to the following publications:

National Geographic Magazine, December, 1911,—Chamberlain; November, 1920—Beach; June, 1926—Freeman. Splendid photographs from Szechwan are found with these articles.

"Mythical and Practical in Szechwan", J. Hutson, National Review Office, Shanghai, 1915. The historical background of the so-called Kwanhsien Waterworks is therein presented.

"Chengtu County Irrigation Project", D. S. Dye,—Presumably being published in the Science Bulletin, Lingnan University. This paper is a complement to and is in no sense a substitute for Mr. Hutson's book. It treats of the subject from an entirely different standpoint.

"Report on Province of Ssueh'uan" Consul-General Alex. Hosie, 1904. This is an exceedingly careful report which included a survey of crops and their distribution and the prices prevailing in 1904. It does not take account of later replacements of indigo by German dyes, the

phenomenal increase in wood oil export, etc., etc. Although out of date in this regard, it is a classic report, a source book of information.

Hanchong (Shensi) and Kwanhsien (Sze.) Topographies in Chinese. These form the sources for the history of these two somewhat similar irrigation projects of late B. C. times.

THE PROBLEM :

(a) *Stated in general terms.*

It is a commonplace to state that FOR A GIVEN LATITUDE AND ALTITUDE THE AMOUNT OF RAIN AND ITS SEASONAL DISTRIBUTION ARE DETERMINATIVE OF THE VEGETATION POSSIBILITIES AND THE DENSITY OF THE DEPENDENT POPULATION of a given terrain ; but such a commonplace does not tell the whole story. The slope of the land itself, the altitude of the hinterland, the grade of the netherland, the "spongage" and the "seepage" characteristics of the land itself, the rainfall of the areas that drain onto or through it, the temperature of that rainfall, the relative humidity, the cloud-sunshine ratio, and the temperature range are vital factors. The number and the nature of the available crops are also important considerations. Most important of all is the capacity of the people to visualize possibilities and to relate possibilities and realization in the production of food-stuffs and food values.

(b) *Stated in particular terms.*

This paper is a discussion of the problems and solutions of this plant-water relation in that part of Szechwan included within rather well-defined limits.

BOUNDARY CONDITIONS.

	Minimum.	Maximum.
1. Latitude	28°30'N.	31°30'N.
2. Longitude	101°30'E	106°30'E.
3. Altitude	750 ft.	6000 ft.
4. Temperature	20° F.	105° F.
5. Raindays	92.7 (Hanchong)	156.8 (Tachienlu)
6. Rainfall, yr., mean	815.9mm (Hanchong)	1113.6mm (Suifu)
7. Rainfall, mo., mean	(3.5mm (Tachienlu) Jan 4.5mm (Chengtzu.) Jan	252.6mm (Chengtzu) Aug.
8. Rainfall, da., max.	70.6mm (Tachienlu) August 6.	207.5mm (Chungking) May 31.
9. Rainfall, mean, in stations by seasons		
Winter	19.4mm (Hanchong)	58.5mm (Chungking)
Spring	116.3mm (Chengtzu)	277.8mm (Chungking)
Summer	425.3mm (Hanchong)	568.0mm (Chengtzu)
Fall	171.5mm (Chengtzu)	311.7mm (Chungking)
10. Average of extreme variations from mean annual rainfall of each station :	77.8%	128%.

11. Physiographic features

Minimum: Mountains up to 6000 ft. with steep slope, vertical to horizontal strata, mountain streams: Omei—Yachow—Tachienlu; Kwansien—Weicheo: Kwangyuen—Mienhsien.

Medium: Hills between 1200ft and 1800 ft. of gently sloping to horizontal strata, well-developed drainage to river or stream beds from 1500 ft to 750 ft above sea level: Yachow—Minshan—Chiongcheo "Table Land"; Tongchwan—Paoning—Chungking—Konghsien—Suifu—Kiating—Jei show—Longchienü "Hill."

Maximum: Low-lying alluvial plains and river bottoms from 1600 ft. down to 750 ft: Chengtu—Hancheo—Miencheo compound fan; Ming, Yangtse, Kialing and other rivers with with-developed plains.

Notes: 2. A block of land between Tachienlu on the west to Paoning on the east, and from Hanchong on the north to somewhat south of Suifu is included in this first hand study.

3. The altitude includes the lowest point, at Chungking to the self upper edge of the cultivated area. Noncultivated plants and self-planted trees which are almost exclusively found above 6500 or so depending upon exposure and latitude, are not included in this study.

4. The temperature of 20° is unusual for most of the area, but this has been recorded in Tungchwan and 22.5F has been recorded in Chengtu—which cuts off certain plants that have been lead to expect higher temperature. No data is available for altitudes of 6000 ft. in this area for the winter time, but it is more than a shrewd guess that the winter minimum is thirty degrees under the minimum entered as well as for the summer which is thirty degrees under the maximum for the summer as entered here.

5. The cloud guage is needed in such a study. Probably 70% of the time the sky is overcast for most of the area surveyed. There may be an error of 5% in this estimate. The humidity is VERY high, but I know of no recording hygrometer in use in the province. Most of the year the humidity is well over 70%.

11. The high, steep snow peaks, many of which are well above 17,000 ft. are not included in this survey. They enter in insofar as they furnish alluvium and a regulated supply of water as well as serve as a rain screen and a rain-maker. They are partial sources of, as well as causal factors in the "water resources" of this study.

FUNDAMENTAL SOLUTIONS:

Fundamentally there are two distinct methods of meeting the plant water situation, but practically there is also a third way which is a combination of the two.

Solution I: Control the water in time and in amount to suit the best food plants desired; i. e. **MODIFY THE WATER CONDITION TO SUIT THE PLANT** requirements* in so far as is feasible.

Solution II: Select, introduce or evolve the best available food plant that will subsist under the local water conditions; i. e. **MODIFY THE PLANT TO SUIT THE WATER CONDITIONS** in so far as is feasible.

The combination solution is *Control the water to suit the plant AND vice versa* in so far as it is feasible for a *modus vivendi* or for a permanent solution. In practically every solution "in so far as" must be met by a factor of safety, which is supplied by an adaptable plant, a variable planting, a movable planting area, or by a superabundance of controlled water otherwise production is a vary variable quantity with exceeding wide limits of plenty and of famine. For convenience of treatment, the combination solution will be included under the two fundamental solutions.

SOLUTION I: WATER CONTROL.

Superabundant Water Supply:

1. (Distant Source.) Where water is carried though a country in too great quantities, it must be carried off for the most part. This is usually accomplished by building up levees and then by insuring the levees by spillways. The spillway water and the seepage must be carried off by secondary streams which may return at the main stream, or again they may not. The lower Yangtse and the Yellow River exemplify this method. The local problem of the area adjacent to Kwanhsien is partially solved in this way. Without such methods much of the land in the vicinity of the debouchment of the Ming River at Kwanhsien would of necessity be condemned to lie untilled.

2. (Local Source.) Where the local supply is too great at times, due to superabundance of rainfall or too little slope, drain in that way which salvages the most acreage as in Shaohsing, Chekiang Province, even if it involves "pond-drainage" of foot-boat canal dimensions. The August rains are drained off the Chengtu Plains through the rice-fields which serve as great slow-moving drainage ditches at such times of stress without loss of acreage. The rice crop does not suffer unless too prolonged or too cold water is drained through the paddy.

Continuously-Sufficient Water Supply:

3. (Distant Source.) Where water from an extensive (as compared with the area served) hinterland flows through an otherwise insufficiently watered land, gravitate water to where it is needed as slope, soil and water supply permit.

(a) Along valleyed streams of moderate slope, divide off small branch streams and lead to valley fields of a lower level and arrange for drainage back into the main river further down the stream. This

allows for gravity irrigation and gravity drainage. This is practicable in almost every part of Szechwan where a valley plain can be found, since the slope of most streams is appreciable. Every stream of any dimensions has a series of such "projects" along its length. The Yangtse Delta area uses the same method but it disguises the method by using supplementary pumps motivated by man and animal, for irrigation and or for drainage (i. e., into fields from streams and/or vice versa). The Ming R. between Pengshanhsien and Kiating has several such that are several miles long.

(b) Over plains, the single-branch side-streams become multiple-branched and great areas may be irrigated and drained by anastomosed ditches which play a double role in different parts at the same time or in the same part at different times. The Chengtu Plain is the outstanding example of this. Hanchong, Shensi (a former Szechwan city) is located upon a conspicuous middle-aged fan. Suiling has a similar system. The plain irrigation-drainage system is a glorified stream-valley irrigation-drainage system which has been carried to its logical conclusion.

(c) Where water cannot be diverted according to (a) and (b) above because of high banks, swift-flowing streams permit of lifting a tith of the water by bamboo waterwheels to a height of 20 ft or even 75 feet. Occasionally these wheels are turned by man-power when the flow of the current is insufficient. These are found all through Chinese-farmed Szechwan. Especially fine examples of these water-wheels are found in the Tunghwan and the Tzeliutsing sectors.

(d) Where the water flow is not sufficient to turn water-wheels, man and/or ox-power, usually man-power, is used to lift water from one field to another of a higher level by "water dragon" or by bamboo suction tube used as a simple "pitcher pump". This is an extension of the purely gravity system and it is used constantly with it. This is found all around the edge of the Chengtu—Hancheo—Tehyang Plain, or wherever the gravity system has been pushed to the limit.

Insufficient Water Supply:

4. (Distant Source.) Where water from a limited hinter-land flows through an insufficiently watered land, gravity water as far as possible and apportion crops that match the water supply or the probable water supply. It is no simple matter to estimate this probable water supply where water is not only seasonal but fluctuating in amount. The mean of the extremes of the stations with available data suggests the possible seriousness of the situation when the water supply may vary between 77.8% and 128.4% where 100% represents the average. Hanchong, Shensi (Former East Szechwan) system is a patent example of this, where there is a variable planting or a variable harvesting of rice due to variation in water from a somewhat limited hinterland supply. Many rice plants are prepared but due to belated rains and lack of water they are not always set out.

At the foot of the mountains near Penghsien, rice has been set out six weeks late due to the belated water from a very limited and almost local hinterland. Chionsheo-Minshan Plateau for certain seasons of the year comes within this class, with its low hills and limited water-gathering area.

5. (Distant and Local Source.) Where the water is seasonal, as it so definitely is in Szechwan, reservoir the water run-off from the immediately adjacent hills and from more distant hills so as to release it to the growing crops when needed so long as the supply holds out. This necessitates the husbanding of water for the most needed times, and it frequently means that land must lie fallow during the winter. Fortunately the rainy season coincides with the best growing season in Szechwan, so that the hardship is not so great. Certain fields in hollows well up the sides of slopes or near the stream sides are set apart as reservoirs, and they are kept as nearly full as possible to tide over between rains and between crops.

6. (Local Source.) Where there is no distant water supply source and where the local supply is limited, certain higher fields are sacrificed or partially sacrificed, to the wet-crop rice at least and their water is gravitated into reservoirs which are great depressions dug into the sides of the hills where streams would naturally be. This water is kept for a non-rainy day. When these dams are full, the farmer may plant out rice with good assurance that the crop will not dry up before harvest. When the longed-for rainy day does not come, the farmer draws on his bank to gravitate water down to where the water is needed, or he may even pump it back up to periphery fields, so far as it will supply. This is the type of irrigation that is so common some thirty miles out the East Gate of Chengtu beyond the reach of the alluvial plain water from Kwanhsien. Fields above these reservoirs are devoted to wheat and such dry crops and the knolls are often planted to pine trees. The fields below these pools are planted to rice when all is well with the water supply. There are no flowing streams save during and immediately after very heavy rains. The danger from deforestation in Szechwan is often overemphasized by those who come into the province from outside. They appreciate outside conditions, but they may not appreciate Szechwan irrigation and Szechwan wet-cultivation with terraced fields and slowed-down or eliminated streams. Reservoired local-water is found in most hills or slopes in West China where rice is cultivated. The Tungchwan-Paoning area the Shinchin-Chiongcheo Minshan-Yachow area are conspicuous examples of this successful method of cultivation. The method might be termed the Rob-Peter-to-Pay-Paul Method where the upper fields are merely "hill-fields" and the lower fields are real "fields". There is as much difference between

these dry-crop fields and the wet-crop field as there is implied in price and utility between pastureland and farmland in the West. Where Methods Nos. 1-No. 5 are not feasible, this is the next best method of utilizing a limited water supply, a method which distributes the unequally and somewhat precariously given rain of the four seasons to those seasons, to those days, and to those fields where it will do the most good.

7. (Local Source.) Where the water table is less than one hundred feet below the surface, the surface-water may be supplemented by drawing upon this supply by windlass and bucket as at Hanchong, Shensi and in North China, or by water-buffalo or cow waterpump in the Feng Whang Shan (North Gate Chengtu), Penghsien, and Dehyang Sections. The bucket-and-sweep method of drawing water from wells is also used all over the Chengtu-Hancheo-Dehyang alluvial fan to supplement the irrigation system or to supply household water.

8. (Local Source.) Where these several methods are not practicable or available, the only thing left apparently is to make the most of a bad situation by "taking the weather as it comes", and planting only such crops as will survive between rains. But not so, the method of finding the soil and preventing the most rapid evaporation is resorted to in the hills which will not reservoir water due to nature of the soil. This method is used where clay is not found to impound the water. The Chinese use this method as do the aborigines in the hills and on the heights. The dividing line—that at times very theoretical thing—between the cultures of this province is in between Method No. 8 and the other methods or thereabouts. The Chinese use this last method as a last resort but the non-Chinese elements of the province have difficulty in employing wet-field methods of agriculture. But this is not the place to discuss whether this division of cultures along water lines is due to opportunity, to choice, or to ability.

Summary of Water Control Solution :

The Herculean task of water control along the lines outlined above is seen at a glance when the curve of rainfall distribution is studied. The table of rainfall is likewise informing. These two, considered in connection with "Boundary Conditions" are prerequisite to a real comprehension of the situation. The first two items below may be seen on the maps of equirainfall in the Zi—Ka—Wei report.

The zones of equal rainfall have a northeast-southwest trend.

The line of increase of rainfall is from northwest toward the southeast.

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The area that has come under personal observation is essentially one as far as amount and distribution in time of rainfall is concerned.

The rainfall tables of the boundary stations reveal that the distribution by seasons is quite different for each boundary region. Even Chongchow between Chungking and Ichang is more similar to Ichang than it is to the region studied. Thus the terrain studied is unique, in the rainfall question.

The beneficence of the major rainfall during the summer growing season is self-evident.

The high humidity especially during the winter diminishes the demand for rainfall during that season. The same is true, in a less degree, however, for the summer.

The great variability in the rainfall for various seasons suggests the magnified problem of water control.

The diverse use of water is one of topography as well as one of rainfall. The highest lands above cultivation provide water for the gravity-irrigated much-lower lands. The higher and steeper hillsides and mountain sides must rely upon local rainfall for the most part. The lower hills of the "Red Basin" can utilize reservoir irrigation. The broader valleys through the Red Basin material can use distant source gravity irrigation. Often these sources not only of water but of fertilizing alluvium are in the upper heights.

This method of wet-cultivation is one that not only insures water, but, in such a terrain with an abundance of water at times, it insures that the land does not gum up due to excess of salts as in desert regions.

These methods slow down the erosion of the soil, even beyond that of forest covering. In fact the valleys oftentimes indicate a distinct flattening out of the stream parabola.

The farming method of carrying (during the winter season) to the upper side of hill fields, soil caught in pockets at the lower side during freshets of summer, still further delays the transport of soil to the sea.

On the other hand the dry-farming on the upper slopes exposes the fields, especially the maize fields, to freshet rilling, and the Han, the Kialing, the Ya, and the other major streams carry a burden of silt from the uplands to the lowlands when the streams are in flood.

The demand on man-power is tremendous for the projection and the maintenance of such far-reaching irrigation systems. Such intensive cultivation can only be maintained by a multitude of people. In fact it is man-pressure for a place-in-the-water that has resulted in this ramification and interpenetrating and overlapping of irrigation systems amidst such diversified topography. During a very slight diminution of the rain supply, it is self-evident that the countryside is population-saturated even if it is not water-saturated.

SOLUTION II: PLANT CONTROL.

A discussion of the second solution of the plant-water relation may well be introduced by listing the plants with regard to their demands upon water supply. The list is made out for the man who is not a botanist primarily. It is suggestive and not exhaustive. Practically every name stands for several and some for a score or more of varieties. The cruciferae and the legumes possibly total more than one hundred. The plants are listed in the order of hydrophytes, mesophytes, and lastly xerophytes. This list is not hastily prepared but it is the result of several years of observation. It is virtually a water-cross-section of the most cultivated plants in the terrain studied, and it is analagous to a temperature-cross-section of the plant life that might be perfected by the extensive use of barometer and thermometer in this province. A parallel list of domestic animals is added for association's sake. The reader must not be disappointed if he fails to find his favorite vegetable in this list, and he is privileged to insert it in its appropriate place on the water scale.

WATER AND ITS RELATION TO GROWTH OF SOME
NECESSITIES PRODUCED IN SZECHWAN.

A suggestive common-name list of products arranged in order of water requirements.

(Hydrophytes.) *Maximum supply of water.*

<i>Vegetable Foods</i>	<i>Fibers Feathers</i>	<i>Oils Varnish</i>	<i>Lumber Fuel</i>	<i>Meats Domestic Animals</i>
Lotus	Duck feathers			Fish
Rice	Matting grass		Reeds	Oysters
Caltrops	Rice straw		Willow	Snails
Taro		(Indigo)	Alder	Ducks
Tare'				Geese
Water-chestnut		Lacquer		Water Buffalo
Arrow Root	Hog bristles			Hogs
Beans (s)				
Bamboo	Bamboo for braiding		Bamboo (w,s)	
Mushrooms			Lanmuh (w,s)	Pigeons
Tea	Bamboo for paper		Cryptomeria	
Cabbage			Banyan	
Sugar cane	Rattan		Gingko	Cattle
Egg Plant	Coir palm			
Squash			Sha Shu	
Melons			Camphor	
Peppers				
Ginger	Skins			
Tobacco (sp.)	Wool			Sheep
Chestnuts			Chestnuts	Chickens
Kaoliang	Mulberry		Red Bean Wood	

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Spinach	Silk		Mulberry	Goats
Carrots (w)	Rabbit fur		Soap Bean	Rabbits
Turnips (w)				Horse
Celery (w)				
Mustard (w)		Rape oil (w)		
Maize (sp, or sum.)				(Yak)
Irish Potatoes		White wax		
Wheat (w)				Mule
Oranges				
Peaches				
Pears		Vegetable tallow (w)	Pear	
Cherries	Hemp	Bean oil (w)		
Grapes				
Oak Lichens			Oak	Donkey
Sweet Potatoes				
Yams	Cotton		Elm	
Honey				
Beans (w,s)			Cottonwood	
Oats				
Peas (w)				
Peanuts	Jute	Peanut oil		
Sesemum	Rsmie	Sesemum oil	Cedar	
Chrysanthemums			Pine	
Walnuts		Walnut oil		
Buckwheat		Wood oil		
Opium Poppy (w)				
Barley				
Hwa Chiao				(Camel)
Millet				

(Xerophytes.) *Minimum supply of Water.*

Note: (w,s) denotes that the crop is produced in winter and in summer. Where no such mark is entered it may be assumed that the crop is a summer or late spring or early fall crop.

The elevation of wild plants to the dignity of the domestic class has possibly been as great in this area as in any other equal area. The opportunity has certainly been great. According to Prof. Smith of the University of Upsala there are between six and seven times as many varieties of plants in this area as there are in all of Europe. The evidence is that tea was first used in this province. (Rev. T. Torrance in West China Missionary News.) The varieties of beans domesticated and wild seem unnumbered. Many have doubtless been introduced in times long past. But crops like tobacco, maize, large peanuts, cabbage, and Irish potatoes have been introduced in comparatively late times. (Maize has been raised on the hills near Weieho only about one hundred years so the Ch'iang people told Rev. T. Torrance, in 1929.) Grapes found their way hitherwards during Tang Days and in Manchu days. The point made here is that this section of China has had a large list of plants to select from locally, and that the people have not been averse to draw upon these and upon the outside for other varieties that suited their purpose.

The selection and the deploying of appropriate crops for particular water conditions is exceedingly interesting. Success and failure, trial and error in the several irrigation methods determine which crops are suited to particular fields. Where water will admit, rice is grown in the summer season. If rice cannot be grown the next best crop that will thrive must be grown. The last resort is to graze the land.

Since the winter season is too cold for rice, the fields in many cases are available for vegetables, providing water can be obtained by irrigation during this dry season of the year. In the neighborhood of cities many fields are planted to vegetables but further afield vetch and beans are planted. If the hills are not too steep, mustard for oil is planted. Winter beans is also a staple crop. Many fields lie empty due to lack of water during this season. Poppy, beans, wheat, vetch, and mustard are outstanding crops of the winter season. Carrots are a fall crop and cabbages are a spring crop. Many of these crops are raised on the Chengtu Plain without ever being rained upon, but they receive moisture from the watertable and from occasional irrigation. Many of these are raised on the higher and dryer land. Wheat is the outstanding staple winter crop of the hills, but frequently there is failure. All of these crops are so synchronized as to give way for the crop of the year, rice, if rice can be grown. Even the leaves of the winter bean are stripped so that the crop may be harvested in time. The transformation of the dry fields in mustard and beans and wheat into wet fields with rice plants set out and green within two weeks in late spring is astounding to those used to less manpower. Tobacco is a spring crop that is also induced to give way to a late-planting of rice. Maize is sometimes in the same class as tobacco.

Maize is the staple summer crop in the hills that will not hold reservoired water. It is also the main crop where swift streams debouch upon the plains a large amount of sand that will not hold water for paddy. Kaoliang is also a dry crop that has this advantage over maize, it can stand in water for a longer time without dying. Choice between the two crops is often decided by this important point. Cotton is planted on knolls and on higher land that will not hold water. Kaoliang for wine is also a staple crop in the hills. Wine can be carried far to market where the grain is prohibited due to cost of transportation. (The same is true of the winter crop of opium.) Sweet potatoes and peanuts are other hill crops. Irish potatoes form another crop of the hills.

Sugar cane is a crop of the plains where the soil is somewhat sandy. Tsechow and Luchow and Suifu are the sugar-growing areas.

The hilltops are planted to the xerophytes like sesemum, buckwheat, millet. Behind the rain screens beyond Kwansien, Hwa Chiao bushes are planted.

Tea is grown on slopes in front of the rainscreen.

Bamboo cannot stand up under drought conditions but certain

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varieties can withstand cold. The lower levels with sufficient moisture grow bamboo of multifarious uses, and the upper levels of 6000 ft grow a small paper bamboo where the clouds condense in the mountains. North of Kwangyuen lack of moisture and possibly lowered temperature during the winter, prevents the growth of bamboo. Ramie must be grown in dry sections where bamboo cannot grow in order to produce fiber for rope and other purposes.

Mulberry is grown for silk culture in the region of Paoning and of Tungchwan and of Kiating. The porous red land of the Red Basin hills will grow mulberry when it will not grow rice. These same dry knolls and hills produce the wood oil tree that furnish the wood oil of export.

The trees for fuel and lumber are distinctly stratified by their moisture requirements. The Horsetail Pine is found upon the tips of knolls which first dry out while the tree immediately below is the cedar. The lanmuh grows where there is a dependable supply of water near the irrigation streams or their equivalent, and is very local. The lacquer tree grows where the hillsides, at an elevation of 5000 to 7000 ft, are frequently bathed in dripping clouds.

All of these crops and products are correlated with and located by the irrigation methods available and availed of under the water and topography conditions. It is scarcely necessary to further belabor this point. If anyone cares to more definitely locate these products of Szechwan, their attention is again called to Sir Alex. Hosie's Report with its map of products. But he who runs may read and interpret growth and situation of plants with respect to water supply in the light of these fundamental principles.

CONCLUSIONS

1. The very varied methods of irrigation employed in Szechwan are unique and they are demanded by the exigencies of the rainfall and its distribution.

Middle and West Szechwan are in one class as far as rainfall and its seasonal distribution are concerned.

The seasonal distribution is very unequal.

The variation in the productivity of the province is due to the difference of topography and to the availability of water from distant sources primarily, and secondarily to the differential alluviation or to the differential denudation of different parts of the terrain studied.

The Szechwanese have utilized ingenuity and man-power to make use of every available bit of water from local and distant sources. The people have done much to conquer in the struggle for water but there is a need of engineering in some places as on the Chengtu Plain to eliminate superfluous ditches by adding cement dykes and dams in many places.

Crops have been selected for almost every water condition.

Production has been increased, especially in the hills, by the introduction of maize, Irish potatoes, and large peanuts.

Food possibilities can be increased tremendously by producing food rather than wine in the dry land, where kaoliang is raised now.

There will always be agricultural gambling in the hills where the people live so near the border line of the water supply with no reserve when the rain varies below the average expected.

There is an imperious demand for selection and improvement of drought resisting crops for the places which must depend upon local water where there is no opportunity to reservoir or to draw on distant sources.

The outstanding need is for a more scientific selection of seeds, all along the line, from the irrigated alluvial plain rice to the small millet of the non-irrigated eroded soil of the upper hills. Much can be done with local varieties, by a gradual improvement through selection of seeds. Much can be done by careful introduction of drought-resisting varieties of wheat, etc.

The acreage can probably be increased on many of the plains by well over 7% by careful engineering in connection with the irrigation streams and dams.

The outstanding need is for plants in the hills which have a larger latitude in the way of water requirements. The periodic or rather aperiodic famines due to failure of the seasonal rains in the upper levels where the crops most depend upon local and the immediate rainfall are most evident to all. The nature of the country and the difficulty of importing food from the plains of assured water and harvests makes it impracticable to relieve the situation under present transportation methods.

Probably the food production of the hills could be increased 40% by selection of seeds, especially drought-resisting plant seeds, and the substitution of food plants for wine and opium producing plants.

Doubtless the rice production of the irrigated fields could be increased by 30% by the wise selection of seed and the elimination of many winding streams which would necessitate the use of real cement.

The solutions outlined above as "water control and" plant control as they have been continuously and successively followed by generations are fundamentally correct, but they can be improved along the same lines by scientific aid and cooperation.

CHWAN.
fall.

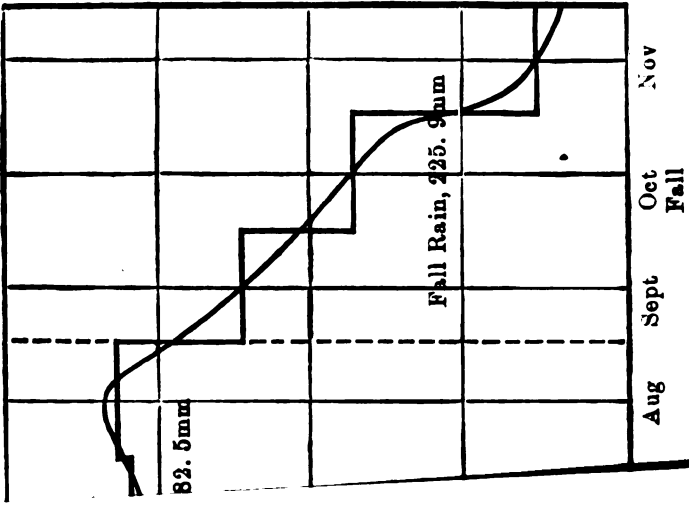


TABLE OF RAINFALL FOR

Units used, mm. (

	Dec.	Jan.	Feb.	Winter	Mar.	Apr.	Ma.
Tachienlu	3.5	9.4	12.1	25.0	27.0	73.1	79.
Hanchong				19.4			
Chengtu	4.5	8.4	10.5	23.4	12.2	48.0	56
Tungchwan							
Anyo	14.3	15.0	20.4	49.7	32.9	91.1	85.
Suifu	18.5	9.4	27.6	55.5	47.1	72.8	103
Chungking	22.0	16.5	20.0	58.5	35.2	102.0	140
Sian				9.8			
Barang	0.0	0.0	2.0	2.0	1.3	8.0	28.
Mean	12.6	11.7	18.1	38.6	30.9	77.4	92.
Yunnanfu	15.4	12.9	12.9	41.7	13.7	18.3	93
Ichang	14.1	19.5	29.1	62.7	53.6	100.6	122.

AREA STUDIED AND FOR BOUNDARY STATIONS FOR COMPARISON

Compiled from Observatoire de Zi-Ka-Wei Etude Sur La Plaine En Chine, 1928.

	Spring	June	July	Aug.	Summer	Sept.	Oct.	Nov.	Fall	Total	Min.	Max.	Day and Max.	Rain Days
0	179.7	188.3	115.0	125.9	429.3	134.2	60.0	4.9	109.1	833.0	723.7	933.7	4-8-70.6	156.8
	194.9				435.3				175.3	815.9				
.1	116.3	113.0	203.2	252.6	568.0	108.8	47.8	14.9	171.5	880.0	588.0	1168.0	3-7-138.0	119.8
									942.1					
7	207.7	160.0	152.9	103.3	476.2	93.9	85.8	25.2	204.9	938.5	733.8	1154.7	14-8-107.6	93.4
.6	233.5	218.1	179.7	144.0	541.9	133.0	121.0	38.2	292.8	1113.0	830.2	1309.9	12-7-76.5	139.2
.6	277.8	181.4	142.7	130.5	454.6	147.3	114.8	49.6	311.7	1102.6	848.6	1518.7	31-5-207.5	131.6
	100.3				272.4				78.4	460.9				41.2
7	38.1	108.0	139.0	128.0	375.1	127.6	27.8	0.1	135.5	570.6	445.9	722.8	18-6-45.0	84.6
7	200.0	172.2	158.7	103.3	482.5	123.6	85.9	26.6	225.9	947.5	748.8	1217.0	13-7-120.0	122.2
.6	125.6	154.8	238.8	206.6	600.2	136.3	92.3	44.2	272.8	1040.3	578.1	1451.2	6-7-108.5	113.0
.6	276.8	154.8	210.8	169.5	535.1	100.4	84.0	35.8	220.2	1094.8	643.8	1402.0	13-7-181.0	106.6

DIETARY STUDIES IN SZECHWAN

MARY C. AGNEW

The purpose of this paper is to present some dieteries of the Chinese people and to evaluate them in the light of our modern knowledge of nutrition.

The food consumption of a nation may be estimated in either of two ways:—(1) It may be calculated from official statistics of the production, importation and exportation of all foodstuffs. (2) It may be estimated from actual measurements of the food consumed by given groups of people during a known period of time.

Owing to the lack of reliable statistics the first method is not applicable to China at the present time. The information given in this paper has, therefore, been gathered by the second method. Groups of students in the West China Union University have supplied the necessary data, some of which was obtained during the Summer vacations on Beh Lu Din. For help in the collection of this material my thanks are due to Dr. W. H. Chen and to Mr. M. Li. The following sample diet sheet illustrates the method used.

Name :— Li Shih-Hsi
 Age : - 25
 Height :— 50 inches.
 Weight :— 120 lbs.
 Breakfast :— Rice, 3 bowls ; Bean Curd, 1 oz. ;
 Turnips, 1 oz. ; Bean Sprouts, 1 oz. ;
 Celery, 1 oz.
 Dinner :— Rice, 3 bowls ; Beef, 2 oz. ; Pork, 1 oz. ;
 Tea, 3 cups.
 Supper :— Rice, 3 bowls ; Turnip, 1 oz. ; Cabbage, 2 oz.

The Determination of Food Requirement. The term basal energy requirement is taken as equivalent to the heat liberated by a fasting man in the post-absorptive condition (12–15 hours after the last meal), when lying down in a relaxed condition but not asleep. Two methods have been used to determine the total quantity of energy required and the relative portion of each type of foodstuff most suitable for individuals under varying conditions.

1. The statistical method consists in estimating from prolonged observation of a large number of individuals the average quantity and composition of the food eaten by normal persons. Such experiments have been carried out in many countries and upon groups of individuals employed in different occupations. This type of information forms a

substantial basis for our deductions regarding the food requirements of man.

2. The second and more exact method is to determine by means of a calorimeter or respiration apparatus the energy exchange of the body.

In the present calculations we have used the statistical method. Four methods of arriving at a standard are available. These really depend upon two different principles regulating the energy exchange of the body. The energy used may depend upon the heat lost, and this in turn largely depends upon the surface area of the body. On the other hand, the energy used may depend upon the amount of heat produced, which in turn is closely related to the mass of active tissue in the body, i. e. body weight. Different formulas have been worked out for arriving at these standards, and so the metabolic rate (energy exchange) may be stated in terms of calories per square metre of body surface, or it may be stated in terms of height and weight. In either case age and sex are also factors to be considered. We have used the surface area method in calculating our results, and the total daily requirement is determined by estimating the increase over the basal requirement due to the daily activities of the individual. This has been done by the use of a detailed record of daily activity.

Almost 2000 daily dietary studies have been collected. 126 of these are from Beh Lu Din, and the rest are from university students in Chengtu. Three students were studied for a period of eight months, two for a period of four months and the rest for varying lengths of time. The results represent records of 6000 meals.

For two reasons we have assumed that the basal standards used in Western countries are applicable to our work here. 1. Studies in basal metabolism conducted in Szechwan by Dr. Leslie G. Kilborn seem to indicate that the basal metabolic rate of the Szechwanese closely approximates that of Western peoples, though insufficient data has been collected to make any conclusive statement. 2. Langworthy, after studies in the United States, Canada, England, Scotland, Ireland, Germany, France, Japan, China, Egypt, and the Congo concludes that there is a general average and it is fair to say that although foods may differ very decidedly, the nutritive value of the diet in different regions, and under different circumstances is very much the same for a like amount of muscular work.

The analyses (percentage composition) of foods used in these calculations are from various sources, as follows:— Rose, Laboratory Handbook of Dietetics; Adolph, Shantung Christian University, Tsinan; U.S.A. Department of Agriculture, Bulletin No. 28; Locke, Food Values; Sherman, Chemistry of Food and Nutrition; Department of Biochemistry, Peking Union Medical College. Some of the Chinese vegetables grown in Szechwan are unknown in Peking, so for the composition of these we have had to arrive at an estimation of their value through comparison with other closely allied vegetables. We have already commenced investigations on Szechwan foods, but in the mean time we are forced to rely on these other figures.

According to the present standards, the requirements of an adequate diet are:—

1. Sufficient total calories to meet the energy requirements of the body.
2. Adequate biologically active protein.
3. Proper amounts of all minerals, particularly calcium, phosphorus and iron, and a proper ratio of calcium to phosphorus to maintain a calcium-phosphorus balance.
4. Adequate vitamins, A, B, C, D, E, and X.
5. Water.
6. Roughage.

Results (1) The women are all low in total calories, while the men are barely adequate in this respect.

Protein There has been varied difference of opinion regarding the amount of protein that a properly constituted diet should contain. In attempting to set a standard for the amount of protein in the dietary we find no such definite and satisfactory basis for judgment as in the case of total food values.

Sherman considers that there is no indication that any kind of work increases the expenditure of protein, as muscular work increases the expenditure of fuel. The body cannot store up protein to anything like the extent that it stores fuel in the form of fat; the feeding of protein above what is required for maintenance increases only slightly the store of protein which the body carries.

According to Voit (Germany) during moderate muscular work a man requires 118 gms. of protein, 56 gms. of fat and 500 gms. of carbohydrate per day, making a total caloric value of about 3000. Playfair (England) considers that an adequate diet consists of 119 gms. of protein, 51 gms. of fat and 531 gms. of carbohydrate per day, or a total of 3060 calories. Gautier (France) believes that 107 gms. of protein, 65 gms. of fat and 407 gms. of carbohydrate, a total of 2630 calories is the correct diet. In America the investigations have been mainly carried on by Atwater, Chittenden and Langworthy.

Langworthy concludes that the results obtained the world over, for persons of moderate activity, do not differ markedly from a general average of 100 gms. of protein, and 3000 calories energy value, and that it is fair to say that although foods may differ decidedly, the nutritive value of the diet, in different regions and under different circumstances is very much the same for a like amount of muscular work.

We may summarize the various standards proposed by indicating that Voit, Playfair, Gautier and Atwater all claim that about 16% of the fuel value of the food should be derived from protein. Langworthy believes that 12% is nearer the correct proportion, while Chittenden advocates a reduction to about 8½%, believing that most people eat more protein than necessary. The normal requirement, though, must not only enable the body to maintain its equilibrium but must also provide some reserve.

An allowance of about 75 grams of protein per day per man, which is 50% above the average estimate of actual basal requirement, seems fully adequate in view of our present knowledge.

To allow for varying conditions and individual preferences, as well as to provide a liberal margin for safety, it is customary to consider that from 10 to 15% of the total calories may be obtained from protein. Probably a better standard is, 1 gram per kilogram of body weight. In this way it is dependent on body weight, not directly on muscular exercise.

Results (2) The protein content of the food of those studied is a little above this standard, perhaps due to the low coefficient of digestibility of the proteins of rice.

Work has been done in India and Japan on the digestibility of bulky vegetarian diets. Oshima gives a range of from 46.5% to 86% for the coefficient of digestibility of rice proteins. McKay discusses the problem at length and gives data from experiments on Bengal prisoners showing how the digestibility can vary with the bulk of the diet. Thus in diets containing 850, 737, 680 and 567 grams of dry rice, the percentages of nitrogen absorbed are 47.76, 53.66, 55.39 and 64.03 respectively. For each quantity of rice there would have to be a separate coefficient of digestibility, and this decreases as the quantity of rice is increased. McKay further shows that a bulky rice diet not only lowers the coefficient of digestibility of the proteins of the rice itself but has the same effect upon all the other proteins of the diet.

The coefficient of digestibility of animal proteins is 97%, while that of cereals is 85% and that of dried legumes only 78% when in a mixed diet. When cereals and legumes form the bulk of the diet, the coefficient is apt to be even lower. Although the gross intake of the protein is greater than our standards, the net intake—the amount available for the body is low.

The quality of the proteins is even more important than the quantity. Recent investigations have shown that proteins of plant origin are of lower biological value than those of animal origin. In terms of the percentage extent to which the food proteins replace or protect the proteins of the body in metabolism,—

Egg protein	has a biological value of	94
Milk	„ „ „ „ „ „	85
Beef	„ „ „ „ „ „	69
Soy Bean	„ „ „ „ „ „	64
Corn	„ „ „ „ „ „	60
White flour	„ „ „ „ „ „	52

at the same level of 10% intake. In these studies the amount of protein may be enough to satisfy the minimum requirement, but it certainly does not seem to be optimal. I would suggest that the diet of our students ought to contain larger amounts of soy bean, peanuts, nuts, green vegetables, all of which contain grade A proteins. I would also suggest a different division of the meat ration. In

frequent intervals, i.e., in place of meat several times a week, I would suggest a small amount once every day. Tso recommends the mung bean. From feeding experiments on white rats, with an intake of about 18% of the ration, and representing not less than 20% of the total calories, the proteins of the Chinese mung bean are claimed to be biologically complete.

The mineral content of the diet in Szechwan is also deficient, chiefly in calcium and sodium chloride. Tso also recommends the addition of egg yolk in the diet in lieu of milk.

The fat in these studies is deficient according to our standards, and the carbohydrates are high. The importance of this lies in the fact that fats are carriers of fat soluble vitamins. Otherwise there is no great significance, since isodynamic quantities of fat and carbohydrate are interchangeable within wide limits.

Mineral Standards The evidence thus far available indicates an average minimum requirement for equilibrium per man per day of 0.45 gm. calcium, 0.96 gm. phosphorus and about 0.010 gm. iron. If the standard allowance be set 50% above the indicated average minimum, that is, calcium 0.68 gm., phosphorus 1.44 gm., and iron 0.015 gm., per day, or per 100 calories which is the better criterion, 0.025 gm. calcium, 0.048 gm. phosphorus and 0.005 gm. iron, these studies show that the diets are low in calcium and phosphorus. The prevalence of steaming and frying as methods of cooking helps to preserve the mineral content. The use of rice water and the variety of vegetables available during the year also aids in maintaining the mineral content of the diet.

Experiments with albino rats on vegetable diets consisting of cereals, legumes and vegetables common in West China (sodium chloride and sesame oil being added to improve the palatability) show that the diets supporting normal growth are: small cabbage, yu tsai (colza), kan lan tsai, kai tsai, when used to supplement a cereal-legume ration.

Tso, working on egg yolk as a supplement for calcium-poor diets says, "Egg yolk should be considered as efficient a protective food as milk. Egg yolk is therefore invaluable in supplementing Chinese diets, particularly diets of young children in which milk or milk products take little or no part."

Vitamins: Results (3) show that the diets studied are probably adequate in B and C, but low in A and D. Vitamine A in West China is obtained almost exclusively from green vegetables. Although some vegetables, such as spinach and cabbage, are rich in vitamine A, they cannot be compared quantitatively with milk and other dairy products. Polished rice is probably devoid of vitamine B. Feeding experiments here in Szechwan with local rice showed the development of polyneuritis in pigeons. The legumes and most of the vegetables are good sources, but the danger of deficiency is not entirely absent, due to the large percentage of rice in the diet.

Cabbage is a rich source of vitamine C, and the local Chinese use it liberally. Sprouted beans and citrus fruits are also good sources. These studies seem to indicate that the Chinese take enough of fresh vegetables to furnish a sufficient amount of vitamine C. Experiments at Peking indicate that of some 20 common vegetables tested, only a few contain enough vitamine D to allow normal development of bones and teeth. (I hope to report this in detail in a later paper). Other experiments just cited would seem to indicate that the Chinese are dependent on vegetables for vitamine D. Sunlight can possibly replace vitamine D, but those who live indoors must depend on food for the anti-rachitic vitamine.

While the deficiency diseases with characteristic symptoms are not uncommon, this does not give a true measure of the extent of malnutrition. Between the cases of marked deficiency with characteristic symptoms on the one hand and those of very slight deficiency with practically normal health on the other hand, there are all degrees of deficiency which are difficult to recognize. Experiments on animals have shown that when the diet is not markedly deficient in any one of the dietary factors the animals do not develop any well defined diseases. Their appearance remains such that they could be regarded as normal. Their fertility may not be decreased, but infant mortality is high, growth is slow and body weight is below normal.

Conditions like this must exist among human beings, and all those signs of mild deficiency, observed in animals are observable among the Chinese. In addition they possess low resistance to infections, such as tuberculosis and trachoma, in which specific immunity is not easily developed by the body. Dr. Hsien Wu says, "Compared with Occidentals, the development of senile characteristics in the Chinese is earlier and the span of life shorter. The general lassitude of the people, the lack of initiative and the apathy in face of unfavorable conditions are probably attributable, at least in part, to poor diets. The difference between the diets of the Chinese and those of the Occident, is able to account for the difference in physique and energy between them."

The physique of the Japanese has undergone a remarkable improvement in the last 25 years, and Dr. Wu thinks the diet is a big factor. Accordingly by raising the dietetic standards in China the same may be true of the Chinese in the future.

SUMMARY

The diet of Szechwan students is probably adequate in energy value.

It is probably adequate in Vitamine B and Vitamine C content.

It is inadequate in the quality of the proteins and in the content of Vitamine A and Vitamine D. It is also low in calcium and phosphorus content.

These results are in agreement with reports from North China and from South China.

ORAL PATHOLOGY IN SZECHWAN.

R. GORDON AGNEW

A more accurate expression of the subject of this paper would be, "Some Aspects of Oral Pathological Conditions found amongst the People of Szechwan." It is a topic vitally related to the health and wellbeing of the people of this province. Observations made in other parts of China seem to indicate that the findings reported here may, in a general way, be considered typical of conditions in the country as a whole, excluding, of course, areas where special factors are at work varying the clinical picture.

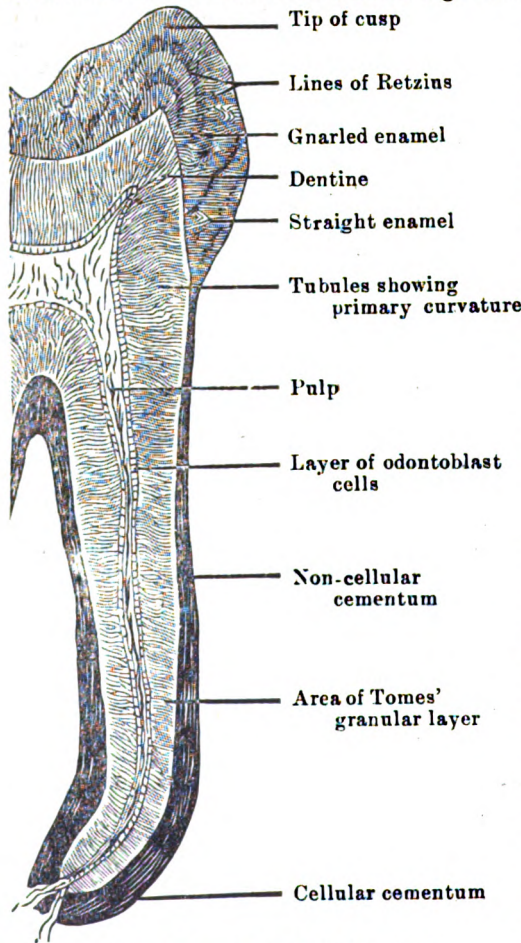
In this paper I am endeavoring to present some phases of a highly—specialized branch of medicine. To make intelligible the observations which I wish to convey, some understanding of the basic sciences is requisite. It is daily demonstrated in the pathological laboratories that without a knowledge of the macroscopic and microscopic anatomy of a given part, the study of pathology is meaningless. Very few of my hearers this evening have been in a position to become conversant with the anatomical details of these structures. It seems inevitable, therefore, that at least a brief resumé of the histological structure of some of the tissues of the oral cavity be given. Oral histology is a large subject. It is one over which the student of dentistry spends weeks of study after he has completed the courses in general anatomy and histology and oral anatomy. It is a subject which, in laboratory investigation and technique, presents probably greater difficulties than any other phase of regional histology. consequence, it bristles with controversial points; vigorous research into its intricacies is being carried on in many parts of the scientific world. Now, to present an intelligible idea of this subject and then to plunge into the complex field of oral pathology in the time at my disposal is manifestly impossible. I shall have to confine myself solely to a few aspects of the subject. I shall have to pass with speed and brevity from point to point, ignoring the mass of detail which is so dear to the heart of the pathologist.

Accordingly, omitting as far as possible, discussion of the gross or macroscopic anatomy of the parts involved, I shall make a few remarks concerning their microscopic structure.

We shall divide the tissues under consideration into three types:

- A.—The tissues of the teeth themselves—the enamel, dentine, cementum, enamel cuticle and pulp.
- A.—The investing or surrounding tissues of the teeth, including the alveolar process, the periodontal membrane, the gingivae or gums and the epithelial attachment.
- C.—The contiguous or neighbouring tissues of the mouth.

The ENAMEL—This is the hardest of all animal tissues, consisting of about 97% inorganic and 3% organic substances. Structurally it consists of enamel rods between which is found a cementing or interprismatic substance. It forms a protective covering over the entire surface of the anatomical crown of the tooth, and is, of course thickest over the morsal or grinding surfaces of the bicuspids and molars and narrows down to a knife-edge at the neck of the tooth or gingival border.



Enamel is probably the most difficult structure for histologists to examine, owing to its great density and the interference caused by refraction in the images which are presented. The rods are tall columns passing from the dentine border to the surface; they are clear and crystalline in appearance, allowing light to pass freely through them. In cross section a rod may be circular, elliptical, polygonal etc., but most commonly it is scale-shaped. The greater diameter of the outer surface of the enamel is probably accomplished by a widening of the individual rod as it approaches the surface. In the region of the cusps, where the increase is most marked, we find "gnarled

Fig. 1. Longitudinal Section of Half of Molar Tooth
Diagrammatic

enamel" an arrangement imparting great resistance to stress. The rod width varies from 3 to 6 micra. A delicate organic matrix place of larger amounts, I would suggest smaller amounts at more

is found throughout the structure of the enamel. The cementing substance is less strong than the rods and more readily soluble in dilute acids (important factors in the process of dental decay) and is of slightly greater refractive index than the rods. (See Fig. I)

Certain other structures must receive mention. The "striae of Retzius" are bands, brownish in color, forming somewhat concentric rings around the tips of the dentine cusps. In the gingival third of the crown they run obliquely from the surface of the tooth toward the tip of the root. These are incremental lines showing the stages of growth of the enamel (See Fig. I). The formation of enamel progresses in rhythmic manner. Disturbances of nutrition in the

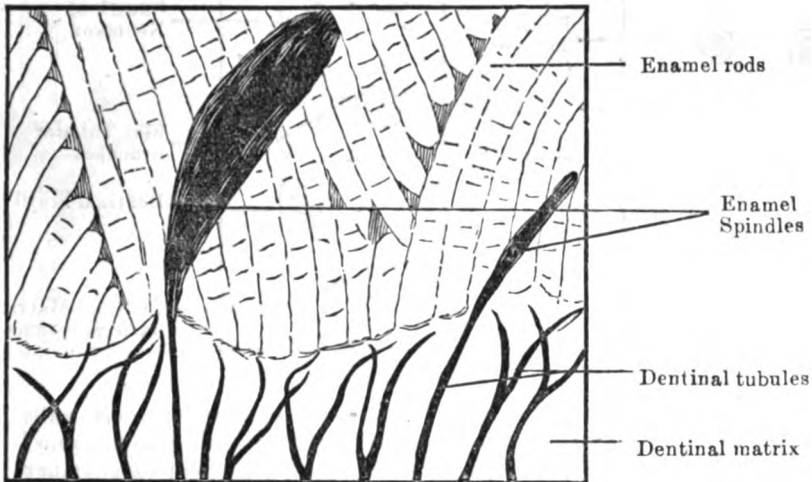


Fig. 2. Dentine—Enamel Border—Diagrammatic

growing child greatly accentuate these markings, as we shall see later in connection with enamel hypoplasia. The striae are caused by a disturbance of the calcium metabolism.

In the enamel near the border of the dentine may be frequently found spindle-shaped or tuft-like structures. The spindle-like forms are extensions from the dentine; the tufts indicate faulty calcification of the enamel rods and cementing substance in that area; lamellae (BANDS SOMETIMES FOUND RUNNING THROUGH THE ENAMEL FROM THE OUTER TO THE INNER SURFACE.) are in some cases also due to faulty calcification of the enamel, in other cases they consist of cell remnants which have grown into crevices of the enamel from the outer surface. Fig. 2).

The DENTINE—This is an elastic highly-calcified tissue of fibrous nature. It forms the bulk of both crown and root and gives to the tooth its characteristic form. It is yellowish-white in color with a silken lustre which is due to the refraction of light from innumerable air-filled tubules. Differing from the enamel the

percentage of organic matter in dentine is relatively high, amounting to approximately 28%.

Structurally it consists of a matrix or basis substance and the dentinal tubules. These tubules enclose protoplasmic structures known as the dentinal fibrils. The matrix, although apparently homogeneous, is itself composed of exceedingly delicate fibrillae. Due to the presence of elastin and to the infinite number of tubules, dentine possesses definite elastic properties. Thus it serves as a suitable foundation for the hard enamel, and enables the teeth to withstand considerable pressure during the process of mastication. (FIG. 1)

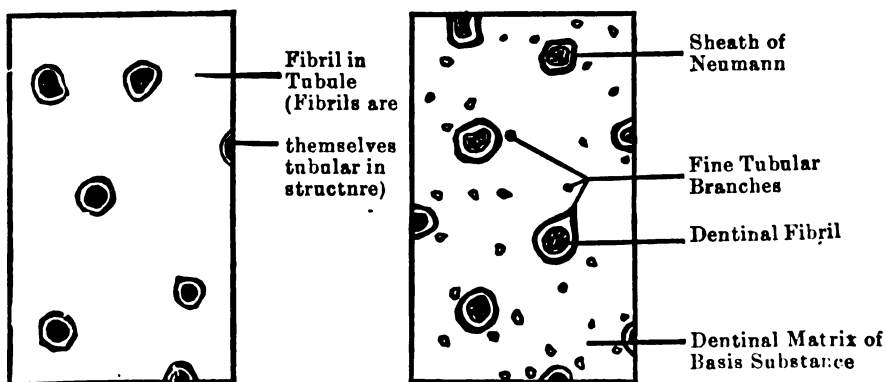


Fig. 3. Cross Sections of Dentine. (In Life the Fibril Fills the Tubule)—Diagrammatic

The tubules are channels in the basis substance; their walls consist of condensations of the matrix called "Sheaths of Neumanns". The tubules arise at right angles to the walls of the pulp chamber and canals and pass outward in an S-shaped curve, ending again almost at right angles near the surface of the crown and root. The tubule may also pursue a spiral course in addition to the primary curvatures, although the spiral type is seen largely in the root, and the primary in the crown. The average tubular diameter is about 2 microns—largest near the pulp and smallest at the junction with the enamel or with the cementum (See Figs 3.4.6.7.) It has been estimated that from 60,000 to several hundred thousand tubules pass through an area of one square millimetre of basis substance. Before reaching the junction with the enamel or cementum, the narrowing tubules often break up into several branches rapidly diminishing in size. In the crown these may end near the enamel or very occasionally may pass into the enamel; in the root they enter a narrow extended area of tiny spaces called the "Granular Layer of Tomes". Innumerable hair-like branches are given off along the course of the root tubules. (Figs. 7. 11.)

The delicate fibrils contained in the channels are soft protoplasmic processes of special cells of the pulp—the odontoblasts—

which line the inner surface of the dentine. These fibrils, themselves tubular in structure, pass from the pulp to the surface of the dentine, and play an important rôle in the formation of the dentine and in the subsequent lymph circulation controlling its nutrition. (Figs. 3.4.9.)

It is found that the teeth of old people are more thoroughly calcified than those of young people. It is also evident that the more thoroughly calcified is the dentine, the greater is its resistance to dental caries. Therefore, keeping in mind the function of the fibrils,

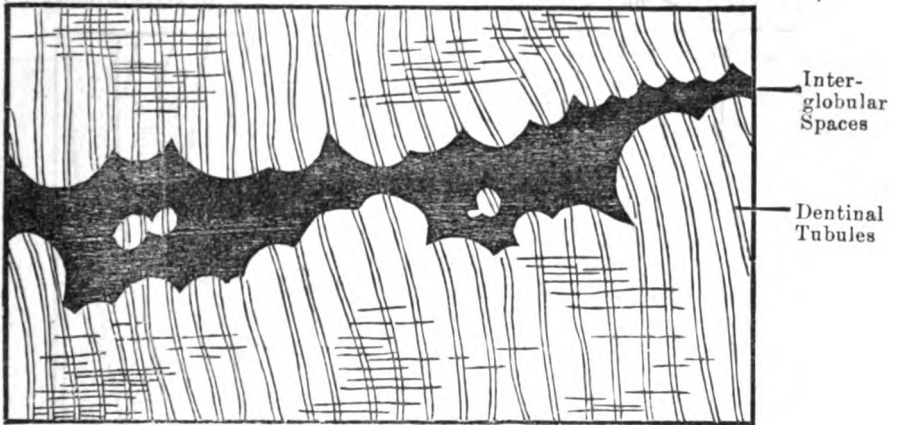


Fig. 5. Interglobular Spaces in Crown Dentine—Diagrammatic

it is advantageous to the individual to keep these as well as the pulps of the teeth in a normal vital state, so that the hardening of the dentine may continue throughout life, thus rendering the teeth more resistant to the ravages of caries. In other words, prevention of the loss of vital tooth tissue results in advantages which the most perfect restorative procedures cannot procure.

Two varieties of so-called spaces are found in the dentine—the interglobular spaces of the crown, and the Tomes granular layer to which reference has already been made. These are not actual spaces but are areas characterized by faulty calcification; the underlying factors are too complicated for discussion here, and must be omitted along with many other features of the dentine. (Figs. 5, 11):

THE DENTAL PULP—The pulp is a soft-like structure composed of connective tissue of the young embryonic type. The cells are of varied form, depending upon the location and the age of the pulp. Around the periphery of the pulp is found a specialized layer of large cylindrical cells, the odontoblasts, which as has already been mentioned, give rise to the dentinal fibrils. The popular use of the term “nerve” to designate this tissue is faulty since, in addition to its special cellular features, it has an abundant blood and lymphatic supply as well as its widely recognized nerve supply. Many unusual

histological and pathological characteristics are brought to light in the study of this interesting structure. The vital functions of the pulp are the formation and nourishment of the dentine and possibly also the nourishment to a certain extent of the enamel and cementum; its sensory functions include response to chemical, thermal and traumatic irritation. (Figs. 8,9.)

THE CEMENTUM—This is a bone-like structure deposited in successive layers around the roots of the teeth. There are broadly speaking two types; one the non-cellular, finely granular or almost structureless

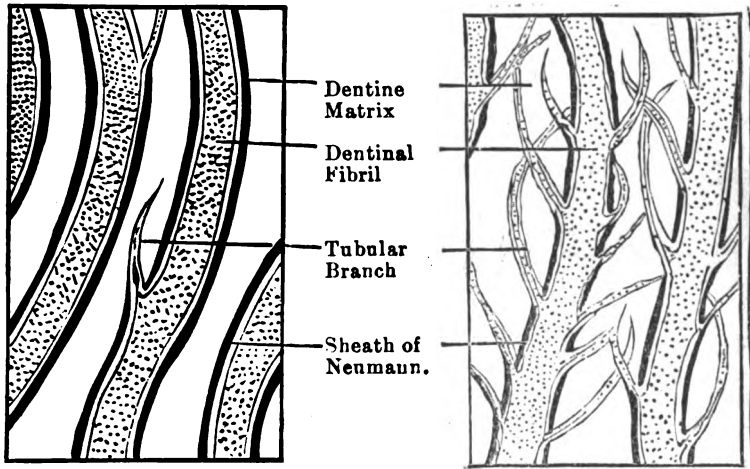
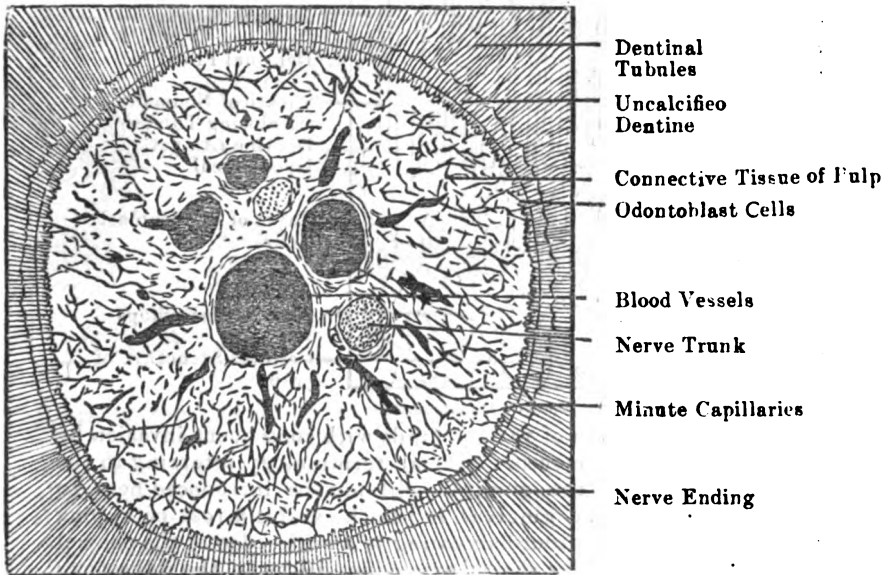


Fig. 6
Dental Tubules in (No. 6) - Crown (No. 7) -Root- Diagrammatic

in appearance; the other the cellular, containing minute 'lakes' or spaces from which great numbers of exceedingly delicate canals or "canaliculi" arise, pass through the cementum for varying distances and anastomose with neighbouring canals. Each lake contains a cell, the cement corpuscle, which, with the aid of its fine branches in the canaliculi presides over the nutrition of the area. Canalicular connection exists with the previously mentioned "Granular Layer of Tomes". The upper portion of the root is normally non-cellular.

The cementum serves as a means of attachment for the fibres of the periodontal membrane which retains the tooth in its socket; it also attaches during certain periods of life a portion of the gingival or gum tissue. Its thickness tends to increase markedly with age and under certain pathological conditions. Latent cells, the cemento-blasts persist on its outer surface in readiness for further deposition. However, at the neck of the tooth the cementum is commonly exceedingly thin—about one hundred and sixty microns or approximately the thickness of a human scalp hair. This helps to explain the extreme sensitiveness often encountered at the exposed necks of teeth. (Figs 1, 10, 12.)

The **PERIODONTAL MEMBRANE**—The peridontal membrane is a very important fibrous structure forming the attachment between the tooth root and the bony wall of the socket. Upon its integrity depend the health and well-being, in fact the existence of the tooth in the mouth. The fibres can be divided into a number of groups each with its special function in connection with the retention of the tooth. In addition to a very abundant bloodvessel, nerve and lymphatic supply various cellular forms of unusual significance are present. At least the great bulk of the nutrition of the cementum is derived from the periodontal membrane or “pericementum” as it is sometimes called. (See Fig. 12)



(Fig 8) - The Dental Pulp. - Diagrammatic

THE GINGIVAE or GUMS—The gingivae or gums, including the so-called epithelial attachment, include all the soft tissues which surround the cervical portions of the crowns and roots of the teeth, and also a large part of that tissue overlying the bony socket. It is impossible in the brief space of time available to even make intelligible reference to many of the details involved. Upon a relatively firm base of connective tissue, richly supplied with bloodvessels, nerve and lymph supply, and in some areas with minute glands, a protective covering of epithelium, of varying form and thickness and with many unique characteristics is found. Recent research has thrown much light on the rôle played by that portion of epithelium which lies next to the enamel surface. While the gross width of this epithelium is considerable, it is invaginated by long finger-like papillae of

connective tissue, with the result that in many areas the actual width of the epithelial covering cells is very slight. Each of these finger-like extensions is found to contain a tiny blood capillary which passes to the extremity of the papilla and loops back, offering an efficient blood supply but at the same time approaching very closely the germ-laden fluids of the mouth. At first connected organically with the enamel by means of the so-called Nasmyth's membrane, the remains of the embryonic enamel-forming organ, this epithelium gradually grows rootward and a space or gingival crevice is gradually formed about the crown. Crevicular epithelium is very susceptible to

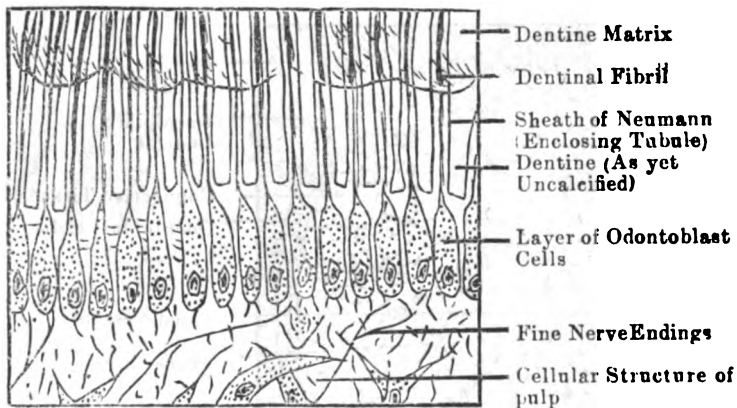


Fig. 9. Pulpal - Dentine Border - Diagrammatic

injury from irritation of various kinds with consequent invasion by the bacteria of the mouth. Special terminology referring to the various divisions of the gingivæ will not be introduced here, to avoid confusion. The gingivæ in health exhibit a rose-petal pink color, with smooth contour narrowing to a knife-edge at the enamel surface, and with wedge-shaped extensions filling in the interstices of the teeth to the contact points. (FIG. 12)

THE ALVEOLAR PROCESS—Here again a brief moderately detailed yet intelligible description for popular use would be a desideratum scarcely attainable. Speaking generally it partakes of the characteristics of spongy or cancellous bone, forming the sockets and the bony support of the teeth. It is built up in response to the stimulus from the developing tooth, is absorbed following loss of the tooth, and in modern man is susceptible to a remarkable degree to changes resultant upon deviations from normal in the teeth or their investing soft tissues. (FIG. 12)

CHINESE CONCEPTIONS OF ORAL DISEASE

Chinese literature dealing with the diseases of the mouth is very scanty. The widespread occurrence of certain types of mouth disease among the Chinese, their inability to effectively treat or

prevent these diseases and their total bewilderment as to their causation engendered the attitude that these distressing ailments are among the inevitable ills which oppress mankind.

I shall give a number of quotations from a book written by a man by the name of T'ang Tsong Hai of Penghsien, Szechwan. This book entitled "Facts About the Blood" was written about fifty-six years ago, although it was not published until twenty-four years later. There are six volumes under the following heads—1.—Yin and Yang; 2.—Similarities and differences between male and female, 3.—The internal organs; 4.—The Pulse; 5.—Drugs which should not be used; 6.—Bleeding from the Teeth.

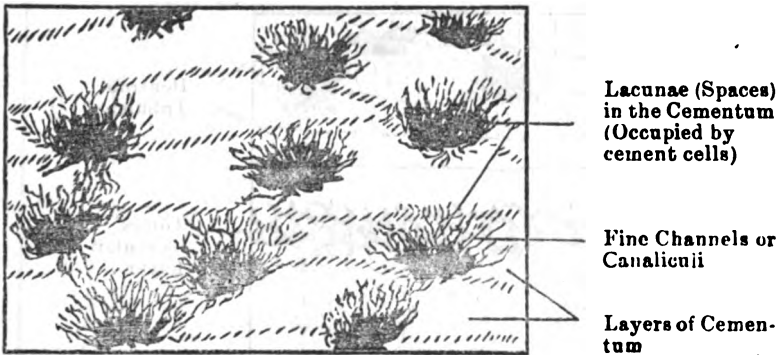


Fig. 10. Cellular Cementum - Diagrammatic

Extracts from "Bleeding from the Teeth :

"The teeth are closely related to the kidneys, although the mouth as a whole belongs to the stomach, since it is the portal to the alimentary tract. The blood supply of the jaws is derived from the stomach so that bleeding of the teeth comes from fire rising from the stomach. When the fire rises from the stomach the blood also rises. The way to stop it is to keep the fire from rising from the stomach, that is, to treat the stomach to cure the mouth. When there is real fire in the stomach the mouth is then 'thirsty' and the gums are swollen." (there is then listed a number of drugs to be used in treatment).

"If there is 'false' fire in the stomach, the mouth is dry, but the patient is not thirsty; the gums are diseased or destroyed; the pulse is light or weak; there is anemia; (another list of suggested remedies follows). These keep down the false fire in the stomach and moreover can vitalize the 'yin'".

"The above two types are caused by fire, true or false, but sometimes there is also wind in the fire; in such an event the patient should also take If in the fire there is wetness or moisture add If the kidney is weak the fire increases in intensity and the blood oozes out of the septa of the gums; during sleep they bleed ;

while awake there is no bleeding. The reason is that 'the 'yin' is weak and the blood cannot stay back. In these cases use the following drugs".

"External methods of Treatment: Use cold water to rinse the mouth, for the blood then coagulates. Vinegar may be used to wash the mouth since the vinegar can cause contraction; also use a powder called 'shi huei san sen' which is black in color; when the blood 'sees' the black color it refuses to flow any more! This treatment also keeps down the fire and when the fire is overcome the blood also returns. A mixture of k'u fan, wu pei tsi and earthworms, ground to a powder is highly recommended to ensure firmness of the teeth."

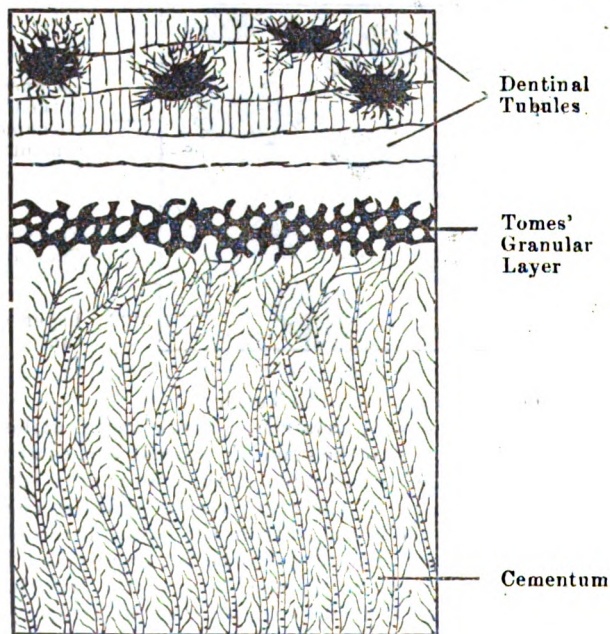


Fig. 11 Dentine - Cementum Border - Diagrammatic

A book called "Pao Yuan Chin" (the preservation of the original condition of the body) written by Kong Yüin Lin, a royal physician, and published in the twenty-third year of the Manchu dynasty contains a volume on diseases of the teeth. The writer first enunciates the principle of fire rising from the stomach and states that the tooth is identical with bone. If the bones of the body are hard the blood will be larger in quantity; if the bones are soft the blood is small in quantity. If the blood is abundant it is cooling and renders the bone hard; if scanty it becomes warm and the teeth are therefore loosened.

All the tissues around the opening of the mouth and chin have their blood supply derived from two areas the 'yang' and the 'yin'.

Because they have this origin the jaws belong to the earth. The tooth in the jaw is like a tree planted in the earth. While the earth has coolness the tree is firm ; when the earth is warm the tree com-

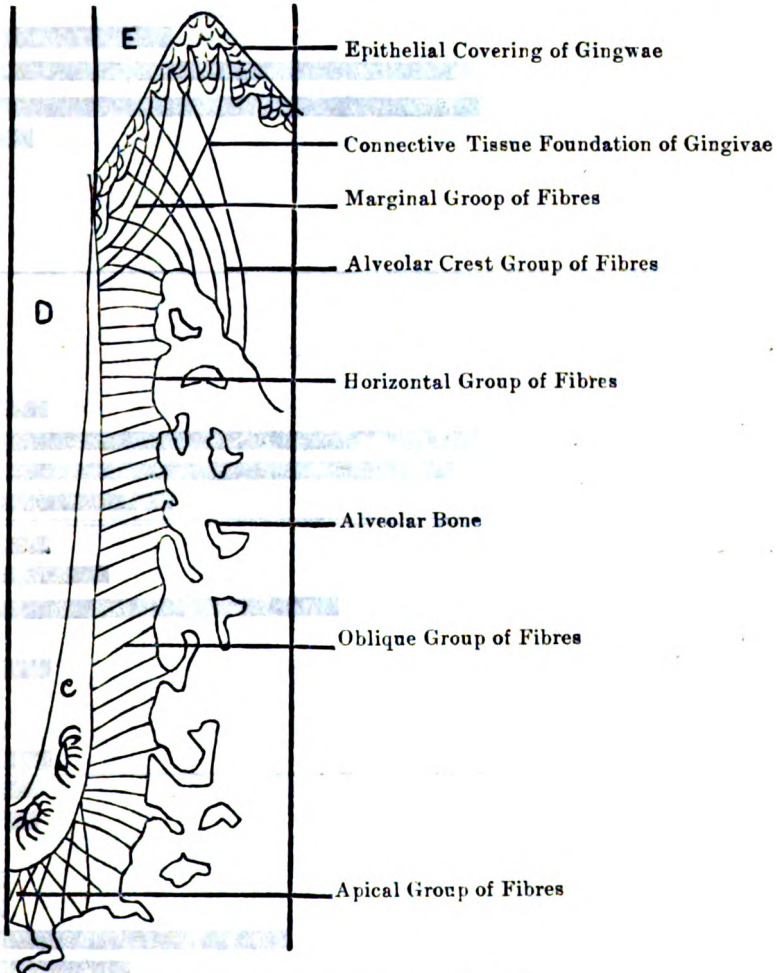


Fig. 12 Outline of Deriodontal Structures Showing Some of Groups of Periodontol Fibres Diagrammatic

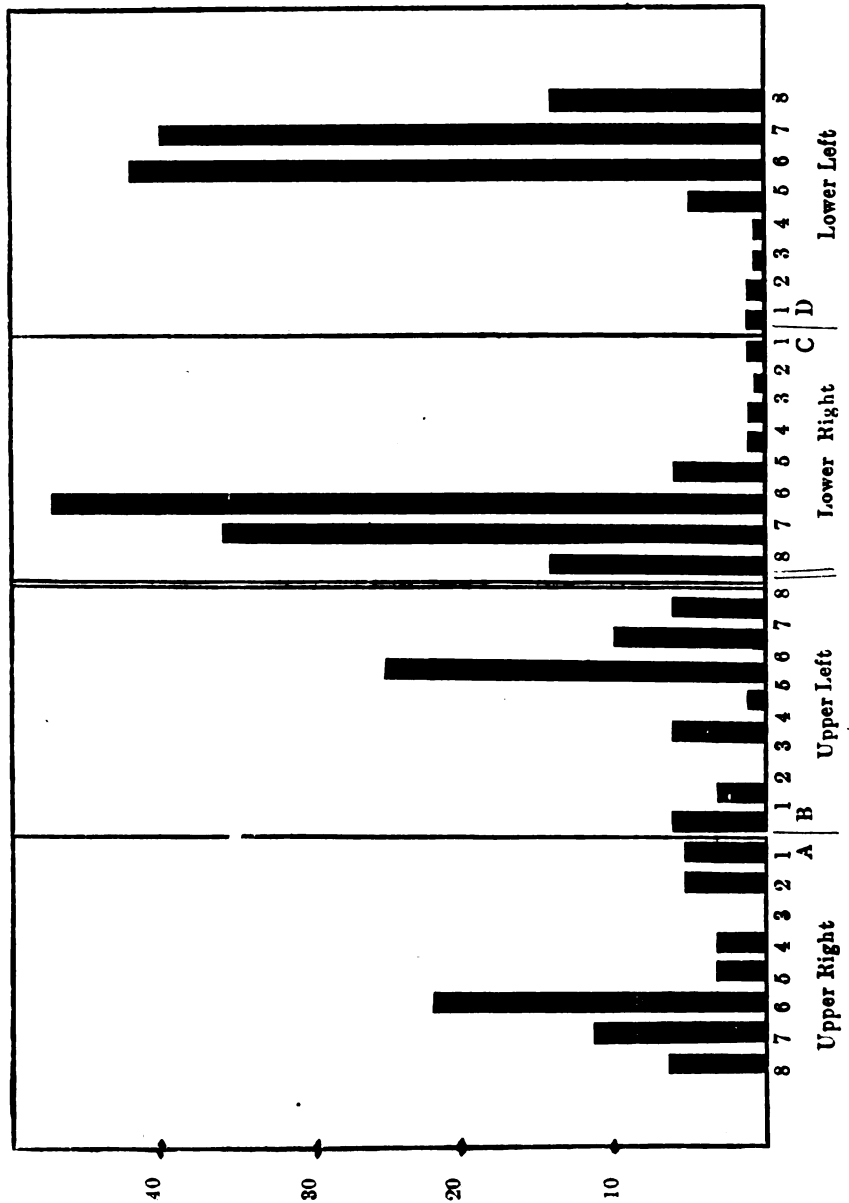
mences to burn up. The teeth are bone ; bone cannot develop soreness ; therefore if there is pain it arises from the gums or adjacent muscles. Sometimes the teeth are loosened and brittle because of fire rising from the kidney.

The same writer quotes from a very ancient book the "Lue Chin" written forty-five hundred years ago by the emperor Huang

SUSCEPTIBILITY OF TEETH TO DECAY

AN EXAMINATION OF 300 UNIVERSITY AND MIDDLE SCHOOL STUDENTS

Key A1 = Upper Right Central Incisor
 Ex D6 = Lower Left First Molars etc.



Ti. In this work it is claimed that all pain, itching, boils and ulcers owe their origin to fire rising from the heart. Below the fire of the heart is the Yin Chin (the real Yin of the Yin and Yang). If this spirit is vigorous, there will not be pain, even if the fire does rise from the heart.

All diseases of the teeth are classified into three groups: the Fong Ya and the Ch'ong Ya (caries) undoubtedly refer solely to the hard tissues and the Ya Kan which refers to the soft investing tissues.

Fong Ya is due to "re" or heat in the body and this heat produces wind. Worms are also associated with it (the character fong has 'ch'ong' in it).

In the condition termed Ya Kan fire rises from the Yang Min, especially in children, causing profuse salivation and enlargement of the cheeks. The term also applies to the condition in which the roots of the teeth become necrosed and turn black; worms are the causative factor here.

If in the combination of Yin and Yang the Yin is not enough the body then can from other sources develop "re".

To successfully treat dental pain we should treat the kidneys with which the teeth are associated. This is the essential principle. To treat the stomach because sometimes the disease is due to fire rising from the stomach would be to violate the correct therapeutic principle; treatment must be directed to the kidneys. Again, to treat a case of Fong Ya by directly seeking to remove the Fong, for example by causing a sweat, would likewise be a violation of the cardinal principle. You must seek the initial cause in the kidneys.

Those who desire to be healthy should avoid exclusively eating highly flavoured food, and should restrict the diet to very slightly flavoured foodstuffs. The reason is that if one avoids the highly flavoured food one does not develop so much fire. Sometimes dental disease cannot be cured because the patients insist on eating highly flavoured food. If such persons would subsist solely on simple foods, although the taste be inferior, the teeth will retain their health and in old age will not fall out. (Some grains of dietetic truth here, indirectly approached).

Hua Chiao and ginger cause overproduction of heat. The tendency to overeat because of the taste (described as "pleasant, hot, and a little painful") causes the individual to be susceptible to certain evil influences and the teeth suffer. If children suffer from Ya Kan, the ingestion of very sweet or highly flavoured food makes the disease more severe. Also the clothing that is worn should not be too heavy.

In the cases of breast-fed infants, if the mother suffers from "re", the children will likewise suffer and will develop Ya Kan.

Of course the popular current idea regarding dental caries is that in some vague way worms are responsible for the disease. The "quack" practitioner produces one or more "worms" from the cavity

and often prescribes a medicine to be held in the mouth until the pain ceases.

THE PREVALENCE OF ORAL DISEASE IN SZECHWAN :

A description of the prevalence in West China of each of the manifold types of oral disease would be a vast undertaking and manifestly impossible. Obviously only two or three groups of diseases can be touched upon. I shall even have to omit mention of the problem of focal infection which has figured so largely in recent years in all discussions pertaining to the relationship between the health of the mouth and that of the body as a whole. The frequency of the sinister effects of oral disease on general health is as true of the East as it is of the West. I shall here restrict myself to a discussion of three types of lesions: hypoplasia of the teeth; acquired diseases of the teeth; and diseases of the periodontium.

A. *Hypoplasia of the Teeth* By this we mean defective or incomplete formation and development of the teeth. In Szechwan this type of lesion is widely prevalent. The defects appear as pits and grooves, transverse bands or fine wavy lines, particularly on the anterior surfaces of the teeth. The so-called "honeycombed" teeth are rough from numerous pits which may be small or large, flat or deep and often discoloured. These defects may lie close together as in a chain or there may be multiple rows. Pits at the cutting edge make that portion of the tooth very brittle and breaks may readily occur leaving an uneven edge. A very frequent condition is the incomplete formation of the enamel covering in the fissures and grooves of the grinding surfaces of molars and bicuspid. Such areas may frequently prove the starting points for caries since they form lodging places for food debris epithelial cells, bacteria etc.

A type of hypoplasia occurring in both the East and the West was originally described in connection with syphilis, and unfortunately the idea has become prevalent that such a condition ("Hutchinson's Teeth") is diagnostic of congenital syphilis. As a matter of fact, it is found in a relatively small percentage of cases of congenital syphilis, and it may occur as the result of various other conditions such as rickets, etc. The lesions are especially found in the upper central incisors. The teeth are small and peg-shaped; the enamel is poorly formed and brittle and the cutting edge soon develops a notch in the centre while the corners of the tooth are rounded off. In China similar notches are very often seen in the anterior teeth due to the universal habit of using the teeth to crack seeds, with consequent wear of the cutting edges involved.

The various enamel defects are due to disturbances in calcium deposition. They develop at the time of enamel formation of the permanent teeth and are therefore already present when the teeth erupt. As these disturbances in calcium deposition set in and cease again, so there are periods of cessation and recommencement of

enamel formation. They correspond to the course of the striae of Retzius (referred to in the description of the normal tooth.)

The causes of the interference in calcium deposition are nutritional disturbances occurring most frequently in acute infectious diseases like measles, scarlet fever, smallpox and other such exanthematous diseases. The disturbances which arise from these sources are most severe in the early years of life and this explains the fact that some groups of teeth are affected and others not (depending upon the group of teeth developing at the time of the occurrence of the disease.)

A peculiar type of enamel deformity is found in the so-called Mottled Enamel. This condition is endemic in several districts throughout the world including a few areas in China (parts of Kueichow, Yunnan and Shansi) It appears to be associated with the water supply in these localities and the number of natives affected in the areas so far investigated varies from 15% to 100%. Its etiology is probably linked with disturbances in calcium metabolism. Microscopically we observe in the enamel the absence of the cementing material between the rods for a third or more of the thickness of the enamel. Frequently a brownish or blackish pigment is deposited in the involved area, in other cases the color is a dead white. The defects appear only in those teeth which are in process of development during the period in which the child is residing in the endemic zone. Thus a child moving into or from the affected zone during the formative periods will have corresponding groups of teeth affected or free from this disfiguring blemish. Considerable research has been done in connection with this peculiar lesion; much still remains to be accomplished. The theory most recently propounded is that the presence of manganese in the drinking water is responsible for the occurrence of the disease. Several students now attending West China Union University come from the Yunnan-Kweichow area and exhibit this form of enamel hypoplasia. The writer contemplates in the near future an expedition into this zone to investigate the local conditions which exist, in the hope of throwing more light upon the etiology of this anomaly.

B. Acquired Disease of the Hard Tissues.

Caries—This has frequently been stated to be the commonest of all diseases of the human body, and considering the human race as a whole, this is probably correct. It has been estimated that only 2% of mankind is immune to dental caries. But when we investigate the incidence of this disease among students of various institutions in Szechwan we find that the prevalence of dental caries is much less than in the West. Surveys among University and Middle School students indicate an incidence of 42.6% (Szechwan) whereas in the West the disease is practically universal.

Now note the difference in West China between the incidence of caries in the permanent and in the deciduous teeth. A survey of the

deciduous teeth indicated in Chengtu an incidence up to approximately 80%, thus approaching conditions in the West. This situation has a very great significance when we come to discuss other aspects of oral disease.

The general problem as to the cause of caries has received a moderate amount of publicity in some of its phases. We cannot of course here go into this question in detail. The process may be broadly described as a decalcification and softening of the dental tissues with subsequent disintegration of the parts. The chemico-parasitic theory is the one most commonly supported. According to this theory the first process, decalcification, is caused by the lactic acid produced in the fermentation of remnants of starchy and sugar-containing food debris clinging to the teeth. The bacteria necessary to this formation are of course present in great numbers; other forms assist in retaining the debris in close contact with the enamel surface. The second phase of the process, disintegration of the softened residue is due to parasitic activity, for the fungi of the oral cavity have the property of peptonizing albuminous substances and rendering them soluble.

These are the exciting causes—the determining factors, however, are predisposing causes which prepare the soil for the process above described. These are numerous anomalies of the enamel, such as the hypoplasias already mentioned; malposition and faulty articulation (relation of the teeth in one arch to those of the other); heredity; racial differences; individual constitution; internal secretions; dietetic conditions such as vitamin or calcium deficiency; possibly pregnancy; effects of other diseases, such as diabetes; effects of civilization; hygienic conditions (very important); chemical constituents of the saliva etc. In spite of the vast amount of research work already devoted to this disease, we can not yet make many dogmatic assertions. The bacteria involved are probably of many varieties; possibly among the most important is that type imposingly designated *Bacillus Acidophilus Odontolyticus*, which has the ability to survive and function even in an acid environment.

A fascinating problem brought to light by the surveys is: Why is there so much caries in the deciduous teeth of children and so little, relatively speaking, in the permanent teeth? A number of possible factors could be enumerated. There is possibly some factor in the nutrition of the pregnant mother, since the deciduous teeth commence calcification from the fourth and fifth foetal months. (It might be added that the one permanent tooth whose calcification commences in foetal life, the first molar, is also the one most affected by caries, as seen in the chart No. 13. However, other factors, hygienic etc., are peculiarly active here and it is doubtful if this is of significance). Possibly there is a lack of Vitamin-D in the food of the mother, whereas the child, later playing in the sunlight, does not prejudice the permanent teeth, in this way.

A very possible factor is the excessive eating of carbohydrate

food. Young children in the large cities in China today consume more candy and allied foods than older children or adults. To be sure the unrefined sugar is less injurious than the manufactured sugar; nevertheless this element in the situation is probably important.

Again lack of mouth hygiene undoubtedly plays a part. Surveys indicate an appalling lack of hygiene in the mouths of small children. Hospital clinics bear further pathetic witness to the fact. One survey in mission schools gave the following results: Clean—none; fair—54%; dirty 46%. The conditions among groups less enlightened than those in mission schools can be estimated. Here the question of the first permanent molar again comes up. This tooth erupts behind the last deciduous tooth and is often mistaken for another temporary tooth. Frequently therefore, the parents, with the erroneous idea that the temporary teeth need no care, allow the first molar to be likewise neglected. Loss of this tooth, happening as it frequently does in early life, does irreparable damage to the entire dentition.

Another interesting and suggestive problem is—Why is there less caries in the permanent teeth of the Chinese than we find in the West? This question cries out for investigation. Perhaps one element in the situation is that the food consumed in China is less concentrated than that in the West. Perhaps the open air life of the Chinese so favors calcium utilization that a more resistant structure is built. Certainly it is not due to cleanliness for immunity to caries is seen to exist in very filthy mouths. In one survey of University and Middle School students deposits were found upon the teeth in 96% of the cases.

Of course there is the vague factor of natural immunity. Here again the answer lies in the future.

The results following unarrested caries are of course fairly familiarly known in the West:—pulpal infection; infection of the periapical tissues with possible extensive spread into the periodontal membrane; loss of bone and alveolar abscess production,—acute with its dramatic symptoms, or chronic with its frequent total absence of local symptoms; and finally the possibility of the occurrence of metastatic infection, that is secondary disease in some other part of the body resultant upon the dissemination of the infection from the primary lesion or "focus" in the mouth.

C. Diseases of the Periodontium:

We found that the incidence of dental caries amongst the Szechwanese is less than in the West. When we come to discuss periodontal disease or diseases of the gums, we find a very different situation. Here the occurrence is practically universal in some form. (The University and Middle School survey showed the 99.66% of the students exhibited periodontal disease in some form, largely gingivitis on account of the age groups).

Moreover, due to the nature of the underlying causes untreated

cases in practically all instances cannot undergo spontaneous cure, but will progress with varying rapidity and severity through definite stages. This is demonstrated by examination of large groups of individuals in the different age classes. In the young boy or girl we often find the early evidences—gingivitis often an increased mobility of the tooth pointing to the existence of that subtle lesion to which is given the term “Rarefying Pericementitis Fibrosa”. However at this age resistance is high, and the lesions do not usually progress to an advanced extent. Then in the young men and women of college age we find the symptoms often markedly increased but still there is good general resistance. When we pass further to adult mouths we find that with lowered resistance the lesions have often progressed to a grave extent, and not infrequently the health of the individual is menaced.

In very young children various forms of necrotic gingivitis and stomatitis are frequently encountered in our clinics; these may result in appalling destruction of teeth and associated tissues. Such cases are naturally among the most pitiful ones which are met with in hospital work. Apart from the immediate danger of general infection lasting injury may result in the mouth and the body as a whole.

A classification of the varieties of periodontal diseases would probably be too complicated to justify inclusion here. Suffice it to say that the term gingivitis (of which there are over a dozen types) is used to indicate lesions localized largely in the soft tissues overlying the bone and the periodontal membrane. The term periodontitis is used to indicate a disease process which involves not only the gingivae but also the periodontal membrane and the bone. This may be acute as for example the so-called trench mouth, or chronic, to which group belongs those types popularly but erroneously referred to as “pyorrhoea”. Another lesion already referred to, rarefying pericementitis fibrosa is often the earliest lesion of all, and may give rise to little or no symptoms for a long period, but may pave the way for the later development of one of the chronic forms of periodontitis. Other forms necessary to a complete classification cannot be discussed here.

As to the causes, only the most sketchy of outlines will be given. We shall group the causative factors as primary and secondary.

Primary factors consist mainly of mechanical irritation. This irritation exerted upon the membrane around the root of the tooth and also frequently upon the bony wall of the socket is most commonly caused by a widespread condition termed “Occlusal Trauma”. This is the result of an improper relationship between the cusps and contacting surfaces of the teeth in one arch with those of the other, causing unequal distribution of stress, either in localized or widely spread areas. It may be caused by malposition of the teeth, restorative defects, abnormal congenital tooth form etc. This irritation may also take the form of injury to the gingivae or gums through surface abnormality of the teeth; through the impingement of faulty fillings

or dentures upon the gums; through hard and soft deposits upon the teeth, the result of lack of or faulty mouth hygiene; through rough enamel surfaces, developmental or acquired; another form of trauma caused by the impaction of food, by incorrect methods of cleaning the teeth etc., may be operative; and so on ad infinitum.

Secondary factors include chemical irritation such as that from bacterial toxins and decomposition products of food; organic and inorganic poisons; abnormal general conditions such as impaired general nutrition, cell vitality or elimination; predisposing local conditions such as the scanty epithelium lining the gingival crevice already referred to in the description of the gingivae; and injurious habits such as mouthbreathing. The above factors form but the rough scaffolding which we must use in determining the elements operating in a given case.

A further word must be said about the condition called occlusal trauma. Physiological occlusion, in a few words, is that condition in which the forces and stresses acting upon a tooth when in function are so balanced that the relationship between the tooth and its supporting tissues cannot be injuriously altered, in other words when the supporting structures are receiving sufficient load for efficient stimulation without receiving an overload. Traumatic occlusion, or, more correctly, occlusal trauma, is that condition in which the force exerted on the tooth and the resistance offered by the supporting tissues are not in equilibrium. The engineering and biological complexities involved in the various types of stresses need not be elaborated at this time.

As a result of the long-continued operation of occlusal trauma the fibres of the periodontal membrane are gradually destroyed and replaced by a type of weak connective tissue; the bony socket is gradually disintegrated, sometimes in small localized areas, sometimes extensively. As the microscopic structure of the part changes the bloodvessels passing upward to the gingivae are injured and the supply of nutrition to the overlying soft tissues markedly impaired. The result is of course lowered resistance in these areas. Remembering that hosts of bacteria are always present in the mouth cavity, and that, as pointed out in the description of the gingivae, the epithelial covering is often faulty or very thin and easily injured, it is easily seen that due to the lowered resistance and to the numerous possibilities of injury to the epithelial covering bacteria may gain access to the inner tissues of the gingivae superimposing an infective stage on the changes already described, and rapid destruction and pocket formation may follow.

Of course types of periodontitis may develop in areas where the occlusion is quite innocuous; here the infective phase of the disease is the dominant one from the beginning. Again in young people, overstress may lead to gradual loss of bony wall and recession of the gingivae without the formation of pockets along the roots of the teeth.

Occlusal trauma may appear in many forms; it may result from cusp interference; uneven wear of the teeth; from dental caries; from faulty restorations; from displacement of teeth due to the extraction of neighbouring teeth without immediate restoration; from thread-biting; gripping of pipstems, etc.,. Again there may be a fusion of several types of causative factors complicating both the diagnosis and the treatment.

In answer to the question—What seem to be the main factors in the almost universal prevalence of periodontal disease in West China—the following suggestions might be listed:

1. The prevalence of occlusal trauma (found to some extent in practically 100% of the cases, often in exaggerated form). Under this head might be listed the following inciting factors:

Too early loss of deciduous teeth through disease, with resultant failure of full development of the jaws and consequent bunching and malalignment of the permanent teeth.

Too late loss of the deciduous teeth due to disease resulting in abscesses at the tips of the roots, and consequent interference with normal process of absorption, due to injury to the apical tissues. As a result the permanent teeth may erupt to the outside or the inside of the temporary teeth and the occlusion is seriously disturbed.

Possible hereditary factors leading to malocclusion, and a disturbed relation between the arches.

Excessive wear resulting in injurious occlusal stresses. This is often extreme, a Chinese of thirty years often exhibiting a state of wear seldom found in the West under fifty years.

Loss of permanent teeth without replacement, a very serious factor.

2. Lack of cleanliness and a knowledge of the principles of oral hygiene.

3. Dietetic factors, possibly affecting the nutrition of the alveolar bone and its resistance. Possible vitamin-D deficiency.

D. Other Aspects of Oral Disease. A discussion of these cannot be included in this paper. Types of severe necroses, tumours etc., such as in the West are rarely encountered even in large urban hospitals are often met as a matter of routine in our clinics. The investigations leading up to this paper also included inquiry into the occurrence in Szechwan of phosphorus necrosis of the jaws. Some years ago, cases of this malady were seen in Chengtu, but a survey of match factory workers revealed no instances at the present time. This is doubtless due to the fact that the factories are now largely using the red, non-poisonous phosphorus. It is claimed that a certain amount of the yellow phosphorus is still in use, but this is doubtful. The methods of dipping are such as to be most highly conducive to injury from the fumes were such a variety now in use. (By the way, economic conditions in this work offer food for thought—children of five and seven years of age arranging matches on racks with astonishing dexterity for 100 cash a day; their mothers receiving six or

seven hundred cash, and men about the same plus food—consider this in the light of the present exchange—May 1929)

A further word as to oral hygiene: the need for propaganda and instruction in oral hygiene is appalling, and the benefit to be derived from such service is incalculable. Amongst a certain percentage of the people an attempt is made to clean the teeth, but the technique is hopelessly faulty, the brushes used are grossly unsuitable in size and design, and the result is inefficiency and often actual harm to the delicate soft tissues.

In conclusion may I suggest some of the vital needs of Szechwan and of the country as a whole in regard to oral disease:

First, the intensive phase including the establishment of schools of dentistry of high standard throughout the country graduating students with high academic attainments and the Christian attitude toward life and service.

Secondly, the extensive phase—cooperation in the general work of public health propaganda; widespread dissemination of information and demonstration regarding the vital care of deciduous and permanent teeth—the proper observance of oral hygiene—the proper adjustment of dietetic factors and living habits—and a knowledge of the relation between the health of the mouth and the health of the human organism as a whole



THE PRACTICES AND PRINCIPLES OF CHINESE MEDICINE.

W. R. MORSE.

The subject of this paper is singularly intricate, and accurate knowledge is uncommon among foreigners. In fact it is difficult to get uniform interpretations of Chinese medical books from Chinese scholars themselves. Investigations, even when scientific, are extremely liable to the personal equation, and human observations are prone to be imperfect, and to be imperfectly remembered. One's imagination may distort his judgement, and one's emotional state influence the accuracy of his conclusions. What is written in this paper is, therefore, subject to future revision.

The sources of my data are as follows;—1. A number of works on Chinese Medicine, particularly an encyclopedia of 60 volumes called “ü p'ei i ts'ung chin gien,” (御批醫宗經鑑) or Imperial Rescript of the Medical Art,—the Golden Mirror, some sixteen volumes of which have been translated with more or less accuracy; 2. Many conversations with Chinese physician-teachers, for in this country many teachers take up medicine as a side-line, and from them one probably gets the most philosophical and accurate interpretation of the principles underlying the practice of medicine; 3. Essays on Chinese Medicine, by medical students in the West China Union University; 4. Observations on Chinese patients and talks with them; 5. Observations on the medical practices of Tibetan and Tribes peoples who live in contiguity to the Chinese and borrow from their culture; 6. Published articles and books on Chinese medicine and related subjects.

Before proceeding to a description of Chinese Cosmogony, or their philosophy of the origin of the world, which is the foundation of their medical beliefs, I shall interpolate a few facts regarding the Chinese and other ancient Asiatic civilizations.

The Chinese date their civilization from about 3,000 B.C. The earliest known medical writings are those of the Sumerians, the ancient inhabitants of Mesopotamia, whose records date from between 4000 and 5000 B.C. From the Sumerians the Babylonians and Assyrians borrowed culture, and it is to be noted that Chinese theories of the world and scheme of the universe have striking similarities to the Sumerian and Assyrian. Egypt is said to have had a high type of civilization in 5000 B.C. Whether or not her civilization antedated

that of the Sumerians is an unsettled question. Some competent authorities claim that the origin of all ancient culture was in Egypt, and from that centre it spread over the world.

Although the actual location of the first dawning of real culture is a debatable point, it seems clear that there were civilizations of a distinctly high order, in particular the Akkado-Sumerian, which antedated the birth of Chinese civilization. In these are to be found basic philosophical principles which are strikingly similar to those of the Chinese.

The exact facts about any human endeavour, be it large or small, are difficult to obtain, and still more difficult to interpret. It is very easy for residents in a foreign land, especially, it might be said of a country like China, to express ideas and convictions which are not based on scientific observation, or are misinterpretations of observed incidents. Chinese medical practices are frequently treated with contempt, and perhaps the general idea is that their procedures are absurd. Because of an incomplete understanding of underlying principles the absurdity of most of their methods has been accentuated. Such wholesale adverse criticism is unjust and unscientific. We seldom recognise how completely we ignore observations which do not agree with our preconceived notions, which we instinctively tend to support.

While we may discover little of modern medical procedure in the history of Chinese medicine, yet a careful examination will reveal valuable medical methods and a mine of psychological material. Although "the proper study of mankind is man", mankind has tended to adopt the policy of letting, good, or bad enough alone, and has delegated authority in emergencies to one kind or another of medicine man, either a so-called secular or a religious one. The history of medicine has peculiar attractions, for it is as good a mirror of a people as can be found in any of their social processes. So called new discoveries have frequently been made, but historical investigation shows that quite often they correspond to calling the first phase of the moon's surface new. In medical history it has been repeatedly proven that some "new" things had been discovered long ago, or at least that the foundations of the idea or practice are to be found in the thoughts and actions of men of former ages.

The human race has constantly struggled to preserve and propagate life. In the attainment of those objects, medicine and religion have played a vital part. For centuries man has toiled and struggled, has killed and been killed, in order to carry on the torch of civilization which his progenitors, more barbarous than he, have handed on to him. Man's history from prehistoric times has been a struggle for material and spiritual control over the forces of nature, and as Osler has said "the trail is littered with wrecks and bones." National and tribal cultures are founded on a wrestle with the forces of nature. The earlier the civilization the greater the struggle to adapt circumstances to use and necessity, and it behoves us to criticise

with justice and mercy. Sympathetic interpretation of the principles underlying the practices of medicine amongst a people like the Chinese, whose civilization has lasted for longer than that of any other race that has continued a political unit, is a revelation of the mind of that people. Such a study ramifies into the whole social life of the people, and particularly into the philosophical and religious beliefs from which their national culture has developed. The practice of medicine undoubtedly began in prehistoric times, before the birth of culture, for the preservation of life was probably the very first purposive act of a thinking being. The practice of medicine originated very soon after the birth of man, and probably began before the development of spiritual values.

In any attempt to interpret the fundamental principles underlying Chinese medical practices one immediately realises that medicine, magic, philosophy and religion are very intimately interrelated and the disentanglement is difficult if not impossible. These four sets of social processes are abstract and abstruse, and a clear definition of terms is not easy.

It is evident that the problem of the origin of disease is paramount, and associated with it, is the question of how far the institutions under discussion were built up separately, or were derived from the cultures of other peoples. The data is obscure, the medical books are written in "wen li," and there is an obvious attempt at purity of style which greatly hinders accurate interpretation. A book is not infrequently a commentary to a commentary of commentary. The very latest commentaries are intricate and vague, and most of them are hundreds of years old. The latest was written about 1830 A. D.

The method which I have adopted for investigating Chinese medical principles is not a clear cut analysis of any one definite aspect of the social processes involved. It is in part, historical. I attempt to go back to the origins of things Chinese, to determine whether the institution was built up by an independent evolutionary process or resulted at least in part, from contact with the cultures of other races, or racial or cultural drifts. The plan also involves a psychological and anthropological approach, to ascertain the states of mind underlying their concept and practice of medicine. It may be regarded, therefore, as a sociological approach because of the interrelations of the many social processes involved.

I shall attempt to define my terms. Medicine regards disease as a phenomenon subject to natural laws, and it attempts to use artificial procedures to correct maladjustment to those laws. Magic includes those rites and processes which man uses to produce effects on supernatural beings. Religious processes depend on a power in the universe greater than man himself, to whom obedience, honour and reverence are due. Philosophy is a systematic view of all things deduced from first principles, which may, or may not include a god or gods in control.

My thesis is that:—(1) Chinese medical practices in their highest aspects, are logical, philosophical procedures deduced from the first principles of the Chinese theory of cosmogony, but the premises are erroneous so far as medicine is concerned and, therefore, their conclusions are wrong. (2) Their practical experience through centuries has, nevertheless, developed some empirical procedures of value, and they have discovered not a few very valuable drugs. (3) They have some procedures similar to those of Western practitioners. (4) In its less cultural aspects, magic and superstition play a large part in their healing art. (5) On the whole, and as most commonly practised, their procedures are wrong and ineffective and show a backward or degenerative evolution. (6) Superstition, magic, philosophy and religion are associated with Chinese medical procedures.

I began to investigate Chinese Medicine some twelve years ago. Eight months ago I commenced to correlate the accumulated facts and fancies; my ardor warm at first, gradually cooled and finally almost congealed for I was overwhelmed with the mass of data.

However, the study has been of great interest and has very materially helped me to understand to some extent the importance of some of the social processes of this great nation. It has given me at least an inkling of the psychology of the Chinese.

In the first place I shall briefly discuss the origins of the principles of Chinese medicine. It began in what might be termed the instinctive stage, common to all primitive peoples. Then followed a metaphysical stage, which John Stuart Mill describes as "that fertile field of delusion propagated by language". Next arose a philosophical stage, the science of things deduced from first principles. Following this came the stage of association with magic and religion. Probably the former came first and was intimately connected with alchemy, though it is difficult to differentiate the magical from the religious stage in China. And, finally, we come to the practical application of the characteristic medical principles of the Chinese.

In the second place I shall examine the abstract, pseudo-scientific craft of alchemy, and its associated sciences, astronomy, "*feng sui*", and geomancy, all of which are intimately related to Chinese medical customs and, in fact, to all of their social processes.

Finally we shall consider some characteristic and peculiar medical deductions and usages; living examples of ancient beliefs and procedures which originated some 3,000 to 4,000 years ago and continue to the present. Many of these are apparently at variance with the otherwise unquestionably high state reached by Chinese civilization. I say "apparently" because the same fundamental philosophy is at work, in their medical practices as in their other social processes. Although in many regards the civilization of the Chinese is of no mean order the results in medicine are distinctly not high grade.

Evidently in medical procedures ancient philosophy is not a good guide.

I will attempt to confine the discussion of the Chinese practice of medicine to that carried on by the intelligentsia of Chinese physicians, although it is impossible to confine myself strictly to that class. The problem is interesting and complex; a whole series of lectures is needed to introduce the subject. One important point, however, must be emphasised; in a study of the medical procedures of a nation all social processes must be investigated, for the interrelation is most intimate. I wish also to point out the rare opportunity afforded in West China of studying not only the life and habits of the Chinese but also those of much less sophisticated members of society. I refer to the Aboriginal Tribes and Tibetan peoples. To any one interested in anthropology the study of races in contiguity is a privilege, and an accurate investigation must add greatly to the value of any inquiry into the history of the principles and practices of medicine.

Origins of Chinese Medicine The question of origins is one that attracts all thinking minds. The child early in life wants to know where he came from, who is God etc.? His early years are one eternal question mark, and a lot of us fortunately never grow old in that regard. It is very human to conjecture about the reasons for life and its social processes. A Chinese proverb says "the first story of the highest tower is on the ground".

An eternally unsolved question is how the world and man originated. In the West different hypotheses have been advanced and discarded, and at the present time the scientific world has not answered the question to the satisfaction of everyone. The West is in a state of continued scientific flux. It is not so in the Orient. The Chinese for some 4000 to 5000 years have been apparently satisfied with their belief regarding the origin of the world, the constitution of man, and of the principles governing his life and social processes. This ancient and elaborate system of belief is the basis of their practice of medicine, and the means adopted for the cure of disease are logically derived from that theory.

A very active but exceedingly small minority in China now believes that "the old order changeth, yielding place to new." and with the Westerner says.

Custom calls us to it!

What custom wills; should custom always do it?

The dust of antique time will lie unswept,

And mountainous error be too highly heaped

For truth to overpeer."

—



CHINESE COSMOGONY. (SEE TABLE I; ALSO GENESIS I,
and II, 1,2,3,).

In the beginning there was the "Extreme Limit", or, "Absolute Nothing", chaos, called *wu chieh* (無極), and this is pictorially represented as a circle in black. The *wu chieh* evolved of itself, and there was formed the *t'ai chieh* (太極), the "Great Absolute", "Great Limit", "Great Ultimate", or "Primordial Matter", this is represented as a black dot. Lao Tsi has defined the *t'ai chieh* to mean two things;—the "Great Principle" that formed the Universe, and "Primordial Matter", from which the earth was made.

The *t'ai chieh* then revolved and congealed, or generated by unions and disunions the "*liang I*" (兩儀), or "two vital essences" of the Universe. These two are the Great Principles of the Cosmic Breath, or "*ch'i*" (氣), and are called the *Yang I* and the *Yin I*. They are represented pictorially by the circumference of a circle which is equally divided by a curved line shaped something like the letter S. Quite frequently the *Yin* half is coloured black with a white dot, and the *Yang* half remains white with a black dot. The *Yang* (陽) and the *Yin* (陰) are the positive and negative principles of the dualism of the Chinese cosmogony. These forces are respectively creative and destructive, constantly uniting and separating. They are also mutual affinities, complementary to each other, and at the same time, are antipathetic to each other! Their interactions create and their separation destroys all objects in nature. A definition of all the qualities of these forces would include an interminable list of terms, that would fit into every imaginable event of animate and inanimate life. (See Table II, page 88)

The *Yang* (陽) and the *Yin* (陰) are the principles underlying Chinese philosophy and metaphysics, and are therefore the fundamental principles to be considered in any discussion of the sciences, arts, crafts, religion, magic, astrology, astronomy, *feng sui*, divination, necromancy, ancestor worship, or medicine, as well as all the social processes of Chinese life. The original meanings of the words *Yang* and *Yin* were, respectively, the bright and the dark side of a bank. They occur on the stone drums (石鼓), of the 8th century, B. C. Traces of the dual nature of Chinese philosophy occur in the "Great Plan" in the *Shu Chin* (書經). By the time of Confucius these terms signified the duality which Chinese philosophers see in all things. When the *t'ai chieh* generated the *Yang* and the *Yin*, and thus formed the first great division of nature, the process of revolution caused the coarser particles of matter in the firmament to fall downwards and form the earth, or the *Yin*, while finer, ethereal substance or essence ascended on high and formed the heaven or *Yang*. The ceaseless permutations of these two forces produced the "Four *Shiang*" (四象), the *T'ai Yang* or Greater Positive, the sun; the *T'ai Yin*, the Greater Negative or the moon; the *Siao Yang*, the Lesser Positive or the

TABLE II

YANG AND YIN

These creative and destructive forces are the fundamental principles underlying the philosophy of the Chinese system of creation.

They are mutual affinities—complementary to each other--as well as mutual antipathies. They possess catalytic action. Their interaction creates and their separation destroys all objects in nature.

They originally meant the bright, sunlit side, and the dark, cold side of a hill.

Some of their qualities, affinities, and antipathies may be categorically designated as follows:—

YANG	YIN	YANG	YIN
Heaven	Earth	Good	Bad
Sun	Moon	Strong	Weak
The Monad	The Duad	Clear	Turbid
Day	Night	Vigour }	Quiescence
Male	Female	Activity)	
Positive	Negative	Penetration	Absorption
Life	Death	South	North
Creating	Destroying	Light	Darkness
Productive	Growing	Active	Passive
Universal	Antithetical	Hot	Cold
Spiritual	Material	Vitalizing	Quiescent
Anode	Cathode	Dryness	Humidity
Acid	Base	Irritability	Non-irritability
Highest	Lowest	White	Black
Anabolic	Catabolic	Expanding	Reverting
Left Side	Right Side	Odd	Even (of
Osiris	Isis	Ohrmuz	Pythagoras)
	(of Egyptians)		Ahriman
Symbol is an	Symbol is the	Is indicated	(of Zoroastrians)
Azure Dragon	Orange Tiger	by odd numbers	Is indicated
Is represented	Is represented by	Belongs to	by even numbers
by a long line	a broken line	the ch'i	Belongs to the k'un
—	— — —	(breath or air)	(influences) blood

fixed stars; and the *Siao Yin*, the Lesser Negative or the Five Planets,—Mercury, Venus, Mars, Jupiter and Saturn.

In their continuous productions and decays, unions and disunions, which have continued from the beginning of time and are still going on there is followed an inscrutable and inevitable plan in strict accord with arbitrary, unchangeable, mathematical principles. The law is called the *Li* (理), or *Tao* (道), and the fixed form the *Su* (數).

The pictorial representation of this philosophy, is made by a series of broken and unbroken lines, called the *Pa Kua*, or Eight Diagrams (八卦). The complete representation is a digram representing the *Yang* and *Yin* in the centre surrounded by light series of associated lines. This mentally enlightens the believers in this intricate system of phenomena, which are explained and resolved into causes and reasons, powers and laws. The *Pa Kua* (see Table I), is said to be 4,000 years old and its invention is attributed to *Fu Shi* (伏羲), who copied it from the back of a tortoise. *Fu Shi* was the first of the Five Legendary Rulers of the Mythical Age of Chinese History. It is pretty well authenticated that the *Pa Kua* was the invention of *Wen Wang* (文王), the Duke of *Cheo* (周), the father of the first Chinese Emperor of the *Cheo* Dynasty (周朝). *Cheo* was formerly a tributary state of China, west of the Yellow River (黃河), in the South-East of what is now the province of Shensi (陝西). The *Cheo* dynasty continued from 1182—255 B. C. Duke *Wen* lived from 1182—1135 B. C. and wrote the famous Book of Changes *I Chin* (易經), of the Chinese Classics. In that book are recorded theories of the *Pa Kua*, which reveal the solution of every problem of life. The famous *Cheo Kung* (周公), wrote a commentary on the *Pa Kua*. He died in 1105 B. C. It has been said that the broken and unbroken lines of the *Pa Kua* represented the knotted and unknotted cords used by the primitive Chinese in their mathematical calculations. The Book of Changes is a metaphysical and numerical conception of the creation of the world, and is one of the earliest known works on the subject. Confucius accepted the dualism of that work, and he used the term Great Limit (*'ai chieh*) as being the origin of the dual principles. The Book of Changes is one of the earliest known books dealing with the numerical conception of the world, as functioning in the moral life of man. The true meaning of the book remains concealed even after many commentaries have been written on the subject.

The eight diagrams correspond to the eight points of the compass, eight different seasons, eight animals, etc. To illustrate all the innumerable changes of nature these 8 diagrams become 64 with special names, meanings and occult virtues. This ancient system was based on 6 not 5 elements and made no allowance for the planets. The Sung Dynasty (宋朝) philosophers retained the 8 diagrams, but worked out a system based on the idea of 5 planets and 5 elements.

The Chinese compass explains all the principles of Chinese physical science—male and female principles, 8 diagrams, 64 dia-

grams, solar orbit, lunar elliptic, 360 degrees of longitude, days of the year, 5 planets, 5 elements, 28 constellations, 12 zodiacal signs, 9 stars of the bushel, 12 points of the compass, etc. The compass is used in astrology, astronomy, *feng sui*, divination, necromancy and in medicine. The almanac is considered sacred, it is said that a copy of it in the house, or even a few leaves will be an excellent method to prevent and cure disease.

Chu Shi (朱熹) says, that the five elements are not identical with the five objects whose names they bear, but are subtle substances whose nature is, however, best manifested by these five objects.

It is thus logically proven according to their hypothesis, *that everything animate and inanimate is composed of the same things, which in turn were formed by the Yang and the Yin. All things, therefore, in essence are conceived by these two forces, and consequently contain them, but in varying proportions.*

An exceedingly intricate and complete scheme of "correspondences" has been developed whereby the *Yang* and the *Yin* are related to every walk and act of life. This paper will only mention a few of those concerned with medicine. Just why certain celestial bodies have been associated with certain specific elements of matter, and then with certain definite organs and parts of the body is very puzzling to the Occidental. However, it must be remembered that the Chinese authorities themselves are far from uniform in their interpretations of these metaphysical assumptions and deductions.

✓ *Man as a product of the universe, is composed of the five elements, and consequently is governed and controlled by the same laws as all other objects. He arose from the vital essences, the Yang and the Yin, and therefore, shows the same properties as do those two forces. He is a micro-organism in a macro-organism. He is a miniature heaven and earth "ren shen ih siao t'ien di" (人身一小天地)—man's body is a small heaven and earth". Man is a union of the animal soul, kwei (鬼), and the spiritual soul shen (神)—the first is the coarser part of his being and the second the finer, subtle, spiritual essence—both are from the 5 elements. At death, these two parts of his being separate, the shen goes on high to heaven or the Yang, and the kwei returns to the earth or Yin. Thus the souls of deceased ancestors are ever present in heaven and earth.*

4 The universal *Yang* and *Yin* are subdivided into an innumerable number of spirits, actuating the living and the dead. Death is, only apparently, a loss of earthly existence. Life and Death are but transitory phases of the same matter. The 5 elements correspond, in man, as follows; metal to the lungs and the small intestines, wood to the liver and the gall-bladder, water to the kidneys and bladder, fire to the heart and the three burning spaces, and earth to the spleen and stomach.

The *Tao* is the mother of all things—the originator with limitless resources, unseen, all-prevading, all-powerful—it cannot be apprehended with the finite senses. Thus we have a fundamental principle, highly



idealistic and profoundly abstract. To obtain long life and immortality it is necessary to obtain the *Tao*. It is to be remembered that *everything existing on the earth has its counterpart in the heavens and vice-versa*—all are ruled by the *Tao* which in its subtle essence is the celestial bodies. The sun is the male and the moon the female principle, and the 5 planets have their counterparts in the ceaseless changes of the 5 elements. The number five is most important in the Chinese theory of nature. The 5 elements have their counterparts in a bewildering series of fives, almost endless, deviating into every social process, with complicated adjustments and incomprehensible applications. Each element has a parent, child, enemy and friend element corresponding to it e. g. water has metal for a parent, wood for a child, earth for an enemy, and fire for a friend. In compounding drugs all of these have to be considered more carefully than the Western physician thinks of the properties of his drugs. It is the idea of incompatibles extended to the *n*-th degree. To each element there correspond 5 tastes, 5 colors, 5 musical notes, 5 ranks, and 5 qualities. There are also 5 minerals, 5 grains, 5 fruits, 5 sacrificial animals, 5 guardian mountains, 5 virtues, 5 degrees of mourning, 5 blessings, 5 shapes, 5 smells, 5 senses, etc. When one takes into account all of these with the sun and moon, constellations and planets, 12 signs of the zodiac, 28 asterisms, and from 54—72 varieties of pulses, one need scarcely wonder why there are so few real doctors in China. The above is a beginning of the complexity of the problem, all these and far more peculiarities are to be reckoned in the diagnosis, treatment and prognosis of disease according to Chinese principles of medicine.

To the Chinese philosopher and medical man, climatic change is directly related to the moral as well as the physical well being of man. From instant to instant the force and direction of the cosmic currents, *Yang* and *Yin*, the spiritual progressive and destructive movements, the negative and positive magnetic energy, if you care to so designate it—are modified by the sun and moon and other heavenly bodies. The constant changes in the heavens are correlated with the constant changes in the earth, the seasons, life and death, growth and decay. Heaven, or it might be said "climate" rules all. The power exerted by heaven on earthly things varies with the position of the heavenly bodies in the elliptic (黃道), *hwang tao*, and in the azimuth. Hence the importance of the compass and almanac in medicine.

The *Li* (理), or *Tao* (道), is by nature good, hence man is by nature good. But the *Tao* is inseparable from the material *ch'i* or ether, as its grossness more or less impedes the spiritual *ch'i*. *Moral differences and disease are consequent on the degree and amount of the fineness of the ether. Grossness in the ether impedes the progress of ethical principles and causes disease. Fineness of the ether allows illustrious virtue to be displayed and all being in harmony, good health is produced.*

Beginning with the first dawning alchemy of spiritual ideas in the mind of early man, there developed an instinctive appeal to spirit

forces when evil of any sort threatened. The celestial bodies were regarded as manifestations of supernatural forces, because those bodies were the perfections, emanations or attributes of God or of the gods. God influenced the angels, who in turn influenced the planets and these in turn influenced man. Each of the planets exercised a special action on a definite part of the body, and at the same time was associated with a metal, which in turn cured certain ills of the body. The science of these influences was called Astrology, and the art of suiting the metals to the needs of the body was called Alchemy. In early times astrology was the eye and alchemy the mouth of medicine. These beliefs extended to at least the 18th century of our era. To illustrate the practical results of the principles that underlie the practice of medicine in China, I have chosen to discuss alchemy, because it shows the application of those principles so clearly, and because it is intimately associated with medicine from very ancient times.

The abstract and speculative pseudo-science of alchemy was founded on the assumption that from the continued unions and disunions of the *Yang* and *Yin* the five elements of which inanimate and animate matter is composed gradually change into each other. Since man is formed of these elements, the same principles are at work and consequently an intimate interrelationship has developed between medicine and alchemy.

There are two grand divisions to the art of alchemy:—

1, *Lui tan* (內丹), or spiritual alchemy, by which through such ascetic processes as isolated and contemplative communion with nature, self-denial and devotion, together with the use of natural mineral and vegetable drugs, the body becomes gradually transformed into the ethereal being, *shen* (神), and thereby attains perfection.

2, *Wai tan* (外丹), or material alchemy, which aims to transform inanimate material, especially metals, into spiritual essences.

Thus man's two great desires, long life and immortality, are combined. In this we see the close connection between religion and medicine, a contact that in earlier times was most intimate, but which modern science has tended to reduce to the almost irremedial loss of both great social processes. Taoism had the same aim as alchemy, and in China, therefore, alchemy became a branch of Taoism, or, at least, the two were most intimately associated. The Taoists were said to have discovered an elixir vitae.

The dualism of nature according to Chinese philosophy, permeates the material and spiritual universe. At birth man is the union of the two spirits, *kwei* (鬼), and *shen* (神), at death, the former or *Yin* element returns to the earth, while the latter, or *Yang* element, returns to heaven. The body, in harmony with the *Tao*. (道), is immortal, and the problem was how to free the body from death. Thus arose the art of alchemy. The Chinese term is *chin lien tan* (金鍊丹), the golden pill of immortality. To obtain this immortality two methods were used:—

- 1, A comprehensive regimen of mental and physical discipline.
- 2, A regulated and selected diet, of articles containing vital essence or force.

In the former, immortality is gained by proper breathing, physical exercises and mental training. Proper breathing is called *lien ch'i* (鍊氣), i. e. transmuting the breath into soul substance, or the vital essence from the air. "Blowing and gasping, sighing and breathing, passing time like the dormant bear, and stretching and twisting the neck like a bird, etc", was part of the advice of an ancient Chinese authority on the subject. Physical exercises as a means of acquiring the vital essence were advocated by Lü Puh Wei (呂不韋), about 237 B. C. He said "vital essence is not collected or condensed in the body unless it enters it collected in the holy man it forms far reaching intelligence But it is motion that prevents streaming water from putrefying, a door pivots from being attacked by insects. Thus it is with the body and its breath. If the body is motionless the vital essences do not stream through it, if they do not do so the body is depressed; this depression may settle in the head and cause headache and boils; it may settle in the ears and cause bad hearing and deafness; in the eyes causing dimness of vision and blindness; or in the nose and cause catarrhal obstruction; settling in the belly causing tension and constipation; settling in the feet, it may cause lameness and weakness If the breath is renewed every day and the bad breath entirely leaves the body the man may reach the age of heaven itself. Such a man is a saint." (DeGroot).

Hua T'o (華陀), the Chinese God of Surgery, said "the human body needs work, when it is in motion the food is digested, and the blood circulates in the arteries in all directions. Hence it is that the immortals of ancient days, while performing the inhalation system or process, and passing the time as dormant bears, looking around as owls, twitching and stretching their limbs and loins and moving the navel gates and their joints hindered the advance of old age. I have an art called the sport of the five animals, viz.—a tiger, a stag, a bear, a monkey and a bird, by which illness can be cured and which is good for the movements of the feet, when they accompany the inhaling process; whenever you feel unwell, stand up and perform the movements of one of these five animals; when you feel more comfortable and in a perspiration, put rice powder on your body and you will have appetite."

The cosmic soul, the *Yang* and the *Yin* permeate all things, but in different proportions. The proof is that if certain substances are eaten they are invigorating,—these possess the *Yang*; others with the opposite qualities are imbued with the *Yin*. The former are life-giving, and the latter life-destroying substances. Thus arose the concept of *vitalized things*. The chief vitalizing substances of the mineral kingdom are cinnabar, gold, silver and jade; in the vegetable kingdom the pine tree and the peach; in the animal kingdom the crane, the common house fowl (the cock) and the tortoise. "Peach

resin steeped in the secretion of mulberry ashes if eaten will cure all manner of diseases. If eaten for a long time one's body becomes buoyant and luminous. On a dark night the body will appear as the moon." Cinnamon has a very wonderful power of restoring the harmony between the *Yang* and the *Yin*. A sample of it 14 inches long by 4 inches wide and 3 inches thick was valued at \$1,000, Mex. Pao Puh Tsi said that cinnamon taken with toad's brains for 7 years enables one to walk on the water and never grow old or die. Chao, the hunchback, took cinnamon for 20 years and hair grew on the bottom of his feet, he could walk 200 miles in a day and lift 1,333 lbs. (Read., "Gleanings from old Chinese Medicine").

Cinnamon mixed with onion extract and steamed till liquefied, then eaten with bamboo sap mixed with the brains of a tortoise, if taken for 7 years enables one to walk on water and not die.

Cinnabar and honey—mixed in a certain way if eaten for a very long time will cause white hairs to turn black and teeth to grow again. If an old man takes it for long enough he will become young again.

The elixir of immortality includes the *lue tan*, the esoteric drug of the immortals, and the *shen tan* (神丹), the divine drug containing the *Tao*. "The elixir of the eight precious things, is so called because it contains cinnabar, realgar, sulphur, saltpetre, ammonia, emptygren (an ore of cobalt) and mother of pearl (a kind of mica)". No proportions are given nor the manner of the preparation. "To make search for this golden elixir is difficult, the sun, moon and stars must seven times make their circuit, and the seasons must nine times retire. You must wash it until it becomes white, and beat it until it becomes red. This if taken endows one with 10,000 eons of longevity." (Pao Puh Tsi, Lue Pien, chap. VII & VIII).

Thus underlying the transmutation of the metals is the monistic philosophy of the *Tao*—the *ch'i* (氣), whose manifestations are the *Yang* & *Yin*. Taoism, with its abstract, philosophical reasoning, aided by severe physical and mental training, assured good health and immortality after a great struggle. Such a subtle regime could only be obtained by an elect few who had the mental equipment and the determination to make the search; it was not practical for the common people, and as a consequence degenerated into magic and necromancy.

The introduction of Buddhism, in the later Han (後漢 times A.D. 56—76 brought hope to common mortals by assuring them that immortality could be obtained through faith in the might and mercy of Amida Buddha. Buddhism with its highly impressive and strongly developed outward forms was a direct challenge to Taoism. So Taoism, to remain influential and to more nearly meet the public demands, became a religion with priests, temples, monasteries etc. Both religions promised immortality and as a consequence were rivals; this stimulated the devotees of each to search for drugs that were immortalising

in quality. During the process of this search many valuable remedies were discovered. However, quite naturally, magic, necromancy, astronomy and astrology were rejuvenated and grew apace. Today, Taoists worship idols, exorcise demons, and are fortune tellers, geomancers, dealers in witchcraft and the preparers and sellers of all manner of charms and amulets.

Alchemists and believers in the practice consider that "the stars are the sublimated essence of things. As the soul is the essence of matter and the purest form of matter in the body, so there are essences belonging to other things, which when very pure, obtain a life and individuality of their own. Of these a series of five corresponds to the five modes of substances found in material matter, viz:—metal, wood, water, fire and earth. The souls of the five elements rise, when highly purified through the air to the region of the stars and become the five planets.—Mercury is the essence of water, Venus of metals, Mars of fire, Jupiter of wood and Saturn of earth. The fixed stars are also the essence of the souls of matter, and other essences believed to wander through space impelled by an active internal life are also called stars though not visible in the heavens." (Edkin "Religions of China".) The celestial bodies possess divine attributes and exert a vital influence on human destiny. The fixed stars have various terrestrial affinities with certain regions in China.

"The cosmic breath which animates vegetation, animal life, man and the dead, waxes and wanes with the cycles of the sun and moon." (Ency. Sinica, P 38.) Thus can we account for the Chinese theory of the pulse in man, going in tides, and for the differentiation of the many varieties of pulses characterised as those of the *Yang* and *Yin*.

According to DuHalde—"Two great forces are latent in the human organism, and by their co-operation life is supported. The one is *Yang* the principle of heat and dryness, the other is the *Yin* the principle of cold and humidity. . . . The normal state, that of perfect health, cannot exist save as those two principles exist in perfect equilibrium, The *Yang* is heat, irritability, the *Yin* the moderating influence on the nervous system. . . . The blood is dependent on the *Yin* the passive principle, and the vital breaths are dependent on the *Yang*, the active principle". These are the vital breaths that agitate the pulse as the wind does the sea. "The action of the blood and the vital breaths cause the blood vessels to expand, causing thus the phenomena of the pulse, which varies in different organs. . . . The pulse, the Chinese believe, records for every region the exact state of harmony or disharmony of the *Yang* and *Yin* principles, that is to say the health and disease in each organ." (E. Vincent). The heart is regarded as having the nature of fire, the liver of wood, the kidneys of water and the stomach of earth. In the preparation of medicines, therefore, account must be taken of the dominance or the lack of it in the human body of the forces of the *Yang* and the *Yin*, and the respective relationships of the five elements

with the five organs of the body. Special materials are supposed to be influenced by special celestial bodies—gold is associated with the sun, silver with the moon, copper with Venus, tin with Jupiter, lead with Saturn and quicksilver with Mercury.

It seems fair to conclude that the principle underlying Chinese medical practice is the theory of the *Yang* and the *Yin*, and further that all orthodox medical procedures are the result of the application of the theory of dualism in Chinese Cosmogony.

Chinese Anatomy and the Twelve *Chin*, or Channels.

In a paper of this length it is impossible to show how the Chinese practitioner applies the principles of his profession. However, I shall touch upon an item or two. The writer is indebted to Mr. Ch'en, the Chinese Secretary of the West China Union University, for the charts of the *T'ong Ren* herewith attached, as well as for correcting them and for much valuable advice on Chinese medical matters.

Chinese anatomy is based on an abstract, philosophical theory, and is not developed from dissection. It contains many speculations and hypothetical assumptions. Actual dissection for the purpose of testing their theories has not been carried out. Their knowledge is founded on the hasty observation of dog-torn human remains or organs removed from the bodies of executed criminals by the executioners themselves and not by anatomists or doctors. There has been no investigation of comparative anatomy. Their nomenclature is not clear, and often impossible to interpret except in the obscure terms of metaphysical reasoning.

Chinese anatomy consists of a vague knowledge of some of the organs of the body, but their illustrations are erroneous and far from exact. Moreover, they assume for the purposes of their theory a number of organs that do not exist, and postulate a series of tubes, called the twelve *Chin*, which are not to be found on dissection. Their knowledge of the bones is superficial and shows lack of observation and care, for human bones are abundantly evident in this country where graves are shallow and dogs numerous.

The muscular and nervous system is not dealt with in detail, the brain occupies but a small part of the skull case (see chart). The larynx is said to open into the heart, which possesses three divisions and rests on the fifth vertebra. The lung lies on the third vertebra, has eight lobes and is pierced by eighty holes. The liver lies on the ninth vertebra and has seven lobes. The small and large intestines have each sixteen convolutions. The gall-bladder is likened to a wine sack. The bean shaped kidney lies on the fourteenth vertebra. The *san chiao*, or three burning spaces are purely imaginary, but occupy a position of great importance in Chinese anatomy, physiology and treatment. The facts that have been

mentioned are based on a treatise that one of the most famous educators of China gave me some years ago. These fourteen stories I have translated, but space forbids more than a mere mention of the fact. This gentleman frequently visited our dissecting room, but nothing that he saw seemed in any way to convince him or alter his opinions. When it was demonstrated to him that the twelve *chin* did not exist he said, "yes they cannot be seen but they are there". His theory was certain in his own mind and the dissection if it did not conform to the theory must either be wrong, or the twelve *chin* were invisible to the eye. When questioned closely and apparently cornered he turned to the wall on which was a chart illustrating the venous and arterial circulation and said "can you see the change that goes on between the two blood systems?" no, was the reply, "that is the same with the twelve *chin*" said he.

An inspection of the charts will show the complex series of twelve tracts or *chin*. The round holes are the places at which a needle can be inserted, supposedly with safety. From the method, as I have seen it practiced, the safety is more on the part of the operator than the patient. The procedure is called acupuncture, and is carried out with gold, silver or brass needles from 2 to 20 cm. long. The skin is drawn taut, the patient is told to cough and with a deft twisting motion the needle is thrust in. The preparation of the needle before the operation consisted in wiping it off on a very dirty coat; spittle was then used and the operation performed. I have seen needles inserted into the eye socket, up the nose, into the liver, into the root of the neck (just above the suprasternal notch), into the knee, elbow, wrist and ankle joints and many other places. This procedure is very common. After the needling, it is a common practice to burn moxa over the point of insertion. This procedure, the object of which is to regulate the vital essences (*Yang* and *Yin*) in the body, is not found in the medical practices of any other nation. These intangible forces of creation and destruction operate through the twelve channels, which are also invisible to the naked eye. These vital essences are in every part of the body, although certain parts of the body are more heavily charged than are others. The head, eyes, and ears are as it were storage batteries of these spirits.

The theories about these channels were originated by Hwang Ti (黃帝) who is said to have lived about 2697 B. C., and they represent present day ideas on the subject, with little or no modification. In the Tang dynasty (唐朝) Sen Si Miao (孫思邈) 630 A. D. collected the treatises of those who had written previously on the subject and wrote "Acupuncture and Caution". He mentioned 650 needling points. In the Sung dynasty an emperor ordered Wang Wei (王維), about 960 A. D., to construct a bronze image on which were marked the various needling points according to the latest anatomical ideas. The charts here published are representations of that bronze figure.

The *Yang* and *Yin* principles have each three degrees of quality. When there is disharmony in quantity it is made manifest by corresponding differences in the distribution of the blood and gas in the arteries, hence the great number of the pulses, some 54 to 72 are to be differentiated by the expert. Much could be written on this subject, but for the present the procedure will not be further discussed.

CONCLUSIONS.

Chinese medical practices began more or less mythologically about 4,000 years ago. Fu Shi (伏羲) and Shen Lung (神農) the first two of the Five Rulers of the Legendary Age of Chinese History, may be said to have been the progenitors of the ancient craft of Chinese physicians.

From this beginning in the dim mists of antiquity, an apparently gradually advancing evolution in Chinese medical procedures can be discerned. This continued for about 3,000 years, but since that time, nearly 1,000 years ago, their beliefs and procedures have been little altered.

It may reasonably be assumed that a spreading of culture occurred in very ancient and early historical times and that the Chinese system of medicine was influenced by these cultural drifts, no matter where they originated. Speaking broadly, however, the development of Chinese medicine has been *comparatively* independent. Chinese medicine, therefore, presents a unique opportunity for the study of medical history from a very early time, extending practically without change, to this present day. It is an exceedingly attractive study of the racial and cultural aspects of a truly great and spontaneous people of more than average ability. But why such a superior type, with a high grade civilization should be so lamentably weak in their medical procedures, is a Chinese puzzle indeed.

The Chinese attitude is quite characteristically a philosophical one. Fine metaphysical reasoning is natural to them. According to their philosophy of the universe all objects, animate and inanimate, are composed of the same five elements and all are governed by the same laws which are intimately associated with the movements of the celestial bodies. One general law of the universe governs all.

The Chinese attitude towards healing probably developed as follows: --1, an instinctive reaction common to all humanity; 2, metaphysical, tending strongly towards magic; 3, a combination of philosophy and magic with a veneer of religion.

There is in Chinese medical procedures a belief in a mysterious power in the forces of nature and in natural objects. This force is obscure and incomprehensible, unseen and powerful, benign and malignant. It may be religious in content. Medical and religious practices are complementary to each other, and fade naturally and imperceptibly into one process. Under certain conditions and with

certain peoples magic and superstition more or less take the place of religion. The Chinese seem to combine magic, superstition and religion with their medical practices. Medicine, astronomy, astrology, *feng sui*, necromancy, divination, ancestor worship, magic, demonology and religion are all inextricably mixed, as all of them have a common origin in the Chinese theory of Cosmogony.

The earlier medical practices of the Chinese reveal real knowledge of the healing art, and contained elements full of promise for future development, but those same practices are in common use today. The philosophical background is unassailable and arbitrary. It has petrified any tendency towards evolution into a rigid theory of arbitrary and unchangeable practice.

“Blessed is he who maketh due prooffe,
With due prooffe, and with discreet assaye
Wise men may learn new things every day.”

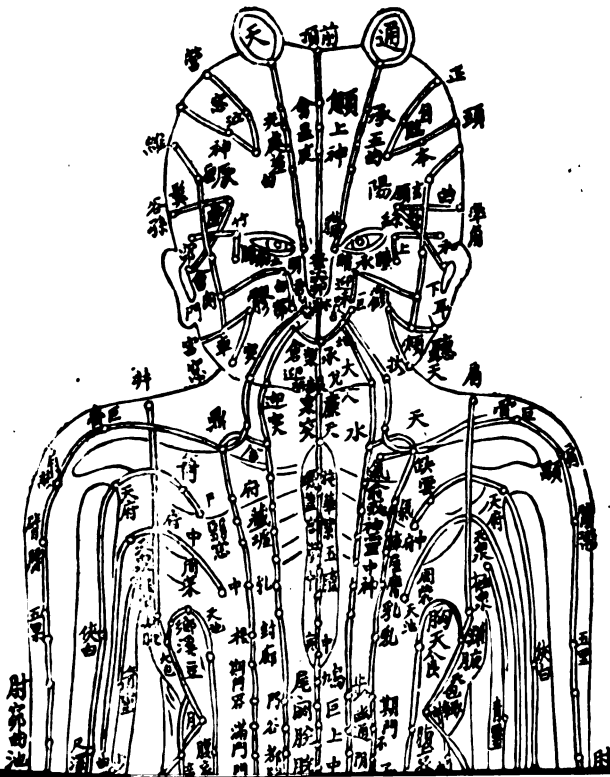
Thomas Norton.

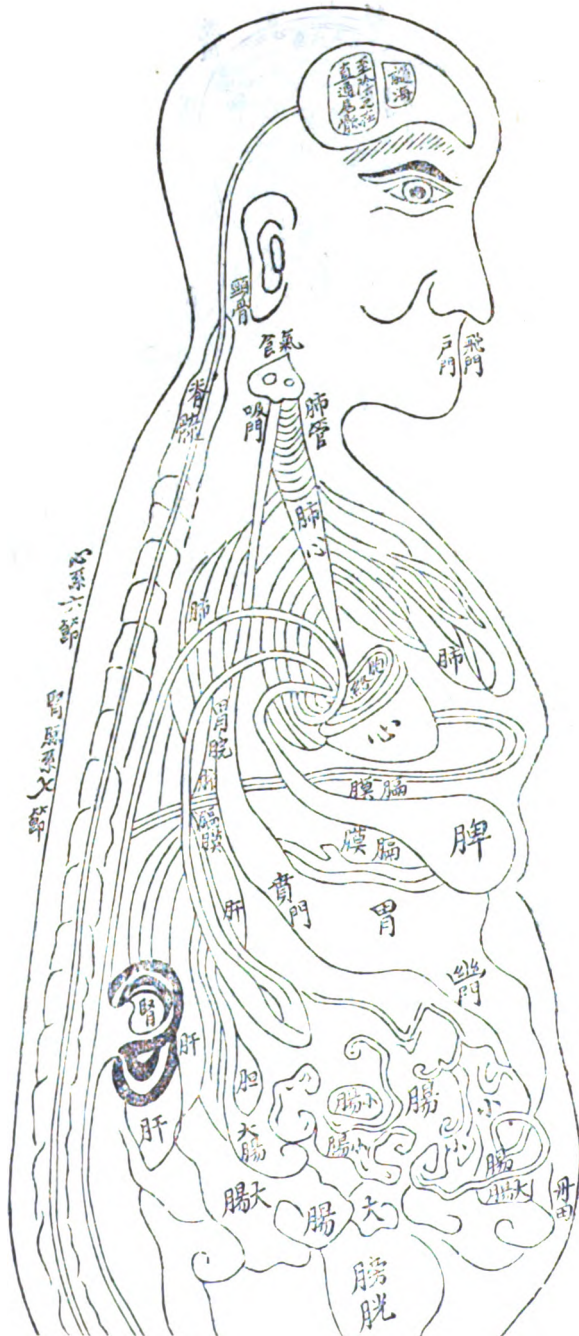
That the Chinese healers, by whatever name they are called, searched for facts is amply proven by their alchemy and their intricate deductions and methods in other procedures. They searched for and discovered facts. Some of these were themselves valuable and others were capable of great development. But there was not present a willingness to alter previous opinions as soon as new facts were presented. The latest information was forced to conform to the old hypothesis or was discarded. Their minds were closed to scientific advancement in *medicine* soon after the preliminary stages were passed. Without the quickening influence of a method of critical examination their philosophy and their methods became scholastic and dogmatic. Individual initiative was crushed and through abstract reasoning was hidden by a veil of mysticism.

“ Man, proud man,
Drest in a little brief authority,
Most ignorant of what he's most
assured,
His glossy essence, like an angry
ape,
Plays such fantastic tricks before
high heaven,
As make the angel's weep; who, with
our spleens
Would all themselves laugh mortal.” Shakespeare.

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THE ANCIENT CITY OF MENG HU¹

J. H. Edgar

Some years ago the Rev. J. Jenson of Yachow mentioned the legend of a ruined city in the unsurveyed plateau near the junction of Ch'ing Ch'i, Jung Ching, and Opien districts. The writer, ever on the look out for El Dorados and Phantom Cities, found difficulty in obtaining anything but a mass of conflicting rumours and fantastic suggestions. No one would admit visiting the mysterious locality, or if they knew of friends who had, they were safe from the ordeal of interrogation. A mosaic, however, of fact and fiction may be of some interest. Meng Hu city was far from anywhere on a plateau of the K'iuung Lai or Ki'ung Tsoh Range² (Ta Hsiang) and was equally unapproachable from any known centre. The city was on an immense plain which was robed with a dense forest in which were trees of gigantic girth. It was evidently wetter than Assam, and its snakes put India to shame. Moreover, leopards and wolves preyed in the sombre woodlands. Apparently, too, denizens from the spirit land found it congenial, and it is affirmed that 81 years of exorcising will be necessary to make it normal. But any rash attempt to cultivate the plateau will bring a famine on Jung Ching as a previous colonising effort had ruined Ch'ing Ch'i. But when it is finally exorcised, and its possibilities exploited, the millennium will come.³

When detained at Jung Ching by brigands the writer carefully scanned the local history. As the city was an ancient one and during the Hsia, Shang, and Chow Dynasties the centre of Pa Tsong and Ti Ch'iang, and was held by the Liao in the Ch'in, Sung, Ch'i, and Liang periods, the "Antiquities" Department promised items of interest. And such proved to be the case, for therein was found an account of "ve" ancient city of Meng Hu. "To the South of the city of Jung Ching" says the extract "at the junction of three districts (but within our jurisdiction) on the Yün Pan plateau, near the Hwang Sha River, is the traditional site of Meng Hu's city. A decade previously our citizens became interested and began to investigate the rumours. The result was that a wall with grass inside sufficient to cover a man was found, and in due time 30 to 40 colonists, mostly from Han Yuen, settled there, etc., etc."

But who was Meng Hu? He was a native chief in the days of the Shih Han. About 223 A.D. when the war with Yunnan was being waged he refused to join China. In the course of some years he was captured seven times by Wu Hou and liberated at once. The seventh time he refused his freedom and made the historic remark "(no;) since Ch'eng (Wu Hou) has proved that he fears God the South will not again rebel."⁴ From this note we conclude that if the city is a phantom Meng Hu was, nevertheless, a real man and by no means unfortunate in his enemies.

1. 孟獲

2. 邛崃 or 邛笮

3. 世界無窮人

4. 丞相天威南人不復反

DID HSUAN TSANG VISIT THE WEST OF CHINA AFTER HIS RETURN FROM INDIA ?

J. H. EDGAR

Hsüan Tsang, or Yüen Chwang, the famous Buddhist pilgrim was born near Honanfu in 605 A. D. He travelled about in China for some years and then set out for India in August 625 A. D. We know he reached his destination by the "Western Route:" that is through I li to Issyk-kul and west to the Chu River. Then passing southwest to Tashkent and crossing the Oxus he entered India via Kashmere. On his return journey he followed the "Middle Route" and went northeast to Yarkand. The Jung Ching History mentions a tradition that Hsüan Tsang practised asceticism in the Shai Ching¹ Temple near that city. The histhorian promptly rejects the tradition as impossible in face of the historical certainty of the pilgrim's routes to and from India. But I was surprised to find the same story with some more details current in Ch'ing Ch'ü. Here it is claimed that a Buddhist priest of the T'ang Dynasty, when returning from India, found that his precious sutras had been damaged by water, and at a point 48 li from the city spent some time drying them. Many years ago, also, an inscription was shown me in a Hsin Ching Temple which it is said commemorated a visit by the "T'ang Sen"². Another tradition associated with Yüen Chwang is that, when in India, he was given a seamless Celestial garment. Later he made his home in the great "Lake Temple"³, and on his departure later left the robe there. "It is probably still extant." It would be interesting to find the cause of the persistency of these traditions. Is it likely that Yüen Chwang⁴ made a detour to Szechwan on his return? I am not aware of any such event. But another solution is suggested. Is the earlier pilgrim Fah Hsien intended? He left China in 399 A. D. and reached India by the "Eastern Route" but returned by sea. In making his way north from some southern port he may have passed up Chien Ch'ang valley to Chengtu. The only other explanation that occurs is that the priest who came from the "Hsi Yü"⁵ during the Posterior Han (936-948 A. D.) with the famous Tea Bushes, now on the Meng Shan may have been mistaken in the minds of the ignorant for his very famous colleague of the T'ang Dynasty.

1. 晒經寺
2. 唐僧 Hsüan Tsang or Yüen Chwang, see note 4.
3. 大湖寺: also at Jung Ching Hsien.
4. 元奘 or 玄奘
5. 西域 or 域

THE STONE AGE IN CHINA

J. H. EDGAR

No one who has considered this subject will deny the existence of a Stone Age in China. But so far no one has been able to prove the identity, or historical setting, of the tribes who used the great variety of implements reposing along the Yangtse banks and in the mountains of Tibet.

The writer has found scores of implements of various kinds, and perhaps representing different cultural stages; but he has looked in vain for hints from Chinese authors which might help to solve the mystery. However, lately, when reading a translation of the "Historical Classic" or Shu Ching—by W. G. Old, he was surprised to find in the "Tribute of Yu" a twofold mention of stone implements. We are told that the King Chow (Province) sent, among other things, "grinding stones, whet stones, and stone arrow heads." Then among the items from the Liang Province—sections of Szechwan and Shensi "were iron, silver, steel, (and) stone arrow heads." Now this happened in B. C. 2203 or more than 4000 years ago. But a glance at the other items of tribute from these two provinces will convince us that the civilization was even at that time of a kind much more advanced than that usually associated with neolithic men. For instance, iron and even steel are mentioned. And from other entries also, we are forced to conclude that the stone arrow heads, if related at all to the cultural remains in our museums, must be an unusual projection of neolithic art into a well advanced Iron Age. But in any case, it may be that an exceptional survival of Stone Age men is here recorded as being acceptable to a ruler who was very cultured and very active 4100 years before the Great War in Europe.

THE LOLOS OF SZECHWAN*

D. C. GRAHAM

In southwestern Szechwan there lives a race of people who are known as Lolos, but who call themselves Noso. They generally inhabit the higher altitudes, while the lower and more fertile lands are occupied by the Chinese.

The Lolos are taller and darker than the Chinese, and they have higher and thinner noses. Their eyes are brown, and while they have the Mongolian slant, it is not so pronounced as among the sons of Han. Their hair is generally black and straight.

Many Lolos wear long, sleeveless robes of wool or felt that reach from their necks to their ankles. When the wearers squat down on the ground, these robes make what are not unlike small, warm tents. The hats of the women resemble old-fashioned bonnets. Both men and women wear earrings, some of which are made of silver, and some of red coral. Straw sandals are sometimes worn, but it is customary to go barefoot.

The Lolos do not generally use chopsticks. They have large, wooden bowls, out of which they eat with wooden spoons. Their stoves often consist of hoops of iron which stand on three iron legs. A fire is built underneath, and the cooking utensils are placed on top of the hoops.

Most of the Noso are agriculturists. They raise pigs, horses, cattle, sheep, goats, and chickens. They plant corn, wheat, buckwheat, rice, potatoes, and other vegetables. They thresh their grain by flailing.

In former days bows and arrows (the arrows were sometimes poisoned), long spears, swords, and knives were used in hunting and in war. In battle the warriors were protected by thick leather armor. Today modern firearms are employed, and leather armor is a relic of the past.

There are no definite months. The year begins and ends sometime in the Chinese tenth moon. Besides the New Year, there are two holidays, one in the Chinese fifth moon and one in the eighth.

*Note:—These data were gathered during a trip to Ningyuenfu in the summer of 1928. Most of them were secured near Fu-lin, and may not be true among all the Lolos, who are also found in Yunnan Province. Allowance must be made for possible variation in different localities.

There is a written language differing both from the Tibetan and from the Chinese. It is understood only by the priests or shamans, and is used in reading and writing the sacred books.

The Lolos are lovers of strong drink. They often become intoxicated, and even their chiefs will bow very low and beg the traveller for money with which to buy liquor.

They are also lovers of music. Among other instruments, they use the flute and the mouthharp. The music of the latter is low and alluring. The Lolo have many folksongs.

Nearly everything in the universe, even inanimate things, is either male or female. For instance, a flower might be considered female and a tree male. This resembles the Chinese *yin-yang* conception.

Many of these people are afraid to have their pictures taken. They believe that when the photograph takes the picture of a person, he secures some or all of that person's soul, or at least a vital part of him, and that the subject of the picture can be injured by doing harm to the picture.

The Lolos are divided into many tribes or clans. The members of each clan are bound together by blood relationship, and all have the same name. For instance, the Liu clan may consist of over three hundred families, all related, and all named Liu. They must not intermarry, but they may marry with any other similar group of Lolos. Descent and relationship are reckoned primarily through males—the clans are patrilinear and exogamic. Members of the same clan render mutual aid in times of calamity or of war. Each clan has its headman, and sometimes there are rulers of larger groups. Kings were done away with soon after the Chinese Republic was established.

Engagements are made through go betweens. The bridegroom's, family give the family of the bride three cows, three sheep, one pig two rolls of cloth, a jar of wine, two quarts of rice, and a ring for the finger of the bridegroom.¹ On the arrival of the three cows and the other gifts in exchange for the bride, the family of the bride must give a feast to those who have brought the gifts, killing first a pig, then a sheep (no two-legged creature will do). If the gall bladders of the animals killed have gall in them, the marriage will be fortunate, and may be consummated. If there is no gall, the young people must not be married.

On the day of the marriage, the brothers and male relatives of the bride escort her to the bridegroom's home. She may ride a horse or a mule, but if the road is so bad that an animal can not be ridden, she must be carried on a man's back. When the bridal party has arrived, the bridegroom's relatives must kill at least two cows and a pig, and give a feast to the bridal party, and there must

1. Note. — This custom probably varies in different Lolo groups.

be plenty of wine. If all the food can not be eaten, the bridegroom's relatives rub the remaining food on the bodies of the relatives of the bride. This is a way of making fun of them because they can not eat it all. Songs are sung to welcome the guests, and in praise of the bridegroom's relatives. All drink wine until they are intoxicated, after which the guests depart—sometimes after there have been quarrels and fights.

Sickness is supposed to be caused by demons. Hence the shaman or priest, who is called a *be-muh*, is an important factor in avoiding or healing disease. If a person is sick, or is afraid that he is going to become ill, a priest is called. The sick person is carried out into the open. First, the shoulder-blade of a sheep is burnt. Then a cow is led around the sick person seven or nine times, after which the cow is killed. From the shoulder-blade of the sheep it is divined whether the cow must be male or female, and what color. When the cow is about to be killed, the clothing of the sick person is placed on the cow. Then the sick person puts his mouth to the mouth of the beast, and blows his breath into it. After the cow has been killed, the priest burns as an offering one tenth of the meat, and the remainder may be eaten by the priest and others. A straw man is made, and meat and some of the blood is placed on it. Then it is carried around the sick person. It is finally carried away and deposited by the side of one of the main roads of the district.

When a person dies, cloth is used to wrap his arms against his sides, and his legs against the front of his body in a doubled-up position. The body is wrapped to two poles, which are used for carrying the corpse. The dead person is thus taken to the funeral ground, where an animal is killed, a cow by the well-to-do, or a pig by the poor. The corpse is carried over the dead animal, after which it is carried to the burial-spot.

The funeral grounds are sacred groves. The trees must not be used for any other purpose than the cremation of the dead. The wood of the trees of the sacred grove is used to burn the corpse. No other wood can be used. When the body has been reduced to ashes, the ashes are covered up with dirt. Then the living relatives and friends return to the home of the deceased, eat the flesh of the animal, and drink wine. Poor people cremate their dead and merely cover them up with dirt. A few of the more wealthy use coffins and bury the dead much like the Chinese, from whom this custom has evidently been borrowed in recent times.


Priests or *be-muh* are taught by other priests. As has been said, they have a script that is neither Chinese nor Tibetan. They have sacred books which only the priests can read. The *be-muh* conduct the ceremonies for the exorcising of demons, for the healing of diseases, and for securing rain. Generally the Lolo have no temples.

When the crops are threatened by prolonged drought, a priest is called to pray for rain. A cow is killed. If the meat is burnt,

the priest gets the skin. If the meat is not burnt, it must be eaten. Some burn a sheep's shoulder-blade with the meat.

Before going to battle, a cow is killed. The skin is hung up, and the warriors pass under it, after which they drink wine mixed with the blood of the cow. There are a number of warsongs.

The Lolos have only one god, who is called in Chinese *t'ien' p'u sah* (天菩薩). This means the sky-god, or the god of heaven. He is invisible, and has no image. He is depended upon for good crops, victory in war, and for all other blessings. Many of the men wear their hair done up into single knots above their foreheads to symbolize this god. A Christian Lolo told the writer that his fellow tribesmen find it easy to identify their god with the Christian God. He believed that the two gods are the same, but that the Christian conception and revelation are superior.



MORE NOTES ABOUT THE CHWAN MIAO.

D. C. GRAHAM.

The Chwan Miao say that their ancestors were brought to Szechwan by the Chinese in order to help populate Szechwan, and that they were brought with their hands tied. They believe that they are related to the Chinese, as is shown in the following legend.

In the earliest known times the Miaos and the Chinese were all one family. Originally there were two brothers having the same father and mother. The Miao was the older and stronger brother, and the Chinese was the younger and weaker brother. The parents died and were buried. The brothers separated and lost all trace of each other. They both worshipped their ancestors at the same graves, but not at the same time of the year, so that they did not meet. The younger brother, the Chinese, worshipped later in the year so that the older brother, the Miao, did not notice it. After many years the younger brother began to worship earlier, and the older brother noticed that someone was worshipping at his ancestral grave. "Who is doing this, and what is he doing it for," he asked. Then he began to watch, and finally caught the younger brother. A disagreement ensued. They did not recognize each other, so each blamed the other for worshipping at his ancestral grave. Instead of fighting they went to law about it. The official asked the Miao, "What proof have you that this is your ancestral grave?" The elder brother replied, "I have buried a stone grinding-mill a certain distance to the right of the grave." He asked the younger brother the same question. He replied, "I have buried a brass gong a certain distance to the left of the grave." The official sent men to dig, and found both the grinding-mill and the gong. Then it became known that the two were brothers. However, in the centuries that followed, the descendants of the two brothers grew apart, their languages became different, so that they forgot their common ancestry and the Chinese denied it altogether. Moreover, the Chinese descendants have become more powerful, so that the Miaos are now the younger and weaker brothers and the Chinese are the older and stronger brothers.


When a Chwan Miao dies, a man called *k'uh gi*, which means open the way, opens the road to the happy land for the soul of the deceased. He takes a bow and an arrow of bamboo and a knife. He kills a chicken, the soul of which leads the soul of the deceased to hades. He does not shoot the arrow, but relates when and where the deceased

was born, where he has been and lived, and when and where he died. The *k'ah gi* generally conducts funerals only. There is the *dan gong* who is called in other situations, such as in sickness.

Both the *k'ah gi* and the *dan gong* are "called" to their work. In a dream an old man comes to them and calls them to open the way of some soul to hades or drive away the demons that are causing sickness.

There is little or no organization to the religion of the Chwan Miao, for the *dan gong* and the *k'ah gi* receive their calls as individuals, and do not organize. There are also no deities who are worshipped, although there is what among the Chinese is called ancestor worship. Many of the Chwan Miao therefore consider that they have no religion (宗教) and question the value of one. It is also true that most of them have not even the rudiments of an education, and do not see the use of learning. A more intelligent Miao said of the others that they were asleep and had not yet awakened to the value of religion and of education.

The Miaos say that formerly the Chinese souls and the Miao souls travelled to hades by the same road, but that the Chinese have become so accustomed to abusing the Miaos that on the way to hades they enslave or otherwise harm them, so that now the Miao spirits always travel to hades by another way.



TIBETAN MEDICINE*

W. R. MORSE

Introduction: Sources of data. The data here presented has been obtained during five trips into Tibet. Unfortunately most of the data collected on the first four trips was stolen. However, it was fairly fresh in mind, and I had the opportunity for long conversations with Paul Serap, an English speaking Tibetan and the hero of the book by H.B.M. Consul-General G. A. Combe. But my greatest source has been the Rev. Robert Cunningham of Tachienlu. I have written him many letters and have asked a multitude of questions. He has been exceedingly kind and painstaking in his answers, and his knowledge of the country and its language and the particulars which he obtained from his Tibetan teachers and others, have been of the greatest value. Many written sources have also been consulted, the most important of which is Waddell's book, "Lamaism."

According to the Chinese, Tibet is divided into Anterior, Middle and Posterior Sections. My observations have been made in Anterior Tibet, the old Tibetan province of Kham, now the Chinese province of Shi K'ang. This province stretches from Tachienlu on the East to Chamdo on the West, where it does not extend beyond the Yangtse River. From Tachienlu to Lhasa one crosses the following provinces, - Kham, the Thirty-Nine States and Tsang, in the last of which Lhasa is situated.

My data also pertains to that section of Szechwan west of Kwanhsien and Yachow, the so-called Marches of the Man Tsi, or rather a part of the country designated by that name. This section, the "Tribes Country," is not pure Chinese for the population consists of Tibetans, of peoples somewhat similar to the Tibetans (such as the Shi Fan, Nya Rong and possibly the Seng Fan), and of Tribes and Tibetan stock mixed with Chinese. The Chinese live chiefly in the valleys. This section of the country is distinctly influenced by Tibetan

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customs and civilization and especially by the Sibtetan religion, Lamaism. Undoubtedly Chinese customs, religion, and medical practices influence these people more or less, but these do not permeate the country as do Tibetan customs and practices. Aside from such independent, aboriginal tribes as the Lolos, these people look, not towards China but towards Lhasa for leadership.

Life and Habits of the Tibetans. The Tibetan is probably one of the dirtiest races on the face of the earth. His clothing is apparently never changed or washed. His body is coated with rancid butter, and he neither bathes at birth nor at any time after. Whether the accumulated layers of filth have resulted in any histological changes in the skin might be worth investigating. Certainly it is difficult to determine where the dirt leaves off and the skin begins. The Tibetan commands attention wherever he is. In a closed room he is as easily identified in the dark as in the daylight, for his odor is absolutely characteristic. So penetrating is it that it fills the rooms, houses, lamasaries, streets and lanes. The traveller who is not affected with atrophic rhinitis can never forget Tibet.

Naturally their woolly clothing and uncombed hair make an almost ideal environment for the rearing of untold millions of lice and fleas. Year in and year out they nourish and care for uncounted generations of *Cimus Lectularius* and other parasites. Hence, a prime essential for a trip into Tibet is a large, easy flowing box of the best insect powder procurable, and this must be applied with an abandon that might astonish and shock sensitive folk.

The culinary arrangements of the Tibetans are extremely simple. Their unwashed hands and a bowl are all that are necessary. After the latter has been cleaned by licking, the national food or "tsamba", is made by mixing barley meal with tea, to which is added some butter containing abundant amounts of hair and not a little yak manure. The butter (or cheese) is kept in hair lined bags from which it is scooped with the fingers, any excess being licked off.

As a result of the elevation of the country and the constant presence of cold winds, wood is almost unprocurable in the grasslands. Hence grasses, shrubs and yak manure provide the fuel for cooking. The smoke is all preserved indoors for there are no chimneys, and windows are few and slit-like. As the smoke is very acrid it is a constant source of irritation to the eyes of the traveller. The ceilings of their houses are thickly coated with a black, shiny, creosote-like substance which hangs in droplets from the rafters and roof poles.

The houses, which are two or more storeys high, are built of stone with thick, windowless walls. In the lower storey are kept the animals,—yak, horses, mules, sheep, goats, pigs, etc. Above them lives the family. The result is a mingling of odors which taken in the mass must challenge the world to beat.

In that country, where rancid butter is the national perfume

and dirt the common diet, one of the remarkable things is the relatively small amount of sickness. I presume that high altitudes, strong winds, bright sunshine and the out of door life of the inhabitants are antidotes to the poisons they absorb. Certainly their coats of butter are real protective coverings.

To some of you, Edgar Allen's "quoth the raven, nevermore." would be the natural reaction towards a second visit to Tibet. Yet when one analyses all the factors and experiences he has gone through, one finds that the sordid is most strikingly off set by the inspiring. On the one hand are the acute discomforts of travel, the dangers from robbers and other outlaws, the exposure to injury from landslides, the want of usual and sometimes any food, the fierce and awesome rivers, those terrifying Tibetan dogs, the lack of hospitality, the physical weariness from extreme altitudes, the predatory insects, and the irritability and nervous tension due to trying, difficult and dangerous situations of mountain travel in a hostile land. But on the other hand, as the majestic scenery from those high passes opens up to your startled eyes there is a sudden dissipation of all these troubles and discomforts. They fade away like the mists about the peaks when the hot sun strikes them, and you are born again. Weariness and worry disappear as the clear, cool air bathes your temporarily overworked lungs, and the fresh, pure oxygen rejuvenates your blood. Your mind is cleansed, cares are dissipated, and your spirit soars to heights before unknown. You have been tried and tested physically and mentally and you know for certain whether there is a yellow streak in you. If there is any set of circumstances that will make a healthy man delighted it is there on the peaks and passes of the Himalayas. Yes, it is eminently worth while and one longs to go again, to feel once more as a boy, and experience the thrills of the explorer in a land of contrasts, mystery, charm, romance, where life is the very antithesis of our civilization. On one's mind, through the tremulous excitement of adventure, beauty and majesty, has been written an elusive but indelible impression that death only can erase. The man who has travelled in Anterior Tibet has walked with God in his picture gallery.

Primitive Healing. The practice of healing may be traced through ethnological studies and archeological research to prehistoric days. As it is extremely difficult to reconstruct those practices from the data accumulated and the specimens recovered, imagination and skill are needed to minimize mistakes. An aid toward a more complete understanding of the probable condition in early times, is found through the study of isolated groups of peoples who continue to employ healing measures that are undoubtedly rooted in antiquity. These peoples live the simplest life, have had little contact with other races, and their association with nature is very intimate. Their healing art is very primitive and ancient folk lore and customs can be studied in the present age. The life lived by them is probably comparable to that of ancient man. They work by a tried, but

uncritical, empiricism. Such is the condition of the peoples who live on the extreme margins of civilization in the far West of China and in Anterior Tibet.

An investigation of the life and customs of these primitive folk carries us back to what the ancestors of civilized man probably thought and did. Some of the finest things in life were attained in the distant past. Those of us whose interests are centered in the present and trained to accept only what can be demonstrated and proven, will find it hard to interpret the mind of earlier man as revealed in present day unsophisticated peoples. It is evident, even in a cursory examination, that these isolated peoples have very definite ways of thinking, and that their customs are the logical outcome of definite theories. That their theories of medicine are founded on premises that are to a great extent false, seems certain, but the history of medicine reveals the fact that not a few superstitious practices are to be found even among persons of good modern education.

According to early beliefs man regarded himself as living in a world of spirits who manifested themselves in the phenomena of nature. Men probably considered themselves as shells for the spirits that made them alive. On the basis of this concept illness was explained as a disturbance of the spirits that were the real man. Now the spirit or spirits were as free as are the other elements of nature. They could be influenced to go from or into people for harm or for good, and if they left the body death resulted. These spirits were apparently intelligent, and could at will give good health and prosperity or cause sickness and poverty. The healer had to study the wiles of the spirits, and thus we see him associated with the wizard, the magician and the priest. Here too we find the explanation of amulets and charms, of divination and idols, of ceremonial dress, masks, and all the long list of strange paraphernalia that have been used by those who attempted to heal.

Almost supernatural skill and knowledge is required to interpret correctly all of these primitive customs, but all are pregnant with significance. It is not easy to evaluate rightly the place of magic and religion in the social processes of a national life, and their association with medicine has been long and intimate. Magic implies an influence on animate life through material objects, while religion implies supernatural or spiritual influences on animate life.

With this short and incomplete introduction we shall attempt to deal with the medical practices, or perhaps what may be better termed the healing procedures, of the peoples of the West China Borderland and Anterior Tibet.

Medical Practices on the Chino-Tibetan Border. W.H.R. Rivers' Book, entitled "Medicine, Magic and Religion," is an interesting interpretation of the primitive mind, as revealed in the methods employed for healing the sick and preventing evil. The idea of

preventive medicine may be said to have originated with primitive man. Rivers and Elliott Smith have strongly emphasized the importance of the "recognition of the part played by the diffusion of culture in the development of custom and belief." In the preface to Rivers' book Elliott Smith states that "the fundamental aim of primitive religion was to safeguard life, which was achieved by certain simple mechanical procedures based upon rational inference but often false premises. Primitive medicine sought to achieve the same end, and not unnaturally used the same means. Hence, in the beginning religion and medicine were parts of the same discipline, of which magic was merely a special department."

Rivers uses three methods of inquiry in studying social institutions,—historical, psychological and sociological. In this paper the author aims to present data on the psychological and social processes which underlie the healing methods employed by the Tribes people and Tibetans of the West China Borderland. Culturally these people have been most influenced by India and China, although when considering old world civilizations the part played by Egypt must not be underestimated.

The people under discussion appear to believe that disease is caused, directly or indirectly, through the agency of human beings, alive or dead, or through the action of spirits. As a rule they do not think of natural causes for disease.

Both India and China have very extensive pharmacopeas. In addition India has not a little surgery, though it has not progressed and has even degenerated, while in China surgery has never, except in tradition, been of any account. In India medicine and religion have been closely associated. In China there is a relationship between the priests and medical practice, but it is not as close as in India, for there is no priesthood specially trained for the practice of medicine. In some sections of India there is a belief that disease is caused by spirits, and such a belief is common in China. In both India and China disease is considered a punishment for sin. In India, and to perhaps a lesser degree in China, a corollary to the belief in transmigration is the assumption that sins committed in a former life result in disease in the present life. In China many medical practices of genuine efficiency may be found, though the belief that disease is caused by some alteration in the amount and degree of *ch'i* or gaseous content of the blood is practically universal with the old style practitioners. Chinese medical practices are based on the Chinese theory of cosmogony.

Religious Element in Tibetan Medicine. A very intimate association exists between medical and religious elements in the civilization of the Tibetans. They supplicate spiritual beings who have the power to cause disease, and they abuse or cajole these spirits if they do not concur in their requests. The chief cause of disease is spirits, and healing depends chiefly upon good spirits. Propitiatory and thank offerings are common. Their medical practices show evidence of belief in taboo, and in the evils which result from its

infracton. According to Cunningham "it appears that for purely Lama reasons practically everything but drinking wine and loving many women is taboo. In order that the lama may be called in, and not the doctor, the lamas have surrounded everything with taboo. The ordinary man may be quite ignorant of what is really taboo, but he falls sick or meets with some disaster and then the lama brings out his taboo. However, there are several well known things which are clearly defined as taboo, namely, polluting streams, springs, and wells; cutting trees, etc. Naturally, of course, in lamaland, saying or doing anything against lamaism is always and everywhere taboo—the whole system of lamaism is impregnated with taboo. The disease or disaster met with by any infringement of taboo is cured and overcome by some definite sacred reading or some particular lama drug. Certain things occurring frequently have been discovered to be cured by some particular remedy. On making inquiries we were informed that practically everything in the land of the lamas is for religious purposes surrounded by taboo."

The Tibetans believe that a man who has been bad in this life may after death cause disease, that is, his transgression of religious ordinances has caused the disease.

Suggestion undoubtedly plays a great part in the medical treatment of the Tibetans. This does not imply that the priests are necessarily deceivers. Their practice is based on belief in their powers with the world of spirits. In other words, they are rational in their treatment of disease; it is not a mere medley of deception and witchcraft.

As far as I can discover medicine is not differentiated from other priestly functions as a separate profession.

Lamaism on the Borderland

"Tibet is the mystic land of the lamas, joint gods and kings." It is to be remembered that up to the seventh century A. D. the Tibetans were rapacious savages and cannibals, without any written language. They were followers of an animistic, devil-dancing religion, called the Bon, which religion has some characteristics of Taoism in China. Waddell, "Lamaism."

Lamaism is a tremendous force in religion and politics on the Border. Nearly the whole population is domineered over by this politico-religious system. It bears a close resemblance to Roman Catholicism in ritual and statecraft. Aside from Lamaism the Ch'iang Tribe has another religion which is centered in the worship of a white stone. Evidence of respect for the white stone, or lithiotry, is seen all through this section of the country, for we found it on the *mani* mounds and in other places associated with worship, even where Lamaism is the predominant religion. T. Torrance is making a very thorough investigation of the religion of the Ch'iang. The religion of the Lolos has not, to my knowledge, been described, though it is said to be connected with the horn of hair prominent on the forehead.

Lamaism as a religion has evolved in peculiar and difficult surroundings. The old Bon religion was undoubtedly animistic and phallic. It survives today in the so-called Black Lama Sect. I have been in one temple of this sect where the immense idols were most obscene. The basis of Lamaism is, therefore, Animism on to which Buddhism has been venerated. The latter religion was secured from India about 641 A. D.

Lamaism is in the main, tantric, that is "dealing with the creation, destruction, and renovation of the world, and the deeds of heroes, as well as magic." The religion is little better than a system of magic. Its sole aim is the appeasal, through fear arousing and awe-inspiring rites, of a world of demons who await you at every corner, in every stream, on every path, from every cliff, amongst the clouds and the mists. Everywhere and at all times devils beset and baffle the wayfarer. Lamaism thus concedes personality, will-power and soul to animals, plants and heavenly bodies; it grants to all natural objects and to living beings, reason, intelligence and volition.

Buddhism maintains that misery is inseparable from existence and therein may be one great reason why a form of that religion has a very natural appeal to these peculiar people. Only moderate emphasis is laid on aceticism, meditation and metaphysics.

It is an Asiatic idea that great and holy men are divine, and consequently there is a tendency for civil and religious governments to declare prelates of the church to be deities incarnate. But the lama of the Borderland is very much a person of flesh and blood, as fond of life and its pleasures as the rest of mankind, and perhaps even more so.

There are three principal sects of lamas: the Yellow or orthodox, the Red, and the Black. This latter variety is tainted with the primitive Bon religion and is strictly heterodox. It is the smallest of the sects. But these sects are not entirely separated in ideas. The lamas usually dress in red or yellow, though other colors and just rags are common. Their woolly, hairy, garments are never clean and reek with the odor of rancid butter. They resemble embryo zoological gardens well stocked with numerous insects that love to roam in the gloaming of such environments.

Tibetan Medicine. There is no strictly designated medical profession in this section of the country. There are priest-doctors, and besides these priests, lamas, and laymen, male and female, who practice some form of the healing art. According to their proximity to or distance from the neighboring civilizations of India and China, are they affected by the prevailing medical customs of these contiguous countries.

In the city of Lhasa there is a Temple of Medicine, that contains a school of medicine, called Ja-po-ri, or the Iron Hill. It was founded some two and a half centuries ago. The lamas are both doctors and priests. This lamasary contains the Healing Buddha, the Tibetan

Aesculapius and God of Medicine. The lamasary and school are said to be well financed and stocked with Indian, Chinese and Tibetan medicines. The so-called practices of medicine are taught at this place. It takes some three to eight years to master the curriculum of the school, depending on the brilliance of the student. The curriculum consists largely of the memorizing of long passages of the sacred books. Very few are said to pass the examinations. Both those who pass and those who fail remain at the lamasary. The school and those trained therein are limited to Lhasa. The poor people are not treated, only the rich are attended. The students come from all classes of the people. There are ten so-called professors at the school. Chinese and Indian medical books are also used.

They teach a crude anatomy, based not on dissection but on a phantastic chart of the human figure ruled off in squares, in which the supposed positions of the body organs are marked. The heart of woman, according to this chart, is in the middle of the body, and that of man on the left side. Their anatomy is thus shown to contain both truth and phantasy. According to their physiology the blood contains four humors, viz. wind, similar to the Chinese *Ch'i*; blood or *tra*; bile or *tri-ba*; and phlegm or *begum*. There is also another designation, blood, cholera, heat and cold. These things are related to the five elements, metal, earth, air, fire and water somewhat as in Chinese medicine. The humors are imparted to the child by the mother before birth.

Symptoms arising from these humors are described as follows: wind or *ch'i*, gives no serious discomfort to the patient, but he has vague symptoms and is unable to definitely locate his trouble, which goes here and there at will. *Tra* or blood humor gives a dry mouth with much bodily pain; the patient has difficulty in finding a restful position. *Tri-ba* humor shows itself by loss of appetite and inclination to vomit; the patient whines and is difficult to please. *Begum* humor or phlegm is the cause of general disability. In tuberculosis of the lungs the blood humor is present, presumably because of the spitting of blood. Ordinary colds arise from the wind humor. According to their beliefs the blood is mixed with air, and the changing proportions mean health or disease as the one or the other preponderates. The blood-air mixture is called *wlung*.

There are three conduits leading from the heart, called the *roma*, *changma* and *wuma*. The airy humor from these can be forced through the body by a process of complete abstraction, and thus produce sanctity. Red blood circulates on the right side of the body and yellow bile on the left. By feeling the six pulses, three on each side, diagnosis may be made, but the principal method of diagnosis is divination.

The Tibetan method of examining the pulse, which is the same in both hands, is as follows: the fingers are spread apart and the pulse is found in the index, middle and ring fingers, a separate

pulse on each side of each finger. On the radial side of the index finger is the pulse of the lung, on the ulnar side that of the heart; on the radial side of the middle finger is the pulse of the liver, on the ulnar side that of the spleen; the ring finger has on the radial side the pulse of the kidney, while the ulnar side has that of the intestines. Whether or not the other organs have pulses, or whether these pulses indicate the condition of the whole body, is not clear, but they probably do so. The Tibetan method seems to be a variation of that of the Chinese. There are three humors in the body, and each goes to a separate finger. For instance, there are "wind," "cold," and "blood" lung diseases. The "cold" lung indicates diseases like bronchitis, the "blood" lung indicates tuberculosis. The elaborate system of pulses of Chinese medicine is well known and it is said there may be as many as seventy-two kinds of pulse differentiated.

The usual method of diagnosis, however, is divination, and it is practiced as follows: when a person is ill he sends for the soothsayer (*Mo-ba*) or goes to him with a scarf and money and asks for a diagnosis. Women go to a *Mo-ma*. These people are adepts in telling fortunes by rosaries, dice, skullcap, etc. The *Mo-ba* says that there are both good and bad spirits which may cause sickness. There is the *Chojong* (protecting spirit) and *Lhamo* (good spirit). The *Nag* (half serpent, half human demon) and *Dre* (angry spirits of those who when about to die do not know where they are going) are bad spirits. The *Mo-ba* tells the patient what particular spirit is angry, and he then goes to a lama who reads that spirit's book of ritual in front of its image to placate the tutelary god or goddess. After two or three days reading he tells the patient he hopes he will be better but does not guarantee his prayers will be heard.

In Tibet a spring of water comes from the *Nag* or spirit that dwells under the ground, and if one pollutes a spring then the *Nag* attacks the man with boils, sore eyes, rheumatism, leprosy, etc. The patient, therefore, knows the source of his disease. It is not necessary to read the book of ritual but the lama goes to a spring in the hills with the following materials which the man supplies, viz., some wool of many colors, white goat's milk, red cow's milk, butter, flower, sugar, also small quantities of gold, silver, copper, iron, turquoise, and coral; branches of pine and juniper; prayer flags. The branches and prayer flags are placed around the spring, the wool is hung on the branches and the offering put in the water. The lama then reads the *Nag's* prayer book for two or three hours.

Some patients are distressed by the *Dre*. A *Dre* is the spirit of a dead man (*namshi*) who has not gone to hell and in an angry mood remains to haunt the place where he died. There are four ways in which a *Dre* may come; 1. men who are killed by weapons, 2. rich men who, even when dying, still think of the possessions they will have to leave behind, 3. those who die suddenly of a seizure. i. e. killed by a spirit, 4. those who die a violent death, either by accident or suicide. These *Dre* of the fourth class are either rock, water, fire

or wood spirits according to the manner of death of the man, and they attempt to cause the death of others in the same manner in which they were killed. If the disease is caused by the *Dre* certain books must be read and offerings made. The offerings are images of the man, and sometimes of his wife, and of his cattle, horses, yak, and sheep made in *tsamba*; similar images in wood of guns, swords and arrows. Silk, cloth, silver, rice and barley, and threads of all colors are also offered. The lamas come with drums made with skull caps, with bells and cymbals, and with small, medium and large (ten to fifteen feet) trumpets, conch shells, and a number of large drums. For seven days and nights the lamas read and beat the drums, etc. On the seventh day the images are taken out of the house and burned with the orchestral accompaniment. The head lama tells the *Dre* who is the cause of the illness that he herewith hands over the patient, wife, family, and possessions, and asks the *Dre* not to return to this house again.

This procedure may have to be repeated on a smaller scale. The lamas are paid. If the man continues ill the *Mo-ba* says the *Dre* must be inside the person and must be exorcised by a *Jaba* lama. The latter comes with his skull drum, a bell, and a human thigh-bone trumpet. He blows the trumpet three times, rings the bell, rattles the skull drum, and calls the *Dre* to him. All this is done in the dark and the lama has a black bear skin over his head. The *Dre* comes and is expostulated with and the lama offers himself as a ransom in place of the man. The lama on leaving tells the patient he will now get well, but makes no promise.

This method pertains all over Tibet. Some people have little faith in it and do it because public opinion favors it. The lamas cultivate the idea, and because of their great power hold the people in their hands and exploit them.

If the patient dies a special lama is called to open the way to Paradise. On the third day the spirit of the dead man awakes and is much more clever than in life. The lama makes the spirit go back into the body, not through the nine orifices, but through the *dsa-wusma* or blood vessels. If the spirit takes the lama's advice he will not be re-incarnated and goes to Paradise.

Causes of Disease. The concept held by the practitioner and patient as to the origin of disease determines the healing methods used. The more fully one understands this concept the more clearly can one explain primitive medical practices.

Rivers says, "if we examine the beliefs of mankind in general, concerning the causation of disease, we find that the causes may be grouped in three chief classes: 1, Human agency, in which it is believed that disease is directly due to action on the part of some human being. 2, The action of spiritual or supernatural beings, or, more exactly, the action of some agent who is not human, but who is yet more or less personified. 3, What we ordinarily call natural agencies."

In civilized communities all three elements persist. "We now only think of human agency in cases of poison or injury, and then only as the means whereby natural causes or agencies have been directed." "The second category only exists in the 'Hand of God' of our statutes, though it has ceased to play any part in orthodox medicine, (not, however, with the laity). In the professional art of medicine and in the practice of the majority of laymen, the attitude towards disease is directed by the belief in its production by natural causes . . . quite independent of human and spiritual agency." With peoples who have not scientifically investigated natural phenomena we find that beliefs concerning the causation of disease fall, in the main, within the first or second, or within both the first two categories. "Diseases or injury ascribed to magic—i. e. agents who have power over non-human, spiritual agencies may have three main classes distinguished:—1, some morbid object is projected into the body of the victim. 2, something is extracted from the body. 3, the sorcerer acts on some part of the body of a person, or some object which has been connected with a person, in the belief that thereby he can act on the person as a whole." (See "Sympathetic Magic" by Frazier in "The Golden Bough.") In the first, material objects as stones, crystals, pieces of bones, etc., are believed to be projected into the body and the disease produced. In the second, something is extracted from the body—(a) an actual part of the body, or (b) more usually, the soul or some part of it. The diviner determines whether the disease is due to soul abstraction or otherwise.

An illustration of the use of magic in Tibet is offered in the following incident related to Rev. and Mrs. Cunningham by a Tibetan doctor-teacher. The incident is supposed to have occurred in his own district of Chamdo. A landowner, by lawsuits and other means, secured possession of land belonging to a lama. Dispossessed of his land the lama determined to destroy the landowner by bringing sickness upon him. Seeking the shelter of his little room he used magic and religious exercises as follows: he made little pills of *tsamba* (barley flour) and put them on a wooden tray. He mixed butter with three or four colors and also put it on the tray. This is called a *choba* or offering, and it is thrown in the direction of the victim. This lama also made a paper image or drew on paper a likeness of his enemy; to this he attached something he had been able to secure belonging to the landowner, e. g. a louse from his garments, a hair from his head, a piece of his garment, some spittle from his mouth or mucus from his nose, whatever he could get belonging to his enemy. This he burned or destroyed. In a short time, in this case twenty days, the victim died of some disease. Usually the symptoms are pains all over the body, beginning with a headache. If a doctor is called in, and is a man of some reputation, he soon discovers that the patient is the victim of some one's magic and makes no effort to prescribe.

A man who desires the destruction of another may seek the aid of a lama *tub-gub-ken* in bringing sickness and finally death upon his enemy.

The *Yidam*, the tutelary deity of the Tibetans, is a constant source of sickness. Each Tibetan, lama or layman, selects his particular patron saint, and should he through neglect or intention disregard this powerful deity, sickness follows fast and sure. The *Yidam* may be neglected in three ways: 1, Failure to read a certain quantity of prayers each day; 2, Failure to make the prescribed offerings; 3, Too much cursing in ordinary conversation.

When a patient is ill from neglect of the *Yidam*, the doctor soon sees something peculiar about the sickness, and a lama is sent for. By divination he discovers what is wrong. One of the fiercest *Yidams* in Tibet is the Pandem Lhamo, the goddess of disease, plagues and epidemics. She rides a red mule and carries the plague bag by her side. Queen Victoria was supposed to be an incarnation of this goddess. A recent epidemic of relapsing fever on the border was traced to Pandem Lhamo.

Sherap, the hero of Combe's "Tibet by a Tibetan" has related the following concerning medical practices in Tibet and the Tribes Country: "They say, when they have sores over the body like itch, etc., that the water god has cursed them; this water god lives in springs and if there is a tree near the spring the god is sure to be there; as a consequence a Tibetan never dirties a spring and especially never relieves nature when near a spring. Leprosy, syphilis and oedema also come from the water spirits."

The Tibetans believe, also, that disease may be caused by a separated part of the body, such as hair, excrement, sweat, etc. For instance, a man sheds a garment wet with sweat, a friend calls and sits on this. Very soon the friend is likely to have pain in his chest or stomach. The Tibetans believe that excrement, more than any other thing, carries disease. They believe much in infection and will frequently blow wind in front of them when entering a house or courtyard.

Treatment of Disease. Concerning the use of drugs Waddell says, "their treatment is based on some simple measures with the common drugs of the country and is saturated with absurdity." We find that the lamas themselves, as well as others who are sick, generally rely more on the efficacy of prayer, charms, amulets, and the reading of their scriptures than on the efficacy of drugs. This procedure is better understood as one realises their explanations of the origin of disease. The prayers are to the demons that cause disease. Exorcism is employed, long litanies are read, and sacrifices are made to placate the spirits.

Surgery is most primitive. No instruments except for blood letting and the actual cautery, are used. The cupping horn is used for certain diseases. Fragments from shrines, fragments from reincarnated lamas and even their excreta, leaves from holy trees, holy water, etc., often work marvellous cures. Astrologers are much consulted in sickness.

Sacred symbols are used as talismans to ward off evils caused by

malignant planets and demons; they are also used to inflict harm on enemies. These usually consist of formulas in corrupt and unintelligible Sanskrit from the Maya-Lana or Tantrik scriptures. They may consist of a single letter. Talismans and amulets are numerous, and are of special kinds for different diseases. The eating of the paper on which the charm is written will, it is said, cure the disease for which it is written. These charms are called the "edible letters" or *Ya-Yig*.

Another method is the washing of the reflection of these letters from a mirror. For instance, the following directions are for dementia: Write with Chinese ink on a piece of wood the particular letters necessary, smear this with myrobalms and saffron as a varnish, and every twenty-nine days reflect this writing on a mirror; wash off with beer and drink in nine sips.

Most charms are worn on the person as amulets. Everybody, apparently, is the possessor of one or more charm boxes, which are worn about the neck or on the belt, or in the voluminous folds of the toga-like garments. They are enclosed in boxes of gold, silver, copper or other metal, set with turquoise, and are sometimes very valuable and very beautiful. These boxes contain threads of the cast off robes of lamas or of the clothing of idols, peacock feathers, sacred kusa grass, images or idols, sacred pills, etc.

"A charm for cholera is as follows; write the monogram Z-A on paper and enclose the dung of a black horse, black sulphur, musk water, a piece of snake skin; fold together and wear; the dung represents the purging, and the horse the galloping of the disease, the black color the deadly nature of the trouble, and the snake the virulence of the disease."

"A charm against plague is a monster figure of Garuda, the king of birds, represented with a snake in his mouth, and on his outstretched wings the Buddhist creed, together with the following, 'Guard the holder from all the host of diseases, of evil spirits, from injuries, including contagious diseases, sore-throat, cough, rheumatism, and all kinds of plague of body, mind and speech'."

An exorcism for the relief of pain is as follows:—"the exorcist places a mirror over the region of his heart on the outside of his cape, on which are the five bats of fortune, the five partite chaplet of the five Jinas, topped by skulls. Placing a cake on his head he calls on Buddha and St. Padma, offers a libation, burns incense to the demons, beats a large drum and symbols, calls on the gods by name, and repeats a charm. The deity comes and is seen in the mirror. First come the tutelary, then the dragon gods, and last of all the *Dre*, or most malignant of spirits. The divining arrow is offered to the demons and its blunt part placed on the painful area. The exorcist then sucks midway down the shaft of the arrow. A drop of blood appears on the patient's skin, without any break in the skin (dropped by sleight of hand). This is considered a miracle and the patient is led to believe that the demon which caused the disease has been expelled."

Another necromantic ceremony for prevention of injury from the eight classes of demons is as follows: The demons who produce disease short of death are called *Shé*, and the are exorcised by the lama invoking his tutelary fiend, and thus assuming evil he orders out the disease demon by threats of having him eaten up by his tutelary god. The demons may be stabbed by a mystic dagger, the *purba*. Also charmed shells or seeds, made holy by spells, may be thrown at the demon. These charmed seeds are stored in a small horn with scorpions, cailyas and other symbols.

Such rites are a combination of Indian magic and Chinese astrology and necromancy. According to Rockhill, divination by sheeps' shoulder bones as well as by cards and dice, is practiced. Divination by white counters with one black one is also seen. Seeds or pebbles are used with or without a dice board. The dice board is ruled in small squares fifteen to twenty-one in number, and each square contains a number within a circle corresponding to a number in the *mo-pe* or divination book. The deity is invoked, the seeds are shaken in the palm of the hand, told out between the thumb and fore finger and placed on the dice board in order of the figures. The one on which the black seed falls is the one which must be looked up in the divination book, and corresponds to the receipt for the disease.

Medical Squares

15	14	13	12	11
6	7	8	9	10
5	4	3	2	1

Triple series of fives

17	18	19	20	21
16	15	14	13	12
7	8	9	10	11
6	5	4	3	$\left. \begin{array}{l} 2 \\ 1 \end{array} \right\}$

Five series of fours From Waddell's "Lamaism"

In the above series of fours there is given in the divination book a fixed prognosis and a prescription for remedial worship, e. g. if the black seed falls on No. 9 one has the following advice: "If you are an actual invalid, it is due to the demon of your grandparents -- agriculture will be bad—cattle will suffer—for your

wishes, business, and credit, it is a bad outlook—in case of illness do ‘obtaining-long-life’, i. e. mend the roads and repaint the *mani* stones.”

Ghosts are malicious and are the cause of dreams, delirium and insanity. “In September there is a thanksgiving festival, the Water Festival. At that time water becomes holy because the water spirits are set free, and water becomes an elixir vitae. This feast depends on the appearance of the dog star Sirius, which is above the horizon at early dawn during the month. This star is holy and through its action the water becomes life giving nectar. The Tibetan goes to a spring or a lake before dawn to watch for the star’s reflection in the water and as it appears he snatches the glorified, holy water, and expects health to be the result.”

Some common therapeutic measures are the following :—

“Musk is used for hydrophobia.

Elephant’s milk is used for some diseases.

Butter, 25 to 40 years old, for epilepsy and madness.

Burning a lamp from sunset to sunrise is a curative measure.

Fox liver and hot blood are commonly used in the Tibetan pharmacopea.

Smallpox is treated with camphor, a few aromatics and charms.”

The milk of a lion is recommended for certain diseases. Query, who milks the lion ?

“Torquoise has mystic powers, guards from the evil eye, and brings good luck ; it is supposed to ward off contagion (as with ancient Egyptians and Persians), and when it changes color or blanches it betokens mischief or sickness.”

Mother of pearl is said to neutralize poisons, and medicines are compounded in vessels of this substance. For the same reason it is used as a wine cup.

“The gullet of animals is used as a cure for goitre.”

Minerals, vegetable and organic substances are used as drugs, but the pharmacopea is subservient to spiritual and magical methods.

According to Sherap, monkey blood is used for amenorrhoea, and dried olives from India for goitre. He also says that the medicines used almost all come from India but a few are from China. Although a lama himself may give some medicines he usually says the cause of the disease is in the spirits.

The following description of the treatment for headache is interesting. Four kinds of headache are distinguished, wind headache, blood headache, bilious headache and worm headache. If the complaint is wind headache old skulls, dragon bones and gentiana chiretta are indicated. If the headache is of the blood variety then terminalia bellarica and red sandal wood must be added to the above. For bilious headache one must use the above and also a yellow pigment, an anthelmintic medicine which is also known as a concretion in the entrails of some animals, and a bitter species of ginger. When a person is afflicted with worm headache a worm is supposed to enter

the head through the teeth and cause headache. It is cured by the above and also asafetida.

In some cases a patient uses medicine, magic and religious rite at one and the same time. The cure is the object, and so anything for relief may be tried.

Common Diseases in Kham. Dr. Andrews of Tatsienlu named the following as the five commonest diseases, small-pox, leprosy, gonorrhoea, syphilis and stomach trouble. Other diseases he named as being common are tape worm and other intestinal parasites, tuberculosis of the lungs and bones, rheumatism, opium habit, itch, ulcers, trachoma, other eye conditions (conjunctivitis) and heart trouble. Goitre is also very common, though unknown among the nomads. At one lamasary in Badi-Bawang one morning as we were packing up to leave, fourteen men and boys stood watching us; of that number twelve had very noticeable goitres. Goitre is not as common everywhere. I have been a week in a place without seeing a case. The local prevalence of certain diseases and their absence from other regions is a problem that needs investigating. Cunningham reports that it is commonly said, "if a person is ill ask from where he comes and you will know the disease."

In reference to stomach trouble Andrews says "they eat largely of raw meat, drink strong wine, eat quantities of rancid butter, use much dirty barley flour and eat practically no vegetables whatever."

The Tibetan eats five meals a day, and one who can not have that many is supposed to be in hard luck. But many of the meals are light. Early in the day butter tea is drunk. This, as the name indicates, is a lump of butter added to tea. In the morning some *tsamba* and tea form a meal, while lunch consists of *tsamba* and meat. In the afternoon *tsamba* and tea are again taken while the evening meal consists of *tsamba* and meat broth. The lamas when reading their litanies are said to eat and drink twelve times a day.

Very few people smoke tobacco but the use of snuff is very common. Tobacco smoke is said to take away the special *yidam* or particular god of a person.

Andrew's Tibetan teacher claims that there are many more women than men in Tibet. This man comes from Chamdo, in Middle Tibet. He states that the proportion is four women to one man. A woman with from one to five husbands will have up to ten or twelve children. Prostitution is prevalent. Sterile women carry in their charm boxes some paper blessed by a lama, and some hope for cure by taking lama's spittle. Abortion is said to be uncommon. Probably there is no infanticide.

People of sixty, seventy and eighty years of age are not uncommon though ninety is rare.

Obstetrical Customs in Tibet. There are no obstetricians or midwives in Tibet and the Tribes Country. The act of giving birth is regarded as of equal importance in women and animals. The

mother may be about her work as usual and the accouchment may occur in a secluded part of the field, then the mother appears with the child, carries it home and works the next day.

The child is said to get its bones from its father and its flesh from its mother, but the spirit is another matter. The religious belief seems to be that the spirit of the child is wandering about the six different regions into which the spirit world is divided, and it takes the best chance offered to get on the "wheel of life" again. Thus the material part of the birth is not the only factor, and the child is only in part that of the parents. The loose morality of the country, or perhaps its lack of morality, is no doubt a factor in the birth idea. It is not at all easy to even guess who may be the father of the child. The birth of a child out of wedlock is a common, and to say the least, not-severely-criticised occurrence.

The time of birth may be known in advance but it is not told because of the belief that such knowledge on the part of others will make confinement more difficult. Even in China there is the most extreme vagueness about the expected time of delivery, and in some areas, even among the educated and intelligent, the matter is not discussed, probably from some superstitious ideas connected with birth.

The place of delivery may be anywhere, in the fields or, in the winter time, in the house. The common delivery room is on the first floor of the building, which is used for the housing of the cattle. Their animistic beliefs are undoubtedly connected with this habit, for since animals have an easy birth the natural place to go is where the animals are. In this way it is hoped that the spirits will be as good to the human as to the animal. The woman goes alone, unless she is wealthy when a servant may accompany her. The child is born on a rug or other material. It is not washed, but a little butter is put on its anterior fontanelle, to strengthen the head. The afterbirth is thrown away, and is likely eaten by the dogs.

Since the child bears so little relation to its parents it has no surname. The personal name is chosen by the lama and not by the parents. On the third day after delivery the lama comes "to give life power" and to baptize the child. The lama then gives the child its name which always bears some indication of the sect of Lamaism to which that particular lama belongs.

The act of delivery is pictured on the "orb of transmigration" or "wheel of life" which is seen in a conspicuous place in all temples. The position here depicted is on the hands and knees.

According to Chinese official accounts the Tibetan woman licks her child clean at birth. This may be its only bath for life.

Buddhas are not born per vaginum but from the side of the body. J. Huston Edgar says that "Tibetans have a disgust for maternity. There seems an abhorrence of contamination arising from contact with a woman during gestation and parturition."

Dystocia in accouchment is known, as a married Tibetan told me,

and in such cases there is no help at all except offerings to the spirits that cause the trouble. There is an account of an "obstretic spoon" for "the extraction of the dead fruit", but they are helpless in difficult cases.

Whether parturition is easier with the Tibetan than with modern civilized woman is not known, but there seems to be no easy way for any woman in labor. The Tibetan woman is strong, healthy and used to an out of door life. She knows there is no help or sympathy for her, and being fatalistic, accepts her travail as in the ordinary day's work.

In cases of dystocia the woman retires alone, the house is kept quiet, guests are not allowed, and the husband burns incense to the spirits, makes offerings and prays. It does not appear that the lamas are called in confinement cases.

Conclusions. As this paper has dealt with the subject very briefly, what has been said is subject to maturer judgment.

The Tibetans were savages and cannibals up to the time of Christ. They had a form of demon worship, called Bon, with a distinct leaning towards phallicism. This survives today, especially in what is called Black Lamaism. A temple of this sect at Badi-Bawang contains very obscene idols, ten or more feet in height. Smaller idols of a similar nature were seen at So Tu Si, just above Wen Chwan. On this background is placed a thin veneer of Buddhism, called Lamaism, and to that apparently is added another veneer of Taoism.

The civilization of Tibet has been most influenced by those of India and China. Judging from the medical procedures on Tibet's Eastern border the influence of China predominates. But, in a country that is peculiarly bleak and difficult, their procedures have been adapted to their environment. There is some slight recognition of natural cause for disease, but in the main it is believed that disease is caused by supernatural agencies. Some non-human agencies cure and others cause disease.

The intimate relation between medicine (methods of healing) and religion (methods for securing supernatural aid) is striking. These folk associate the treatment of disease with religious practices and both seem to be of equal value. In the treatment of disease Eastern peoples have been adepts in the use of hypnotism, and this seems to be present in Tibet too.

The Roman Catholic Church in some of its practices emphasises elements that are being used in Tibetan religion and medicine. I refer to an important principle in the treatment of disease, viz. the tremendous influence that reliance on spiritual powers has on the mind and body, whether diseased or not. This idea is very prominent in Tibetan medical practices. A great factor in Tibetan medical procedure is the appeal to the emotion of fear and to superstition—the suggestion of an unknown mysterious power. The power of suggestion is a great force in healing, even though in modern medicine

the tendency is to insist on a physical basis for every disease and to minimize the power of mind over matter.

Because the Tibetans use suggestion in their medical practices does not mean that their methods are correct, even in this regard, but it does mean that they have a real weapon for healing. The lamas exercise this power to the limit, but unfortunately often to the patient's detriment.

The religious beliefs of the Tibetans differ from our conception of religion. To them every-day blessings come of themselves, but disease is caused by malignant spirits. Their beliefs are religious if the recognition of the presence of powerful spirits is religious. This, I suppose, may be considered a crude form of primitive religion.

The medical practices of the Tibetans are not a meaningless medley of disconnected customs but are inspired by definite ideas concerning the causation of disease. Their treatment follows directly from their ideas of etiology and pathology. From modern pathology we know that their ideas are wrong, but their practices are logical. Although their ideas are wrong, here and there truth shines dimly through the mass of superstition and error.

Finally, according to William I. Thomas, present day man's thought and feeling is a compound of animal instincts, of childish characteristics, of our prehistoric ancestors' intellectual attainments and of the achievements modern civilized man. Economic stress, fear, hate, war, anger, prejudice and sex impulses show how easily one drifts, in varying proportions, from the last to one or other or all of the first three mentioned elements on our intellectual heritage. The savage is very close to us indeed, both in his physical and mental makeup and in the forms of his social life. Tribal society is virtually delayed civilization, and the savages are a sort of contemporaneous ancestry. Civilized man possesses volition, the power of choice in experience, through his ancestors' trial and error processes; he of all animals possesses the power of cooperation i. e. learning from others, and thus he has accumulated the wisdom of today.

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WHAT THE GODS SAY IN WEST CHINA.

H. G. BROWN

I. Introduction.

- (a) The importance of our idea of the divine.
- (b) Material and spiritual gods.
- (c) The value of images in worship.
- (d) The importance of the character of the god.
- (e) The problem of giving the material image character.
- (f) Prophets and priests of the gods.
- (g) This paper deals with the priestly side of idol worship as practiced at present in West China, and aims from a study of the answers given by the gods to their suppliants to come to a clearer idea of the divine character as it is understood, and as it is doubtless being taught by word and example to the children in West China.

II. Method of Prayer.

III. Answers to Prayer.

- (1) Temples and gods from whom answers are taken.
- (2) General classification of answers into favorable, neutral and unfavorable.
- (3) The content of the answers.
 - a. A table—classifying the “goods” sought.
 - b. Discussion of “goods” sought.
 - c. Comparative value of “goods”.
 - d. Values which seem to be neglected.
 - e. Examples of answers.

Two good, two medium, and two bad answers from each of the four gods whom we are studying.

IV. The Religious Value of Idol Worship

1. Thankfulness
2. Good will
3. Reverence
4. Faith
5. Loyalty.

V. The Instincts Appealed to by Idol Worship in West China.

VI. The Political Significance of Idol Worship as Practised in West China.

VII. The Inadequacy of Idol Worship for these Times.

I. INTRODUCTION

What people say to God or the gods, and what they think God or the gods say to them are two interesting, important and very closely related subjects. Not only are they closely related one to the other, but they have a very great bearing upon conduct and character. In our relations with our fellow-beings, our conduct as well as our speech is governed to a large extent by our estimate of their character, their tastes and their attitude toward us. In our relation with God or the gods, and this relation is a more or less conscious factor in all the interests and activities of life, we are inspired, restrained and generally controlled to a great extent by our ideas of the divine. Perhaps no factor in individual or social life is so potent for good or ill as is the idea of God. We may say that what a people are being encouraged to believe about God or the gods is one of the greatest if not the greatest factor in social evolution.

In regard to the divine, people's ideas may be considered from two standpoints, from that of form, and from that of character. Some think of the gods in the form of idols, creations of mud or stone. Others think of them in the form of spirit, a form which for most people defies concrete description. The difficulty with the former belief is that it cannot but be crude and unworthy. The difficulty with the latter is that it readily becomes so subjective that one is left without that companionship and inspiration which is the heart of religion and which gives the divine its reality for us. So far as getting help from our religious faith is concerned, we are to get it from ourselves, as who would get help by tugging at his own bootstraps. A worshipper of an idol of somewhat elevated character is in a spiritual condition more to be desired than is the man who does not know where to look for God. Indeed it might be argued that a man might bow before a relatively unworthy idol and be blessed with greater moral and religious reinforcement than the man who is conscious of no other power than the unaided energy of his own mind.

In the evolution of religion, idols have been of help in making the divine objective. In early days, dreams and visions, thunder, lightning and sudden sickness were interpreted as divine language. These phenomena however are too arbitrary, and uncertain to be satisfactory. One could say 10, here and 10 there, but for the practical issues of life, one wants to feel one has some little control, wants to be conscious of some regularity, and if possible look for responses or revelations at more or less fixed times and places. Naturally tangible objects, whether artificial or in their natural state, have been considered either the abode or representation of the gods. In more sophisticated circles, these objects or images have been considered simply helps to the attention of the devotee. Whether sophisticated or unsophisticated, however, the value of the object has been the same in that it helps objectify the god. So far as form or method is concerned, the use of an object or an image to make the divine seem real is an effective one.

But when one turns from the method of worship to the question of the character of the object of worship, we come to another aspect of the great problem of the relation of the human to the divine. True, objects may have associations, and symbolic significance, images may be moulded in some suggestive posture or with some meaningful expression, but human needs are too definite and pressing to be met by the contemplation of any object no matter what its significance, or by the unchanging expression which can be moulded into the features of any idol. It must reveal purposes. It must if possible respond to appeals.

With the strong desire on the part of men and women to learn the mind of God or the gods, and with images and objects, to say nothing of the whole material world, which refuse to be vocal, it is natural that there should arise men and women who for various reasons feel that they have the power within them to help both men and the gods by intermediating between them. Such men and women, directly or indirectly, become spokesmen for the gods, and also for the people. They determine the approach people should make to the gods, and the responses the divine beings make to the people. They put prayers into the mouths of the people, and answers into the mouths of the gods. They represent the people before the gods, and the gods before the people.

Acting as an intermediary between gods and men may be lucrative; it may be dangerous; it may involve deceit, with at times a considerable mixture of self-deceit; it may simply be a monotonous business; or it may be one of the highest, if not the highest service a mortal can render his fellows. The character of the service will depend upon the character of the individual, upon his idea of the needs of people, and his idea of the character of God.

Two types of intermediaries may be distinguished, prophetic and priestly. The prophetic are those who discover and promote new ideas as to the character of God, or of man, or of the means of interrelation between the two. The priestly are those who accept the ideas which are handed down to them, and give their lives to the promotion of these ideas and the maintenance of traditional forms.

So far as idol-worship in West China is concerned, we are in a predominantly priestly age. Doubtless there are priests with some little flame of prophetic fire, but the purpose of this paper is concerned with forms and ideas which are in process of being handed down at the present time. We shall concern ourselves with idols only. We shall not however discuss their history individually, nor yet their appearance or posture. Very briefly we shall describe the method of approach which the priests prescribe, and more fully the responses they make to their suppliants. From these responses, the hope is that we may arrive at a fair estimate of divine character as it is being represented to the children of West China today. After ancestor worship, idol-worship comes second in the field of religious practices in West China. Idols are resorted to very generally in

times of stress. They are related to the larger issues of life. A large proportion of the people of West China get their idea of the divine from them. It is surely a matter of importance that we have a fairly clear idea of the character they are generally thought to bear.

II. THE METHOD OF PRAYER;

In a cylindrical box about one foot in height are placed a considerable number of bamboo splints. This box stands on the floor in front of the idol, and within easy reach of the suppliant as he kneels on the low cushioned rest prepared for worshippers. Taking the box in his two hands, and holding it in a slanting position, he shakes the splints vigorously and in a short time, one of them falls out. On each splint is written a number which corresponds to a fortune. So the number on the particular splint which has fallen out points to a possible fortune for the suppliant.

That the splint which first falls out is really the right one is not certain. Another check is put upon it. The worshipper takes two pieces of wood, approximately the shapes of the two halves of a cucumber. Each piece has a flat and a rounded side. The worshipper, being still uncertain whether the splint which he has shaken out refers to his fortune, asks the god to give him further evidence that this is the god's will. He chooses one of the three possible positions of these pieces of wood, namely—both with flat sides down, both with rounded sides down, or one with flat side and the other with round side up. Then he throws the pieces on the ground and if the pieces lie the way he selected, then this fortune is actually the mind of the god. If the pieces of wood lie in some other way he replaces the splint and shakes out another, and again by the use of the pieces of wood, tests the god. In case the pieces of wood fall as he has stipulated the splint is presented to the attendant priest, and the worshipper is given a fortune. Most people think the best position for the pieces is with opposite sides upward.

These fortunes consist of a verse of poetry in rather ornate language, followed by an explanation in rather simple language, in some cases also in poetry. In addition, in some fortunes there is also given a sentence entitled the divine meaning. In practically all cases the fortune designates a suitable offering for the god. This is not felt to be a binding matter however. The response of people to the god's suggestion is doubtless decided by the earnestness of their quest or the warmth of their faith in the god's power.

III. ANSWERS TO PRAYER.

(1) In this paper we will take up the answers of the gods as follows;—

P'u Shien, at the Golden Summit of Omei,
 Ts'ai Shen, the god of wealth, at the famous Chiu Lao
 Tong temple on Omei,
 Kuan Yin, at a temple on the road up Chiu Fong, and

Szi Chu, the god worshipped at the summit of Chiu Fong.

(2) *A General Classification of Answers into Favourable, Neutral and Unfavourable.* Each god has approximately one hundred answers ready for its devotees, and we may assume that these are calculated to meet all possible cases. Of the answers of the four gods studied, all answers except 23 of those given by the god of Wealth can be divided into three classes,—good, indifferent, bad.

In all four cases the good outnumber the indifferent and bad by a long way. The gods for some reason, seem to see a bright fortune for practically all people. It may be that from long reflection on human life, they have decided that the good is more common than the bad. It may be that they like to be bearers of good tidings as who does not, and so they foretell happiness; they may, however, be decidedly sordid, for in case they foretell very good fortune, they require larger offerings than they do if the fortune is bad. They seem to want to share in the good fortune of the devotee. For instance, those who are to be blessed with very good fortune are asked to present to the god from three to ten pounds of oil, a garment or hat for the god, incense or money. Those who are promised an ordinary fortune, give less. Those whose lot is to be hard are not requested to make any offering at all, in many cases. The god suffers with them.

Of 361 fortunes, 213 are good, 108 are neither good nor bad, and 40 are actually bad. That is to say 59% are good, 29% are fair, 12% are bad.

Of the good fortunes which number 213, the majority, 120 or 60% are very, very good. Of the total fortunes about 35% are very, very good. What is true in regard to the total numbers is true of the individual gods.

Kuan Yin and Shi Tsu each give about 65% good fortunes. Ts'ui Shen gives somewhat over 40% good fortunes, but in addition gives over 20% special fortunes which might well be classed as good. Nine of these are entitled "peace", and the other 14 have the following meanings, good luck, good fortune will come, things are going to improve, the god blesses you, you are going to have a son and the like. Inasmuch as all these are good, we may say that Ta'ai Shen also is very well disposed toward his worshippers.

P'u Hsien gives a smaller number of good fortunes than the others a somewhat larger number of medium and decidedly more bad ones. Nearly 20% of his fortunes are classed as distinctly adverse. However, with 44% good, and 35% medium, one cannot consider even P'u Shien entirely austere.

(3) *The Content of the Answers.*

Each fortune offers several blessings. The gods do not presume to know exactly what the suppliant may want, so they offer several to each. The following, however, are the desires which it is assumed

people have. A good name, or honor, success in or freedom from lawsuits, wealth, or success in business, good health, offspring, the return of a traveller, and the consummation of marriage. No other good takes sufficiently large a place in these fortunes to merit attention.

The following table will show the emphasis each of the gods puts upon these various goods:

	Name	Success at Law	Health	Wealth.	Children.	Marriage.	Traveller's return
P'u Hsien	83	86	63	69	59	8	78
Si Tsu	52	37	44	72	45	48	34
Ts'ai Shen	39	2	55	75	31	7	16
Kuan Yin	90	7	79	78	76	60	27
Total	246	132	241	293	211	123	155

This table is interesting from three points of view: from what it contains, what comparative emphasis upon the various goods, and from what it does not contain.

It will be noted that all these goods are personal or domestic. Name, success at law, health and wealth are predominantly personal. Marriage, children and return of the traveller are domestic. We can see in these the recognition of the economic struggle. We can note the fact that in a populous land it is far from an easy matter to get a name. Health is a problem all over the world, and a pressing one. When children are necessary to happiness in the future life, and when they mean honor in the present, it is quite to be expected that they should have a large place in the thoughts of the gods. The desire of the Chinese family to maintain its unity is evidenced by the large place given to the return home of the traveller. An unsatisfactory legal system is doubtless responsible for the frequent mention of lawsuits. In practically all cases the god warns against going to law. They seem to have a very low opinion of the justice of the officials. Marriage is a matter to which the gods pay considerable attention. It is not a mere civil contract.

In regard to comparative emphasis, it is interesting to see that wealth comes first, ahead of reputation, health, and all other goods. It is worthy of note that reputation, name or honor, or we might almost say "face", comes very high. That children come higher in the scale than marriage, is of interest.

If the Christian message were confined to these seven goods, it would be interesting to arrange them in order of worth.

In these messages from the gods we see no reference to a heavenly society or kingdom for which we should seek with all our heart. These four gods could easily compromise on command for men to seek wealth first. P'u Hsien personally would urge that the greatest need, and we may say the greatest good is to be at peace from adversaries. Si Tsu would say, "seek first—wealth". The god of wealth Ts'ai Shen

would naturally echo the command. Kuan Yin, strange to say, would say "a good name is more to be desired than all else." There is no social note worthy of the name struck in these messages.

No mention is made of the service to others which gives wealth its value. No mention is made of the fact that we should seek our reputation from God and godlike men. "Reputation" looks a very cheap thing as the Christian would see it. No suggestion is made that health is to no small extent a result of following the laws of health and the gods should encourage folk to the observance of these laws. No suggestion is to be found in regard to lawsuits, that we should strive for social justice. In these messages, a pitiful, personal attitude is taken. At all costs, keep away from the law. Depend upon personal relations and compromise. In regard to children no encouragement to help them in any way is suggested.

Practically no principles of any kind enlighten these messages. Each express the god's inscrutable will. Justice, mercy, humility and the like are scarcely mentioned. It may be said, however, that these messages are not at all degrading. They assume a moral standard of a fairly worthy sort. It is individualistic and negative. The idea of a possible life of communion with the god is not prominent. Little emphasis seems to be put upon mystic experiences, except in so far as the very fact of appealing to the God implies one's faith in, and feeling of dependence upon the hidden powers which the image represents.

P'u Hsien No.21. Very Good.

Just before you is good fortune. Your fortune is sure as a pine rooted in the rock. Frost and snow may come, but you need not fear. The pine is not like the wild flower of the heath—

If it is honor you desire, you ought to pray for it. If you think of going to law, you had better not do so, but quietly make the matter right. If you think of the traveller, a letter will come. If it is profit you seek, great rewards are in store for you. If you are ill, your trouble will pass. If you are to have a child, he will bring honor to you.

No.27. Very good.

Long have you planned in vain for your desire, but now success is just beginning to smile upon you. True, storms have long beaten upon you, but you have received no harm. You are superior to the ancient towering pine, which stands protected by a cliff.

If it is honor you seek, you may pray with hope. If you think of going to law, you ought rather to make peace. The traveller arrives. Profit is according to your wish.

No. 7 Medium.

The ills you see before you are but clouds and mist. They are not real. Even should they come upon you, they will not harm you. Spend freely of your substance. Though trouble may come, it will not come upon you.

If you desire honor, you may pray with hope. Do not go to law.

A letter will come from the traveller. If it is profit you seek, you may hope, but not for much. If you are ill, pray for a cure. Be sure to keep your conduct pure.

No. 18 Medium.

Listen not, sir, to empty talk. Be loyal and true, and help the poor. The gods will of course, take care of you. You will be blessed in all things.

Honor will come, but is delayed. Do not go to law. The traveller is delayed. A little profit is in store for you. If you are ill, pray for healing. Keep your heart pure.

No. 36 Bad.

Fierce are the waves which roar along the Great River. But grasp the rudder tight, and you will come to no harm. Do not covet the flowers which so richly carpet the forest. The good will help you, and you will soon reach home.

Your prayer for honor is in vain. Do not go to law. The traveller is delayed. A little gain will come to you. If ill, consult a doctor. Above all, be careful.

No. 37

Happiness, and calamity alike are before you. All depends upon the thoughts you harbor in your heart. It always pays to keep to the good old ways. But you are too covetous. That is the source of your trouble.

Honor is delayed. Do not go to law. The traveller is delayed. Of gain there is but little. Be careful of your health. Your affairs are going away.

Kuan Yin No. 3

Keep steadfast at the task begun. Seize the opportunity. It will come. Go forward with your work, and fear not for honor or reward.

If name and profit is your quest, they will be yours. If ill, you need not sorrow. The traveller will come. Happiness is all but at your door. You will have a happy home.

No 17. Good

All in good time, bad luck will go, and good will come. In all things good and bad are but the fruits of that which has been sown. If you have come to a forest, with flowers, beautiful as flowered silk, then elsewhere seek for flowers, and plant them there.

Bad fortune has gone, and good has come. Everything is harmonious. You pray for honor and it comes, for wealth and here it is. Marriage has come, and sickness gone, and all is arranged for your child to be.

No. 25 Medium.

Sir, if in your heart you are entirely sincere, the heavens themselves must protect you from harm. Now has come the time for the

reward of good and ill. Happiness is in the hands of the gods, to give and to withhold.

Wealth will increase, and honor be attained. You will have a son, and a happy home. Illness will depart. Beware of mean fellows. Pray for the god's help, and you will escape calamity.

No. 36 Medium.

To south and north you sell your costly wares. A hundred-fold profit will be yours. Now, sir, give up your business, and return to your country home. Be satisfied and restrain your heart's desires.

Honor will come, with marriage, wealth and children. Your home will be blessed with wealth. If illness has been long, pray the god to help you.

No. 21 Bad.

Your cupidity will not down. It tangles your affairs. You are like a boat without a hauser to hold it to the shore. A dangerous rapid is just before you, and after it, another still more to be feared.

If ill, pray for help. Expect little in the way of honor or wealth. Do not associate with mean fellows. If about to marry, you would do well to delay. If you are to give birth to a child, pray for the blessing of the god. Do good deeds, and you will escape your misfortunes.

No. 61 Bad.

Wealth and honor are like the dreams of down. Your position is like the fleeting cloud. Your friends who surround you will prove false. Your domestic love will turn to hate.

You will have honor and be blessed with gain. You may marry. The traveller arrives. If ill, take medicine. If with child, fear not. Your home will be blessed.

Ts'ai Shen No. 63 Very good.

Do not go where people are quarreling. Keep guard over your tongue, and keep out of sight and you will not get into trouble. If an opportunity of large profit offers, seize it without fear. You will have a life time of happiness.

Your business will prosper. This fortune means good luck. Give three pounds of oil.

No. 87 Very good.

Do not be worried or excited. From the East will come your fortune, and you in the West stand awaiting it. Think carefully. Do your duty. You will escape misfortune. In all things you will be fortunate.

This means for you to be patient and careful. Give fifteen pounds of oil, and the god will guard you always.

No. 78 Medium.

Just before you is the fortune of the white tiger. All who look up on you are moved to pity. But you are a man of great courage.

What do you fear? You can override calamity, and live a happy life.

Bad fortune is before you, but present some oil to the god, and as the sun lights the land for a thousand miles, so will the lighted temple lamp dispel your sorrow.

Bad fortune has gone and good has come. Give ten pounds of oil.

No. 85. Wealth lies to the East. Ride your horse to the town to the South of you. When people criticize you, just be patient. In business, you will outdo all your rivals.

Explanation: You will be wealthy. You will attain your desire. This fortune means that in all things you will prosper.

No. 72 Bad.

Men all about you claim to be your bosom friends. Really they are not. You should attend strictly to your own affairs, and so avoid getting your self into trouble.

If you want gain, you may get it. Do not listen to the deceitful words of the mean fellows about you. Do good deeds and all will be well.

Give one thousand sticks of incense and the god will grant you happiness.

No 98. Bad.

The red bird sings at your door. Out of the blue comes a small calamity. A good heart will influence me. I will send the Guard of Heaven and he will bring you happiness.

A good purpose has brought you here. Give five pounds of oil and you will be happy.

Do good deeds and the god will protect you always.

Si Tzu No 81. Good.

Men who try their powers in rivalry think themselves heroes. Really, honor and dishonor, poverty and riches, are all fleeting, and all change in the twinkling of an eye. The silver toned temple bell with one sound awakes the dreamer, and awakened, he realizes that all was but a dream.

Our affairs may go well or badly. In fortune itself, there lurks calamity. You will be honored, and get great gain. Amass merit, and you will have sons. The threefold blessing of happiness, long life and sons will be yours. Yield to your adversary that you may have peace.

No 89. Good.

In the second month, the withered tree puts forth its flowers and fruit all fresh and bright. Sir, the coming generation will far surpass you. With such a good son, why should you put forth effort to win honor.

Good luck has come. Business will prosper. Your home will

be harmonious. Honor and children will be yours. Your descendant will be honored and in all things will you be blessed.

No. 88 Medium.

The flowers before your eyes are false. Do not think of the shadows of bubbles as real. I urge you, sir or madame, to develop a good spirit. The afternoon breeze will spring up and all things will be as new.

Wealth and honor are but the shadows of flowers. The poison is heavy in your heart. Your treachery is too great. Do not be so covetous. Help others who are in difficulty. Happiness, long life and posterity will be yours.

No. 97 Medium.

You are fifty, and have no position. You are discouraged. Who would suspect that wealth and honor are following close upon your track. So, continue to do good deeds, and keep square. You will live to be as old as the hills, and will in due time get to heaven.

Now comes calamity, but soon will come good fortune. Your law troubles will be past, and your sickness cured. You will be married and be blessed with sons. The traveller will arrive. It is hard to find lost things, likewise a high position is not to be quickly found.

No 78 Very bad.

To become a spirit or a Buddha all depends upon your heart. If your heart is pure, you need have no care. Good deeds bring happiness, bad bring sorrow. Heaven makes no mistake. Repent of your sins. Wash clean your heart.

Business will be dull. Your marriage will be postponed, and honor hard, if not impossible to attain. Wanton conduct brings calamity. Covetousness will shorten your life. If you repent, you shall be given a son. Do good deeds and you will be blessed.

No. 98 Very bad.

In the midst of your difficulties you ask whether you are to suffer no matter which way you turn. If you do your best, you must needs get your desire—just as the dry tree blossoms with the coming spring.

Reputation and fortune are won. Your plans will be fulfilled. You will have a son. The traveller is delayed. Your marriage will be delayed. Do good deeds and you will have a son. Keep to the old ways, and you will get great gain.

IV. THE RELIGIOUS VALUE OF IDOL WORSHIP.

The attitudes which Christian worship aims to produce have been classified under four headings: Thankfulness, goodwill, reverence, faith and loyalty.

In the study we have made, the attitude of thankfulness is not mentioned. It is implied, however, in the god's request for an offering. A problem presents itself here, which has bearings on the whole philosophy of ancestor worship. The god may be thought of simply as a reporter or mouthpiece of the Powers. In that case, such thanks as is accorded a messenger is due him. To the Powers, one feels such thanks as one feels toward luck or such thanks as is expressed in the phrase "Thank Fortune." Such a feeling is far removed from the feeling expressed by St. Paul, "I thank my God", or by our Lord when lifting up his eyes, he gave thanks. On the other hand, the god himself may be thought of as the source of power in this case, there must be a feeling of thankfulness. But as in most cases, the god is not felt to have suffered for one, one cannot focus one's thankfulness very fully upon him. Inasmuch moreover as worship is confined rather to the presenting of definite petitions, as it is sometimes in the case of Christians, there can be little consciousness of thankfulness to God for his gracious, eternal and all embracing purposes, which type of thanksgiving is the glory of religion. We may say that idol worship is not productive of thankfulness in any large and disinterested measure either to men or to the gods.

In regard to good-will, we are not impressed with any great saving purpose on the part of the god. He is a more or less friendly adviser to mortals. He warns them that people reap what they sow, that good deeds bring happiness, and evil ones bring misery. The idea of loving our fellowmen because of their worth, and because of the value they have in the eyes of a Heavenly Father, is missing. We cannot expect any great increase in mutual good-will among men from idol worship.

As for reverence, idols are too inert, too inactive, too impersonal and non-moral to produce an essential element, wonder. Our reverence requires moral superiority. With the exception of Kuan Yin whose kindness must meet with general approval, reverence is not greatly developed in idol-worship. Attempts to kindle wonder include miraculous flights and accomplishment of various sorts, but these being mostly physical exploits, do little or nothing to produce the type required for true reverence.

As for faith, if we may classify it as predominantly feeling,—a feeling of confidence that there are powers and that they are of a fairly reasonable sort,—neither particularly well nor ill, disposed toward mankind, we may say that idol worship is valuable. Any confidence in a final victory for good in the world with the social and eternal implications of such an event and purpose is outside the range of idols. They minister more to an unreflective, unsocialized, faith of a comforting sort.

So far as loyalty is concerned, idol worship may be considered neutral. Dealing more with material blessings, with wealth, health and position, it is clear that one could not well go down with a losing cause and still be blessed. As the idols see it there can be no success in failure. Loyalty values that which cannot be measured. As such,

loyalty does not take any worthy place in the view of the gods of West China.

From the standpoint of the instincts, idol worship is firmly entrenched. First,—in wealth, we have the acquisitive instinct. Second,—in name, we have the self-regarding instinct. Third—in health, we have a combination of instincts which make for physical comfort at all costs. Fourth,—in interest in travellers' fortunes, we have doubtless the protective instinct, confined to a narrow area. Fifth,—success at law or freedom from legal difficulties, appeals to the self regarding instinct. In children and marriage, we have a combination of instincts of protection, self-regarding and sex among others. It will be seen that the big appeal of idol worship is to the self-regarding instinct, and that the protective or parental instincts in any wide relation of life are almost entirely disregarded. Idol worship is strongly entrenched behind these powerful, but non-social instincts.

For days when an autocratic government maintained a more or less peaceful state of affairs throughout the country, and when social contacts were few and when people were fairly free to go their way with but little interference (mild and relatively simple) of any sort, idol worship no doubt served fairly well. But now, with liberty, equality and world citizenship, with the coming of the industrial age to China, with communication and transportation such as they are getting to be, idol worship with the type of character it fosters is as inadequate as the most primitive of tools. It is like the survival of quackery in an age of science. The protective feelings with their concern for others, in ever broadening circles, must be called forth. Otherwise oppression of the poor will continue as at present, accompanied more or less steadily by war and general confusion. Christianity is surely the only remedy for these times. A God who loves and suffers for men, a God who is unwilling that one single soul should perish, a Master who incarnated that love and that concern for men, a Spirit in man to respond to that love and that example, these are what China needs to know to-day. This is the God they need to hear from, this is the Master to whom they should be introduced, and this is the inspiring Spirit necessary if China is to overcome the manifold difficulties with which she is confronted to-day.

VI. Politically the worship of gods of this character should be a check to radical movements. The overwhelming emphasis put upon individual and domestic matters constitute at once an obstacle to Christian mutual helpfulness and to communistic propaganda. At present the oppressed classes are being stirred by the thought of some sort of socialistic panacea for their troubles. The idols are insufficient for these times, but the weight of their influence, and it is backed by strong human instincts, is against the mutuality involved in such social solutions. In so far as wealth, reputation and general well-being can be obtained by these social experiments, in so far will the gods lend their august assent and approval. In so far as social service

and sacrifice are involved, the gods will show themselves comparatively inert. We may consider such gods for good or bad bulwarks of the present social and political order.

A final word should be said in regard to the best attitude to be adopted toward idols. It is not uncommon for morals to break down along with faith, albeit it be only faith in an idol. Unless one has a better faith to substitute, it would seem best to say little in opposition to idols. Men and women need the reinforcement which comes from a living faith in the divine. A freedom from superstition which brings with it freedom from all divine restraints and inspiration is not a freedom, which one should covet for his fellows. A destructive attitude toward idols, except in so far as they are retarding growth in a truer faith is surely not the best attitude to take toward them. These idols really make more inspiring company than such a machine as some seem to conceive our universe to be. They are better than none. It is for men and women who know the experience of a divine companionship richer and deeper, purer and higher than any idol can afford to introduce our fellows in West China who now look to idols to the Great Companion.

SAMPLES OF THE ANSWERS OF THE GODS.

I

P'u Hsien.

- No 1. Very, very good.— — Give a set of presents for the god.
 Good fortune and happiness will together come upon you.
 Life for you is at the spring, and the sun is in the east.
 That which you desire from your heart can come to you.
 In harmony with heaven and man, all things will be happy
 for you.

Explanation. Of all fortunes, this is first. Complete happiness has come. Things are as you desire. In everything you will attain success.

Note. This fortune is of all the first. He who gets this, in all things will succeed.

2. Very, very good. Give an incense burner for the altar.
 The full moon shines clear in the central heavens.
 Its light shines forth without a shadow.
 For the moon god himself this is the most perfect time.
 Good things are in store for you these days.

Explanation: Honor comes. If at law, make peace. The traveller returns. Wealth will come. Marriage will be satisfactory, and a good son will be born to you.

Note; This fortune is like a precious jewel brought forth from its case. Do not stop to talk about the price.

3. Upper medium. ——— Give 60 pounds of oil.

The ancient mirror again shines bright.
The maiden seeks her mate, and the swain desires to marry.
Henceforth, the home will prosper and be happy.
Happiness and children will be increased.

Explanation. You may expect honor. Your law troubles will be settled. The traveller will return. You may pray for profit. Your health will be restored. A son will be born.

Note: This fortune is like rain after a thousand days of drought. Good times are coming. A happy star will soon shine upon you.

II.

Kuan Yin.

No. 1. Very very good.

King Wen is victorious.
At the third hour, the red sun rises from the East.
The Phoenixes answer each other in song.
Soon the sun will rise higher, and the world will all be flooded with light.
God's meaning. You may expect honor and gain. Have no fear of illness. You will have a son who will bring honor to you. In all things you will be fortunate.

Explanation. Just as King Wen conquered all the world, so the one who gets this fortune in all things will enjoy happiness and success.

No. 2. Very, very good.

Su Ch'in—seeks to become an official.
Your success and honor will resound throughout the earth. You will be the incomparable saviour of the people. Whether you are an official or a common man, this thing you desire will come to you.

God's meaning. Your prayer for long life will be answered. Honor will come. Profit is assured. Happiness is near. Sickness will be cured. Home affairs will turn out well.

Explanation: This fortune brings to the one who gets it that which he desires. Prayer is answered. Honor and profit are sure. This year be careful of mean fellows. If these do not interfere, all will be well.

No. 3. Good ——— Shuen Teh crosses the river.

Have no doubt as to that which you desire. Seize the opportunity which presents itself. Go forward in your

work earnestly. Don't worry about honor or profit. They will come.

God's meaning: You seek name and profit, they will come in good time. Illness will bring no sorrow. The traveller will come.

Happiness is near. Family affairs will be happy. Marriage and children are before you.

Explanation: This fortune means that in all things be quick and ready. Great advantage will come from honest prayer. The god's spirit will secretly help you.

III.

God of Wealth.

No. 1. Very, very Good.——— Buy five pounds of incense.

If you amass merit, and give yourself to good deeds, and follow your conscience and reputation and profit, your affairs whatever they may be, will be according to your desires, your whole family will have good fortune, and happiness will increase.

God's meaning: Reputation and profit are both complete. You will lack for nothing and your home will be happy.

Explanation: Worship on the first day of the month, and you get this fortune. If it is name or honor you seek, you shall be satisfied.

No. 2. Medium.

You ask in regard to your family affairs. Your family are all well, but their difficulties are many. If you can maintain a quiet fair mind, your misfortunes will turn to happiness, and your difficulties will clear away.

God's meaning: You may wear out iron shoes in a vain search, but having found, you look upon your find as of little worth.

Explanation: If it is wealth you desire, in all things you will have good fortune. You will have a son.

No. 3. Good.

In coming in and going out, you observe good form, fairness and are respectful, and in your judgment of the affairs of men you are moderate and fair. Your home will be happy, and things will be as you desire. The sun and moon will light your skies.

God's meaning: Everything will go happily. Great labours and great accomplishments.

Explanation: If some one has treated you wrongly, you will have revenge. If you are on good terms with people, you will be able to return their kindness. This fortune will bring a change in your affairs.

IV.

Si Tsu.

No. 1. Very good ————Give five pounds of oil.

Alone you make your way to heaven on high.

In the temple of U, in fairyland, you are of first rank.

Riches, honor, glory, renown all are yours, happiness as of the Eastern Sea, ageless as the hills.

Explanation. If it's office or honor you seek, you will have them.

If food, you shall be filled. If at law, you will get justice.

If a child is to be, it will be a son. If it's illness, you shall be well. Your marriage shall be consummated.

No. 2. Medium ————Give three pounds of oil.

Wealth and penury are all at the behest of heaven.

Today, do not forget the days of old. If you ask what your future has in store for you, then must you by all means be steady in your ways.

Explanation: Wealth is coming; your illness and law troubles must end. The traveller returns. Your marriage will be consummated. Your wealth will be moderate. Keep to the good old ways.

No. 3. Medium. ————Give three pounds of oil.

Heaven naturally concerns itself with your food and clothes.

Why, pray, are you so troubled about them? Maintain a filial, friendly loyal faithful heart, and happiness will soon come, and calamity will keep far from you.

Explanation: Reputation and profit await their time. Illness and lawsuits are without sadness. Pray that your marriage may be consummated. You will have an honored son. In all things keep to the old paths. Perhaps all will turn out well.

"THE SIN BEARER," A NOTE ON COMPARATIVE RELIGION.

J. H. EDGAR

In Leviticus, Chapter 16, we read of a custom, divinely sanctioned, which is of great interest to students of Comparative Religion. Lots were cast upon two goats, and while one was sacrificed to God, the other, with all the iniquities, transgressions and sins of the Children of Israel, was sent away by a man "unto a solitary land." The sin burdened animal was for that "mysterious power of Evil, Azazel."* This belief that the concentrated national, local or individual sins could be transferred to a person, animal, or objects that could be destroyed, is known in widely separated parts of the Earth. In Lhasa the sins of the region are symbolically placed on a man who carries them away beyond the limits of settled population. The sins of some towns in Nigeria are laid on a slave girl who eventually is left to expire in a river or lagoon. In Japan the same idea is expressed: paper garments on which the sins are loaded are carried out to sea where they are swallowed up for ever. Even in the Aleutian Islands the wrongdoer carries certain weeds on his body with the object of saturating them with his sins, When this has been accomplished the tainted weeds are burned with fire.*

That a custom resembling the Jewish one obtains in the Lifan district will probably surprise not a few, and no doubt suggest explanations as varied as the trainings and temperaments to the readers. There the sins of a certain community are, by the aid of magical formulae, transferred to a yak which is then driven to the solitary wastes,—mazes of cliffs and sombre forests,—behind the Temple of "White Negation."† Here "Azazel" will be the ferocious wolves and leopards of a terra incognita. When it is known that the animal has perished a new one is liberated. Naturally we might suspect social contact with, if not a remnant from, Semitic races. It may be so, especially as litholatrous survivals are connected with the temple mentioned above. But at present we may only claim analogy and leave it to later investigators to prove the definite influences. A sense of guilt and a dogging fear because of it are universal; and the belief that sin may be transferred to an object other than the sinner is not uncommon. If "Azazel" is an unusual name for the Devil the sins of the people are returned to their source, to be, in due time, destroyed with the source. In John 1, 29, we are expressly told that Jesus is "the Lamb of God which beareth away the sin of the world!" The destination is not stated, but we know that they were taken to the accursed place,—the Cross.

*The illustrations dealing with Nigeria, Japan and the Aleutian Islands are from Dr. Carpenter's book on Comparative Religion.

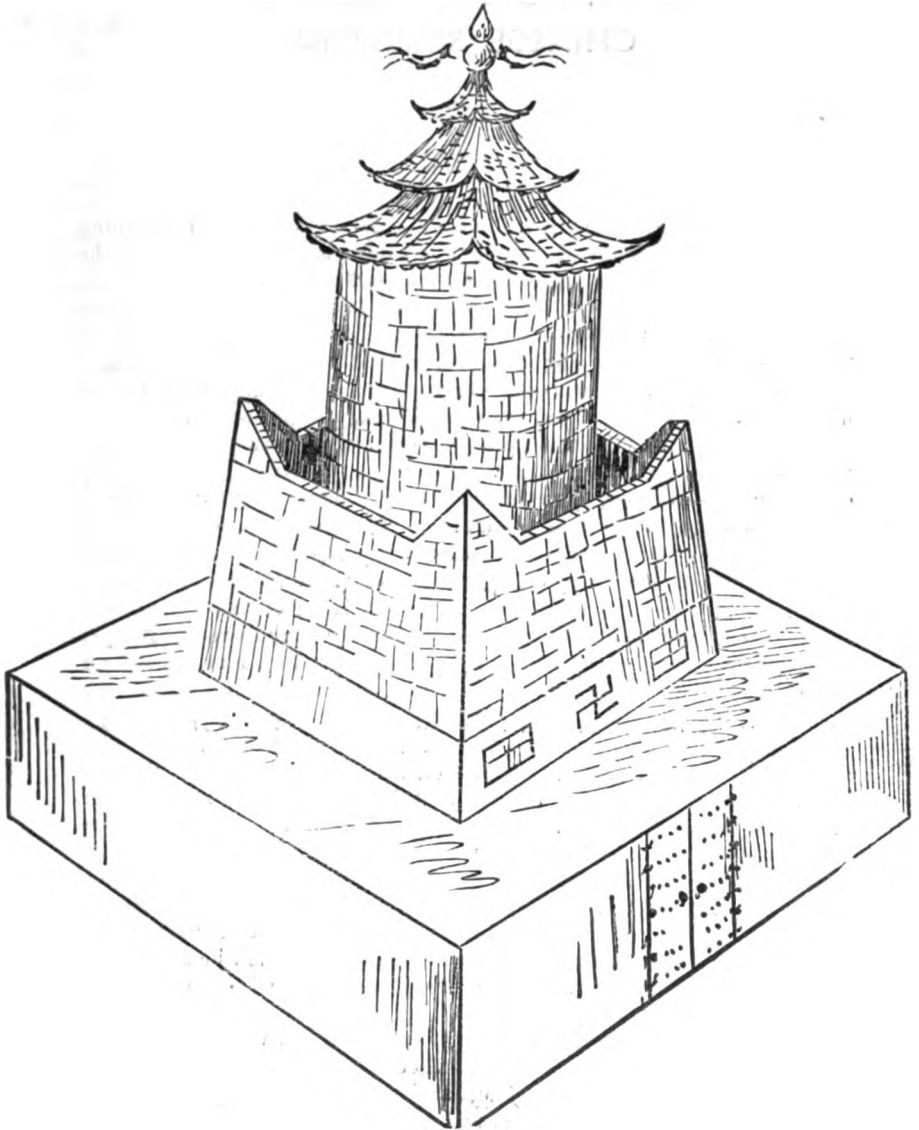
† 白空寺 (Beh Kung Si)

A NOTE ON THE BÖNS OR BLACK LAMA SECT

J. H. EDGAR

It may be of interest to some to learn that the Böns or Black Lama Sect claim to have a definite connection with Persia, which they call "Tazing." Their Heaven, and the home of all faithful Böns, is "Ormu Lung Ring", which I imagine means the "Long Vale of Ormuzd." This latter was the good deity of the Persians. The Böns, therefore, were probably colonies of fire worshippers who for some unknown reason came to Tibet.

We know that the teachings of Zoroaster had reached China by 621 A.D. The Chinese speak of the Böns as the Black Sect; and it is interesting to remember that Persia was thought to be the home of black magic. The religious colour of the Böns is said to be white, and survivals of fire worship are thought to be common. The disposal of the dead by exposure to vultures and wild animals may be also a survival of a Persian custom. The illustration is a rough sketch of the "Black Cathedral" in Tibet. The courtyard is not shown.



“The Black Cathedral” Of Bon Temple

UNIFYING SYMBOLISM OF CHINESE RELIGIONS

A. J. BRACE

Chinese religions are by no means mutually exclusive. Remaining quite within the bounds of propriety, Chinese may be members of the three principal cults at one and the same time. Confucianists, Taoists and Buddhists join their philosophy and have much in common under one mystic symbol, namely the "T'ai Chi" (太極) and the "Ying—Yang" emblem (陽陰), elaborated in the "I Chin" (易經), Book of Changes, as originally discovered by Fu Hsi (伏羲) from markings on the back of the tortoise and the dragon-horse.

This work and its interpreters teach that in the beginning all was confusion and utter chaos. Order was evolved by the activity of the "Tai Chi" (太極), the "Great Extreme" or "First Cause", acting through the "Yang Principle" (陽) (male), and the "Ying principle" (陰) (female) in collaboration. From their joint operations came the "Four Seasons" (四季), and the "Five Elements" (五行), metal, wood, water, fire and earth. The last being common to all was not counted, and the others were known as the "Four Forms" (四象); these produced the "Pah Kua" (八卦), and the "Pah Kua" produced the "Sixty Four Diagrams" or as the familiar Chinese Cosmogony phrases it, "太極生兩儀, 兩儀生四象, 四象生八卦, 八卦生萬物".


The warmth of the Yang produced the Sun, typifying Fire. The cold exhalations of the Ying produced the Moon, typifying Water. From the seminal influence of Sun and Moon come the stars. The Five Elements combined and produced the Universe. These speculations being too subtle for the common people they naturally wished to personify and deify these powers. Lacking the imagination of the Greeks, the Chinese personages were shapeless and grotesque. In Chinese mythology the "Architect of the Universe" is "Pan Ku" (盤古), and his task was to mould the chaos out of which he came and carve out the world. The name "Pan" means bowl or egg-shell. "Ku" means solid, secure.


The "Tao Teh Ching" (道德經) approaches a very respectable philosophical system in the Taoist theory of Life. It teaches the existence of the "Ren Shin" (人心) and "Tao Shin" (道心), the first conscious, the second unconscious but with intuition. The first is the Sun-Fire, typified by the serpent; the second is the Moon-Water,

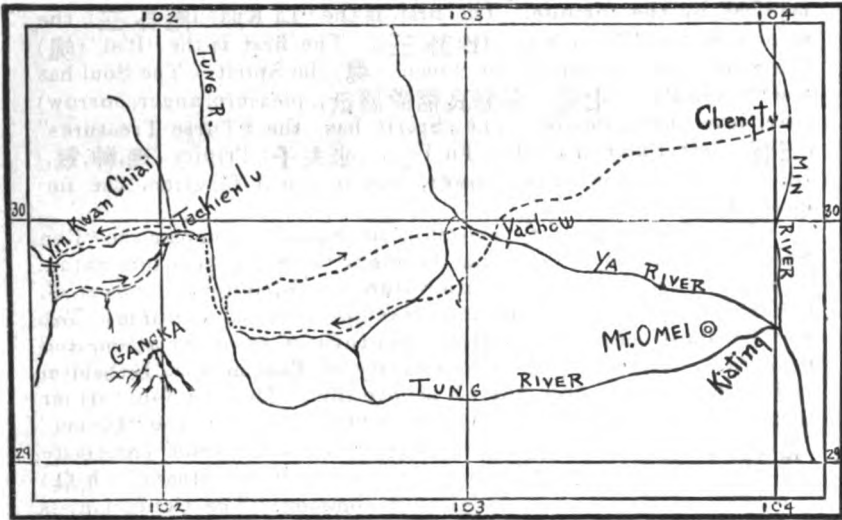
typified by the tortoise. The first is the "Li Kua" (離卦 三), the second is the "K'an Kua" (坎卦 三). The first is the "P'ei" (魄) the Soul; the second in the "huen" (魂) the Spirit. The Soul has the "Seven P'ei" (七魄: 喜怒哀懼愛惡欲), pleasure, anger, sorrow, fear, love, hate, desire. The Spirit has the "Three Treasures" (三寶), better known as "Lai Fu Tze's" (來夫子) Trinity (理, 神, 氣). Li, Shen, Chi,—the ruling power, the mystical function, the immaterial breath.

The Taoists use the "Tao Shin" or Spirit to conquer the "Ren Shin" or Soul, as in Christian Theology the Spirit conquers Satan. The Spirit is Nature. To nourish Nature the Spirit becomes powerful, finally becomes independent and develops spiritual children. The Soul or Ghost goes down to Hell, then through transformations and re-birth. This reveals the close identity of Taoism with Buddhism and with Confucianism, for all believe this. They all hold further that the "T'ai Chi"—"First" Cause or "Creator" is in the "Dipper" (北斗), thus the "Seven Stars" with the "Sun" and "Moon" constitute the "Nine Kings" (九皇), and each year the "Chiu Huang" (九皇) is celebrated by all three religions in common. The Confucianists had the "Tao" first, as recorded by Mencius, but lost the succession through the "Burning of Books" by Chin Tze Huang (秦始皇). The Taoists kept the Tao of Lao Tze and shared with the Buddhists. Later in the Song Dynasty, Cheo Tze (周子) and others repaired the Confucian loss with a new philosophy derived from the Taoists, who in turn lost their genius and took up magic.

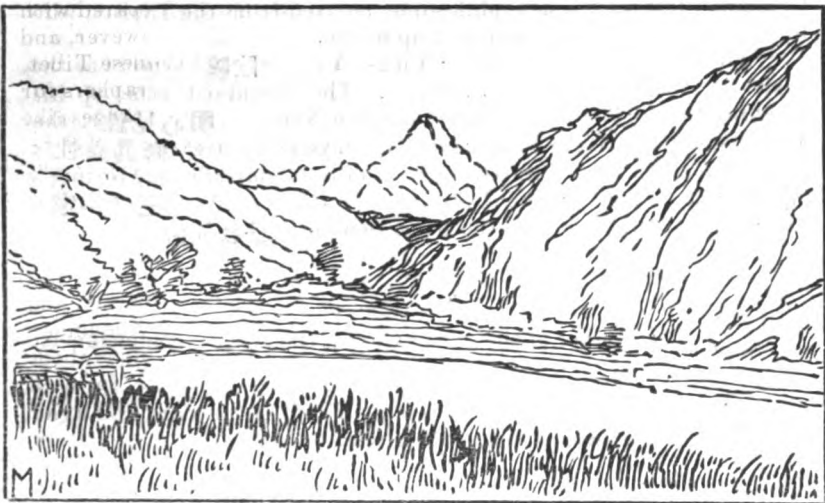
All three religions use the "Ying—Yang" (陰陽) symbol as the basis of their working philosophy. The Buddhist sums up his teaching thus, "The pure in heart can See Nature" (明心見性); the Taoist says, "Cultivate Truth and Nourish your Nature" (修真養性); the Confucianist says, "Search out Reason and Complete your Nature", (窮理盡性). The "Three Religions are One Family" (三教一家). The "Three Religions have the Same Source", (三教同源).

 The symbol of the "T'ai Chi" is the circle—completeness.

 The symbol of the "Ying—Yang" is the dark and light blending within the circle.



Relative position of Yin Kwan Chiai, from where the the view of the Gangka as shown in the accompanying sketch was obtained July 20, 1930.



'Gangka' meaning *The Peak*, as seen looking south-east from Yin Kwan Chiai. Approximate distance 50 miles.

Sketches by H. J. MULLETT

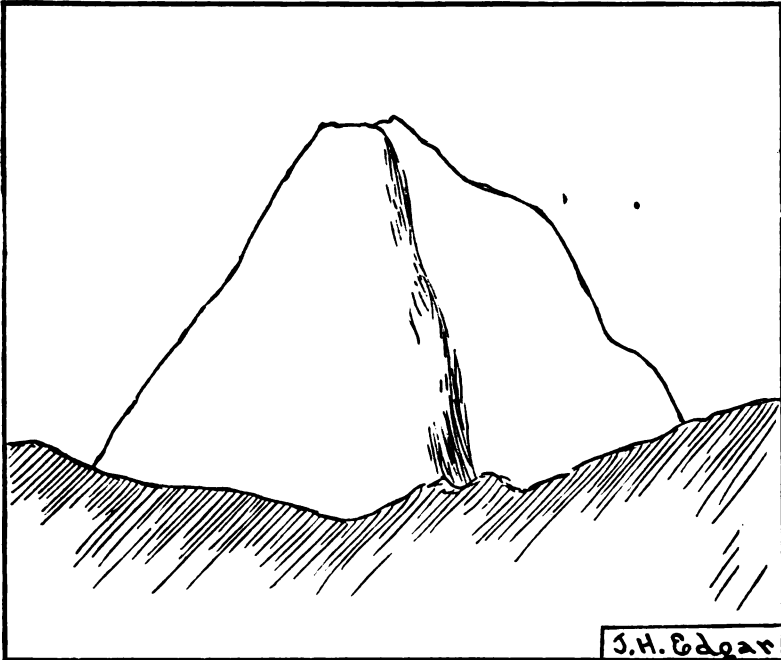
THE GANGKA—A PEAK IN EASTERN TIBET

J. H. EDGAR

The Gangka is one of the very remarkable features of the world, and it is certain that neither the poet nor the artist could adequately sing the praises of the glorious spectacle that remains the heritage of a few nomads occupying limited areas of the planet's roof. It may sound incredible to many, but it is nevertheless a fact, that even here in the highest habitable zones on earth the Gangka is a strikingly exceptional feature. For Eastern Tibet is not obtrusively a land of snows. Indeed, anyone may travel for weeks over richly grass clad passes and plateaus without gloating his eyes on virgin snow, and latterly when it does appear the deposits are confined to the sharp ridges and isolated peaks of exceptionally high ranges. But owing to the general abnormal altitudes of the adjacent valleys and tablelands Tibet is very often a poor second when compared with mountain areas of many other lands. The Gangka, however, and other land masses on the Eastern fringe of Kham, or Chinese Tibet, are noted exceptions. Why this is so must puzzle geographers for many years to come. But it is a fact that our frontier ranges like those frowning over India seem to bulge up and eventually form gigantic rims which overlook plains and mountain country of relatively insignificant altitudes, This is peculiarly so with the Southern part of the Tung—Yalung divide.

The feature in question is one of several sweeping extensions from the Eastern portion of a great water parting which send supplies North to the Yellow River and South to the Salwin, Mekong, and Yangtse systems. The section of the Tung—Yalung divide under discussion begins about forty miles North of Tachienlu and ends about fifty miles to the South. In the North it bifurcates and forms a circle around the Tachienlu depression and unites in the vicinity of the Cha-Ze Pass. At the top end, at the beginning of the Western rim, we have Zha-Ra with peaks near or above 25,000 feet and a smaller range further South with snow clad country four or five thousand feet lower. On the Eastern rim, apart from much high broken country, we have five snow peaks South-East of Tachienlu which must exceed the 20,000 feet line. Near the Southern junction of the rims we again find mighty peaks of a similar altitude, but which are probably disregarded by modern map makers. They are the beginning of a short range which runs in a Southerly direction

towards the Eastern bend of the Tung and undoubtedly contain some of the earth's highest land. As seen from the region around Yin Kwan Chiai the tract exhibits a truncated cone of great altitude and exceptional charm; an extensive broken plateau well over 20,000 feet; and the peerless Gangka, perhaps the earth's culminating point outside the Himalayan system.



The Gangka from the Mi Chi Heights looking roughly northeast.

(Note: The shaded part has grass and brush wood.)

The Gangka is a mysterious mountain. Many Europeans seem certain that it may be seen from Chengtu and other cities on the Chengtu Plain. If so, scores of missionaries and others, although ignorant of its true position, have been privileged to admire the extensive snow deposits on or below the summit. There are others, however, who scornfully reject such claims; and the writer who has certainly seen snow clad peaks from the China Inland Mission balcony in Chengtu, while sympathizing with the majority, is content to leave the question open. However, he has no doubt that the Gangka is plainly conspicuous from the summit of Mount Omei. But to Europeans living in Tachienlu the Gangka, even now, has elements of mystery surrounding it. This is partly explained by the fact that the tract of country between T'ien-Wan and Tze-Ta-Ti and Westward to

the Yalung is still largely a *terra incognita* to modern geographers. Hence the Gangka has no place on recent British maps. But someone might argue: "It is often on view from centres traversed by famous travellers." We admit the claim at once but point out that owing to shrouds of dense clouds many a man interested in conspicuous earth forms has passed on his way entirely unconscious of the superb view ready to bewilder him "when the mists have rolled away." But both the Zha-Ra and the Gangka are cases of mountains having been found, then unaccountably lost, and finally found again.

The French fathers who have been in Tachienlu for more than half a century must have measured the Gangka before most of the present readers were born. So must many famous travellers who reported on these regions thirty or forty years ago. If not, why was it on the maps of those days with both position and altitude relatively correct? The writer probably saw it during September 1903, and certainly many times after that. But owing to an idea that description of scenery without exact measurements was poor geography he refrained from discussing or publishing his opinions. However, early in 1922 he suggested to Professor. A. E. Johns, head of the mathematics department in the West China Union University, Chengtu, the necessity of a survey by experts. Unfortunately, our plans did not mature owing to the retirement of this brilliant and very charming gentleman from the China field. About the same time a sketch, imperfect in many ways, and not too correctly reproduced, was printed in the Journal of the West China Border Research Society. Then during 1926, when the writer was in Australia, a party from the West China Union University visited the Yin Kwan Chiai region, but no report of their work has been published. The Roosevelts were the next to meet the opportunity, but they were after pandas, not mountains! H. Stevens, however, the naturalist of the same expedition, obtained many fine and varied views later; and apart from sketches, has valiantly advocated the claims of the Gangka to a place on the Royal Geographical Society's maps. Dr. J. Rock, also, has practically circumambulated the Gangka block, photographed it extensively, and made measurements from high altitudes and close quarters. Up to the present his results have not appeared in print, but it is almost certain that he will do in America what Stevens has done in England. As regards the position of the Gangka it will probably be found approximately West of Tien Wan at the extreme North of the Chien-Ch'ang Valley some distance from the point where the Tung turns towards the East.

The Gangka on the Tibetan side may be seen from almost any point on the passes and high plateaus; but every angle, altitude, time of the day and climatic condition adds to but never detracts from its excellent grandeur. Seen from beyond T'ai Lin, one of the more distant views, it rises as a terminal giant high above wonderful peaks and extensive broken snow-clad wastes, and is impressive almost to the point of stupefaction. But the view from the plains around Yin

Kwan Chiai is most pregnant with possibilities for poetic and artistic exploitation. Above the partly ruined village we look down a valley flanked with grass-clad rounded hills where an unattractive green is modified by the darker shades of some forest clumps. Just beyond the Cha Ze Junction similar hills seem to run across the main valley and incidentally form a concave line above which appear the base and peak of the Gangka enveloped in a thick blanket of eternal snow. It is difficult to decide at what time of the day and under what conditions the Gangka's glory is best displayed. One view, however, must always live in my memory, pre-eminently. On July 19th., 1930, our party rode down a valley that might have been the home of Rasselas. The air was warm and softly tinted with an exquisite haze. Suddenly from behind the light brown hills a cloud like structure appeared in the form of a phantom mountain of unearthly size. Was it a delusion, or a trick of the clouds? or a sweetly haunted world enveloped in an atmosphere of ethereal softness? Or was it the Heaven of Loyal Buddhists, Mount Sumern itself? No; it was something real in this world of ours; the mighty Gangka in evening dress; the pride of the Marches; the glory of China; and the wonder of the world! The next day clouds hid it from our view as if in excess of admiration we had unwittingly offended some law of celestial etiquette. But in the afternoon it was out again, and although angry and defiant in demeanour, occasional modifying influences in the form of cloud patches and changing shadow, seemed to assure us that amends were being made for the mistakes of yesterday. "The Peak" in the crystal air of day stands out grim and stern like a terrible God: dead, detached, and forever unapproachable. What we see from the Yin Kwan Fort is, apparently, a three cornered pyramid rising from a coronet-like base of mangled, ice clad country, where ridges, chasms, and cataracts of ice sag down from both bluffs, sheer precipices and hummocky plateaus to the line of brown hills which hides the snowline. From this wild defiant mass "The Peak" towers up thousands of feet. The Northern side, of great extent, looks out steep and wildly broken, while the Southern one seems to suggest a gigantic sloping sheet of slightly frosted glass. In some places discoloured markings would imply that a mighty mass from the summit had broken away, and slipping down, had formed the large hummock which occupies an important position in an extensive cirque. Very often a peculiar cloud seems to hover slightly to the East of the summit. It is no doubt the result of wind driven snow, and has no more connection with internal fires than a venerable fact appearing at times in one of the ice clad caverns, has with colonies of immortals thriving comfortably in an environment of eternal death!

The effect of the Gangka on men and women, naturally, must be profound, but, nevertheless, as varied as are the temperaments of races and individuals. The immense size and grim majesty of to towering outline will of necessity engender awe and reverence. But the writer often turns away conscious of a mild stupefaction which ends in a

vague, tantalizing depression. The grandeur is too overwhelming; and such peerless displays of Nature too rudely proclaim human limitations and man's inability to fully enjoy the works of God. But humiliation and depression are only a part of the story. At eventide, for instance when the unshaded parts near the apex lie immersed in pale but golden shades how hard it is to forget a dead mother's conception of Heaven; or when it glistens in the morning with the entrancing whiteness made sacred by the transfiguration is one not reminded, that after all, victory is the ideal for man.

To the ordinary practical Chinese the Gangka is no asset. It is an uninhabitable waste without cereals for food or forests for dwellings or fuel. Moreover, if gold, silver, or precious stones exist under the frozen mass they are forever beyond the reach of man. Chinese companions have, at times, it is true, remarked on the Gangka's great cold height, and even discovered in it traces of unusual beauty; but it may be doubted if poet or painter of moderate ability in our adopted land has ever sung its praises, or reproduced its beauty on art material. Again, it has failed in the case of the Chinese to engender that awe and reverence which is so closely akin to religion. In any case Chinese temples there are non-existent or of little importance; and the number of pilgrims who visit it, if any, would hardly entitle it to a place in the lists of holy mountains in China.

But the Tibetan, less practical and with a keener susceptibility to religious influences, is more powerfully affected. If our deductions from chains of *mani* mounds and the frequency of white quartz capping stones are correct it must possess potency of an unusual kind. We can well imagine it being a symbol of power. It laughs at human effort and man's understanding is challenged; that is he has not the physical equipment to conquer it, nor the capacity to appreciate its glory. But the Gangka to the Tibetan could mean more than a God-like defiance of man. Although lone and detached, its peak, high in the crystal heavens, may suggest the omniscient eye of God; the pure, cold snow the negation of passion and impurity; and the monstrous base and towering peak the source and fount of retributive justice. Moreover, it is the crowning mystery of these regions and potentially possessed of all kinds of sinister possibilities; hence fear is a natural result, and worship and sacrifice are usually in such cases closely and surely associated. But the Gangka with its frozen base and glistening peak will exhibit to many the almost incomprehensible, awful beauty of Death, for the snow is eternal and consequently all life is banished from this appalling realm. And to the devoutly trained Buddhist that is Nirvana,—the cessation of being and desire, a salvation which insures that "ache of the birth, ache of the helpless years, ache of hot youth and ache of manhood's prime, ache of chill gray years and choking death" will curse man again no more forever.

SOME ELEMENTS OF CHINESE ARCHITECTURE WITH NOTES ON SZECHWAN SPECIALITIES.

D. S. DYE.

FORMAL GRAMMAR.

“I seek unity, all pervading.” Confucian Analects,

Grammar *per se* is not necessarily scientific, for grammar must deal with a language, a mode of expression, as it finds it, no matter how unscientific that language may be. Grammar does not make the laws of a language, it merely states them. Grammar is primarily the formulation of a result, an unplanned result in practically every case. It is the analysis of what a language or mode of expression has attained unto--up to date. Grammar is but the formal, scientific statement by the school man of the manner of expression unconsciously followed by the people. Grammar takes the raw material, the language under observation, and then analyzes it and formulates the principles, rules, and laws under which it works at a given time and in a given place. Grammar is an *ex post facto* formulation.

Every language has come to birth, has grown, has added, has deleted, has compromised, has fumbled, has accepted, has excepted, has evolved, until it has unconsciously approximated to principles, rules and laws. These principles are subject to change, for they express temporary working relationships between the medium of expression, with all its advantages and limitations, and the physical, physiological, and psychological constitution of man and his environment. Grammar is an afterthought, but it is an important, yes, an essential afterthought which may aid in the conscious endeavour to perfect and to use a language with freedom and with beauty. Grammar is primarily the effect; but secondarily it may be—when formalized—the cause, the studied cause of the further development, beautification, and utilization of the language. Formulated grammar lives that the language may live and function more beautifully and effectively.

A mode of expression is seldom perfect, but it is or should be forever enroute to perfection. When a language ceases to add new features, to experiment with innovations, to discard unfortunate or unhappy expressions, to perfect old modes—in other words, when a language ceases to have exceptions to rules, when it fails to modify

rules, when it fails to develop new rules, it fails to progress and dies. A living language is always being perfected and its grammar never attains perfection. A language is forever en route, but it does not always know its goal, nor does it bother much about directions or warnings. Grammar is one exposure on a moving picture film and modern grammar is the last exposure that has been "developed". Grammar *must* hearken to the dictates of language; while language *should* listen to the pronouncements of grammar.

Parable: All of the above is so patently true and applicable to the language of architecture as well as to speech that further words would be labored and superfluous.

Man does not pause in awe before laws but before Law, not before grammar but before brain action and reaction. Thinking, imagining, previsioning and postvisioning stand superior to fabricated thought, just as science does to invention. "Above all stands humanity" said Goldwin Smith in another connotation; and similarly behind and underneath, above and beside the grammar of architecture stands cerebration that involves the thinking-machine,—the man and his environment. Just within the shadow, on the very edge of light, stand the "heavenly balance" and the "water level"—the plumb line and the spirit level. The semicircular canals, the persistence of vision, irradiation and fatigue in sight, concentration and the "moving picture" mind all these and more are omnipresent in the Grammar of Architecture. An appreciation of the psychic reaction to animate and inanimate forces, built up and stabilized through age-long racial experience is foundational to this formulation. Such a conception of the Grammar of Chinese Architecture is as far-reaching as it is far-fetched. It is basic.

"In the first place, knowledge of truth, truth which we discover and verify in our human experience, always presupposes something more than finite. Knowledge is something more than the formation of subjective ideas. It implies a foundational reality underlying and uniting the knower and the objects known in a wider inclusive whole. Sense experience furnishes no adequate basis for knowledge. The so-called 'items' presented by sense—color, sounds, tastes, odors, roughness and smoothness, weight and hardness—are no more knowledge than chaotic masses of stone, brick, and lumber are a house. Knowledge involves organization, synthesis, unity, consciousness of meaning, interpretation, feeling of significance, a conviction of certainty, a sense of reality, aspects of universality and necessity."—Rufus M. Jones in "Religious Foundations".

INTRODUCTION.

"Architecture is the art which so disposes and adorns the edifices raised by man, for whatever use, that the sight of them may contribute to his mental health, power, and pleasure."—Ruskin.

A brief dissertation upon "The Grammar of Chinese Architecture" is an essential preliminary. It is not foreign, it is not a work of supererogation since Chinese Architecture is an organic whole. "Architecture" is used in the generic sense in this section and in many places the word may be replaced in turn by "temple", "residence", "pagoda", "bridge", while in some places "lattice" or even "ceramics" may be substituted.

Essentially this is a first-hand statement concerning the composite mental picture produced by a myriad dwellings and courtyards, the silhouettes of a thousand temples set in trees, the reflections of a multitude of bridges by water, the passage through numerous memorial arches en route, the lights and shadows of pagoda cones on hundreds of hills, the crenelated walls of a tithe of China's 1800 walled cities, and a few unique magic shapes and meaningful forms. It is an attempt to formulate motives and principles that underlie Chinese architecture, to state rules that have been both cause and effect and that have come to be established through ruling dynasties.

The writer is constrained to warn the reader not to be prejudiced by the seemingly mechanical and condensed presentation of this verbalized grammar. He would assure the reader that he has been forced to revise this "translation" again and again, to revamp these statements until they conform with the facts of the original text of Chinese architectural construction—woven into bamboo, carven upon wood, wood-blocked upon paper, tooled upon stone, baked in tile and porcelain, and accumulated in rock and earth.

The Principles and Corollaries are prepared for those who have never visited China but who can, nevertheless, check up the translation by available pictures. The Summary is presented for those who live in China, and who can consequently compare the translation with the original text in its culture-setting of allied arts. The latter "Summary" might be termed a literal translation, while the former "Principles" may be called a free translation.

GENERAL STATEMENTS RE ARCHITECTURE.

"All good architecture is the expression of national life and character."—Ruskin in *Crown of Wild Olives*.

A compound leaf and one of its leaflets are all of one piece: analogous if not identical principles and laws appertain to each and to both.

Construction without regard to beauty, in response solely to man's demand for shelter, does not attain unto the status of architecture; but construction—be it for residence or for worship, for education or for commerce, for government or for social function, for public or for private use—be it building, bridge, or other structure for the purposes of civil life—such construction with sensitive and sensible regard for beauty becomes art, and does attain unto the status of architecture.

The desiderata of architecture are common to all times, peoples, and climes, but man's response to these self-same desiderata is peculiar to time, peculiar to the state of society, peculiar to the history of the people, peculiar to the terrain, peculiar to the climate. Aesthetic demands are elemental and they are as broad and as universal as humanity; and so self-evident is this that a decalogue of desiderata in architecture seems to be a catalogue of platitudinous axioms. On the other hand, man's response to these self same desiderata varies with the climate, with the material, and with the social and cultural history of the people evolving and materializing the response, and so much does this response vary that very clear statement of principles, methods, corollaries, and examples is needed in order to understand and to appreciate the stress points, the peculiarities, the characteristics of the architecture of a particular people in a particular place at a particular time.

A people when it has apprehended, materialized, and consciously or unconsciously accepted criteria of beauty, when it has harmonized these criteria with materials and cultural requirements in construction,—then and only then, has that people achieved an architecture in its own name and in its own right. Racial and cultural architecture is that common, self-accepted, harmonious working-response in the construction work of a people which is the result of the interaction of materials and climate, society and culture, utility and beauty, through a series of generations until it has become worthy of being standardized, until it has become standardized. Geographical architecture is that harmonious compromise between culture and history, mind and man, materials and climate that has materialized into buildings which have become the acceptable and accepted norm of a geographical area.

Chinese building construction is architecture, since it is the integrated, organized, and accepted response to the aesthetic and utilitarian demands of the people of China. And, moreover, Chinese architecture is racial, cultural and geographical—by its content, by its intent, and by its extent.

DESIDERATA OF ARCHITECTURE.

"Proverbs have a prerogative to be commonplace; their mission is to voice the most widely diffused experience. And there is no literary function higher than that of giving point to what is ordinary and rescuing a truth from the obscurity of oblivion."—R. C. Moulton in *Modern Reader's Bible*.

The desirables in architecture are primal and are common to all peoples.

- I. Architecture should be located: i. e., located and orientated to the best advantage.
- II. Architecture should be organized; i. e., organized around master feature (s), or/and ideas.

- III. Architecture should be insulated ; i. e., insulated from the sky above and from the earth beneath.
- IV. Architecture should be isolated : i. e., isolated from, or else accommodated to its environs,
- V. Architecture should be inviting ; i. e., inviting to psychological or/and to physical approach.
- VI. Architecture should be pleasing ; i. e., pleasing to the outside populace and suited to the inside persons.
- VII. Architecture should be proportioned ; i. e., proportioned in its major and in its minor features.
- VIII. Architecture should be harmonious ; i. e., harmonious in its coloration and in its line.
- IX. Architecture should be functionable ; i. e., functionable as a shelter from certain and/or a shelter for certain.
- X. Architecture should be suitable ; i. e., suitable to climate and the materials.

Note: There is nothing sacrosanct about the number ten as there is about the number five in China ; but desiderata, data, principles, methods and summary seem to fall into the decalogue system. Since these are better suited for cross-reference the system is retained notwithstanding the fact that III and IV above might be combined and VIII might be divided.

SOME DATA OF CHINESE ARCHITECTURE.

Careful observations of the more or less unstudied product of a people as it has been produced through generations is more than a mere experiment carried on through the four seasons by a single individual. Virtually, it is an experiment carried on in an extensive way by an extensive number of people over an extensive time. In truth it is a major experiment on what man considers beautiful, useful and fitting in construction.

Frankly these data have been culled and marshalled from the mass of data that prompted this formulation. They are presented after the rest of the article has been prepared.

Those who would obtain further data in order to check the conclusions of this article are referred to pictures found in the National Geographic Magazine, The China Journal of Arts and Science, and Asia.

The lecture is accompanied by lantern slides taken from photographs from Szechwan, by the courtesy of the West China Union University Museum.

IA. Pagodas are usually set upon hilltops or knolls near cities when elevations are available.

Temples are usually located in commanding positions.

Memorial arches are erected where they will be seen to the best advantage.

I B. Confucian temples face south. (The writer knows of no exceptions.)

Farm buildings face south with a threshing floor and a drying court in front, whenever practicable.

The "wind water gentleman", alias the geomancer, uses a compass in locating sites. Either the professor has a sense of the beautiful and practical or the dragon can be coaxed to suit the desires of those who do have a sense of fitness.

II A. The household gods and the ancestral spirit tablets hold the central place in the central bent in the central building of the house of "many mansions". (The present head of the house occupies the room to the left of this chief room.)

The chief idol occupies the corresponding position in the main temple.

Bridge arches or openings are odd in number with the central one larger than the rest—higher or longer.

II B. Scrolls are in pairs usually, with more than an implicit respect brought to the sole and central.

Side buildings face each other and lead up to the "Top Side Room."

The main god usually has a pair of lesser gods, one on either side.

III A. Roofs have heavy ridgepoles, and a heavy comb. This is often doubly outlined and doubly ended.

The eaves are outlined several times, by rafter ends once, twice and even thrice, as well as by upturned tile ends, down-turned tile ends, by color on rafter ends, and by rows of colored tile at times.

The outline of the walls of the buildings are somewhat closely followed and weighted down by heavy lines of tile and mortar in a most effective way.

III B. The base of a building is slightly raised above the surrounding level and a curb from three to ten feet in width surrounds the building.

There is a stringer or base timber surrounding the building at first floor level somewhat like an exterior base board, which is effective in insulating the building from the ground.

An exterior wainscoating from three to five feet high, depending upon the class of the building, heightens the insulating effect. The ensemble presents multiple framing with effectiveness.

IV A. Structures are apparently planned from a view from the air. Anything worthy the name of real building is inwalled and framed for the birdman's view.

The whole layout is broken up into smaller units which are in effect isolated from each other.

The Great Wall of China has its counterpart in the walled city, the walled city has its counterpart in the walled compound, and the compound has its counterpart in the heavenly wells and courts.

IV B. Chinese buildings are built upon the inward-look and shut-out idea. Exterior windows are largely eliminated and inward windows open upon the court, or heavenly well. The patio of Mexico and the compluvium-atrium of Pompeii are analagous.

Buildings are planned to meet the cultural necessities of the day. Gate and wall with gateman are part of the culture complex.

The heavenly well as one of the end-results is unique in providing encl-ibility against the wind also.

VA. One of the characteristics of Chinese buildings is the series of doors or portals along an axial path leading up to the top buildings and to the "Top Room". As the lord of the manor or his guest goes up to the main building there is an unfolding view as they proceed and approach.

Some people still talk of a great house of Chengtu with a series of NINE such doors leading up to the house that has long since gone.

On red-white-occasions—weddings and funerals—the whole line of doors may be opened, revealing a series of frames from the gateway to the main house and room. (The servant or tradesman who may be called in must use the side doors.)

V B. The finest buildings are often set above the lesser buildings which subserve.

Buildings are often stepped on natural or man-made terraces.

The paths or roadways are often level and stepped.

VI A. Few buildings are more beautiful than worthy Chinese buildings seen from a distance, providing they have not been crowded by hovels or other buildings.

The buildings lose much of the detail when viewed from a distance the windows appear well-proportioned vents or else with gross patterns, the bents may appear as wholes even, and roof lines or borders merge.

Pagodas appear as silhouette or outlined stories and little more, a proportioned whole to be sure, unique and sole.

VI B. When viewed from within the enclosing and bordering wall, a temple or residence is seen to possess a wealth of detail that has been executed with meticulous care in many cases.

A separate court or small quadrangle is a unit in itself, even though it fits in with the large general plan. It may be appreciated from the center of the small court, just as the whole building group may be appreciated from a distance outside the whole enclosure.

Carvings, brackets, windows employ pleasing detail that can be appreciated from close up.

VII A. The typical building has a large central bent which is well outlined with the heavy framing timbers. The paired supporting bents on either side are slightly smaller but likewise well outlined.

The bents themselves are broken up into rectangles and these are framed and bedded. The wainscoting is likewise broken up into a series of frames.

Vents and windows are framed and bordered. The guest room door is oftentimes circular which enframes the master and his guest. The major door with its shin-breaking sill is objectionable until its framing feature is appreciated.

VII B. The building as a whole is heavily outlined.

The bent is less conspicuously demarked.

The smaller units are set apart sufficiently to make the whole a proportioned whole, a united unit without the stressing or suppression of parts.

VIII A. The use of prime and contrasty colors is strikingly effective when one comes to appreciate them.

The rich colors of earlier days—blues, golds, greens, vermilion, and lacquer black—were exceedingly effective.

The use of red or black in gloss on pillars is indeed rich.

VIII. The use of two or three colors on rafter ends for instance, picks out the several lines when viewed from close-up.

The merging and mixing of colors by irradiation when viewed from a distance gives a heavy border effect.

Inferiorly the use of colored boards and rich calligraphy is part and parcel of the line and color scheme.

IX A. Buildings shield from the wind and rain, for the outside is the outside with few if any windows.

Residences shut out the curious outsider, and have windows opening upon the courts.

Some buildings use straw thatch to insulate against sun and wind.

IX B. Many buildings have one or more solaria. If the protected and sunned spot is small it is a heavenly well, if it is larger it is a court.

During the summer days these are oftentimes matted over, but during the winter these are open to the welcome sun.

These solaria are needed, especially below the 35° parallel for the drying of grain or of books and clothes.

X A. On windblown mountain tops, walls are substantial, oftentimes of stone, sometimes of brick, with few projections to catch the wind.

On protected low plains buildings are out-reaching with great effective eaves.

In windblown cities, compounds are high-walled to protect against fire. Hangchow is an instance of this. Buildings are within

cells formed by walls laid out in a checkerboard fashion. Here the wall is a feature.

X B. The typical building is a wooden structure. It may be disguised with brick or mud filled in so that the posts are concealed, but nevertheless it is true that there are few "permanent" buildings.

The rectangular building is the typical building form, although there are octagonal pergolas and a very few circular buildings.

The larger buildings may have a clear storey, recessed to be sure, but the great majority are single storey buildings.

PRINCIPLES OF CHINESE ARCHITECTURE

A formulation of the Chinese response to desiderata of architecture.

"A principle ascertained by experience is more than a mere summing up of what has been specifically observed in the individual cases which have been examined; it is a generalization grounded on those cases." J. S. Mill.

- I. Chinese Architecture is *outstanding* to man; and to the sun.
 - A. Sited.
 - B. Oriented.
- II. Chinese Architecture is *centered*; and balanced.
 - A. Centered.
 - B. Balanced.
- III. Chinese Architecture is *bordered-and-framed*, "up"; and "down".
 - A. Roofed.
 - B. Based.
- IV. Chinese Architecture is *united*; and isolated.
 - A. Concentrated.
 - B. Walled.
- V. Chinese Architecture is *approached* through doors; and ascended to by steps.
 - A. Door-ed.
 - B. Step-ed.
- VI. Chinese Architecture is *observed* from the far; and from the near.
 - A. Telescoped.
 - B. Microscoped.
- VII. Chinese Architecture is *proportioned* in square-and-circle; and in lines.
 - A. Framed.
 - B. Proportioned.

- VIII. Chinese Architecture is *colored*; and unified in lines.
 A. Colored.
 B. Lined
- IX. Chinese Architecture is "compound"-ed; and sunned.
 A. Wind-shielded.
 B. Sun-trapped.
- X. Chinese Architecture is *adapted* to weather; and to materials.
 A. Acclimated.
 B. Materialized.

METHODS OF CHINESE ARCHITECTURE.

Key: Chinese architecture frames a central feature and idea in construction materials.

Methods and materials mutually play the role of cause and of effect. Methods effect and affect principles, and principles affect and effect methods: each and both effect and affect inception, perfection, and retention of architectural procedure. It is only when there is harmonious correspondence between methods and principles that a stable style can be approached and perfected.

I. RE LOCATABILITY.

A. Buildings are located so as to have the advantage of visibility to man.

B. Buildings are oriented so that the sun at high noon heightens the visibility of the south-facing front.

II. RE CENTERABILITY.

A. Buildings and their parts are deployed and organized around a central building or feature and or function.

B. Buildings are bilaterally symmetrical. While subsidiary buildings are paired to correspond and or to face each other.

III. RE STABILITY.

A. Buildings are rimmed and bordered from above, and the roof becomes the outstanding, upstanding, "top-side" feature—THE feature of a Chinese building.

B. Buildings are based and bordered from below with curb and base, exterior skirting and wainscoating.

IV. RE ENCLOSABILITY.

A. Buildings are enclosed and environed anteriorly, posteriorly, and laterally by a series of alleys, courts and other buildings.

B. Buildings are encompassed and inboxed, prevented and interned, bordered and inwalled, so that they look inward and they are behind and beside.

V. RE APPROACHABILITY.

A. Buildings must be approached via a central axial approach through a progressive series of infolding doorway portals.

B. Buildings are "go (ne) up" to via sloping walks and successive series of steps.

VI. RE OBSERVABILITY.

A. Buildings are designed in major features to be observed from a certain vantage point from outside the courtyard, from a distance, from outside the wall—and that wall is part of the ensemble.

B. Buildings are planned in minor detail to be appreciated from close-up, from within the courtyard.

VII. RE PROPORTIONALITY.

A. Buildings are "framed" and detailed with squares and circles, with acute angles avoided.

B. Buildings are framed and lined so that there is proportion and "finish" not merely blocking off and termination.

VIII. RE CONCORDABILITY.

A. Buildings are colored, even if nothing more (or less) than with grey and with white, enhancing the framing of the whole and of its parts.

B. Buildings are unified by proper weighting and proportioning of the integrated parts, and this concordance is heightened by judicious selection of multiple, and usually prime, colors in paints.

IX. RE FUNCTIONABILITY.

A. Buildings are shields from the wind and from the rain.

B. Buildings are supplied with courtyards functioning as solaria on a winter's day.

X. RE ADAPTABILITY.

A. Buildings are adapted to meet the exigencies of altitude, latitude, wind and moisture.

B. Buildings are built of posts and framed timbers, or of brick or stone with framed timber roof in a few cases (like city gateways).

Note: Each categorical, general statement is made concerning the ideal building. Practically, these methods meet the particular exigencies of the case, since configuration of the land, location of other buildings, prevailing winds, function, and other considerations change the order of importance of the various principles so that certain methods are exaggerated and others are suppressed in order to meet the particular situation. The reader who takes exceptions to these blanket statements should either precede "buildings" by "ideally" or follow by "when feasible and practicable".

SUMMARY

An adaptation of the central-plaque-and-balanced-scrolls for the presentation of the ideas in concise form.

B-A-L-A-N-C-E-D S-U-M-M-A-R-Y

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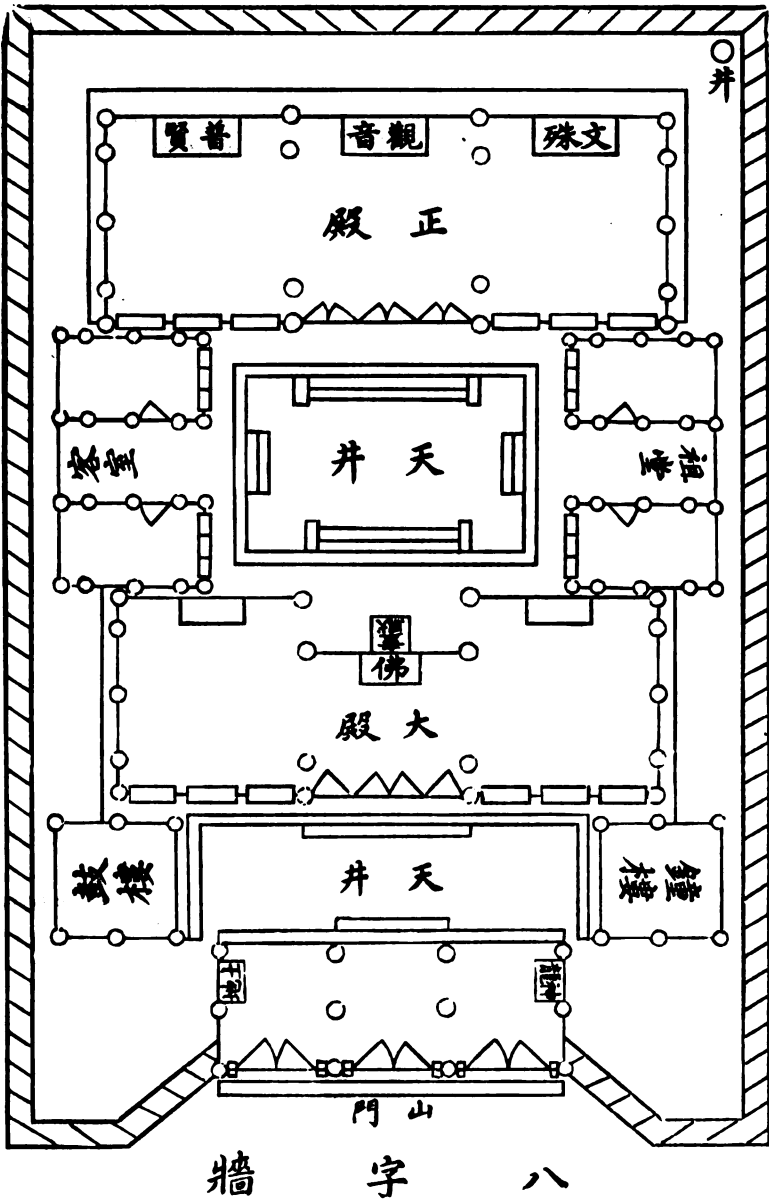
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VERTICALLY ENFRAMED	
10'	Roofed.
9'	Outlined.
8'	Foregrounded.
7'	Acclimated.
6'	Approached.
5'	Far-Sighted.
4'	Unified.
3'	Circled.
2'	Balanced Vertically.
1'	Oriented.
FUNCTION CENTRALLY FEATURED.	
1"	Located.
2"	Balanced Horizontally.
3"	Squared.
4"	Compounded.
5"	Near-Sighted.
6"	Exited.
7"	Materialized.
8"	Backgrounded.
9"	Detailed.
10"	Based.
HORIZONTALLY ENFRAMED.	

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P-A-I-R-E-D P-A-R-T-I-C-I-P-L-E-S.



A TYPICAL SZECHWAN TEMPLE GROUND PLAN.

Goddess of Mercy Temple.

- 八字牆 "Eight Character" (shaped) Wall.
 山門 "Mountain" Gate.
 龍神 Dragon Spirit.
 土地 Local God.
 天井 Heavenly Well.
 鐘樓 Bell Tower.
 鼓樓 Drum Tower.
 大殿 "Big" Temple.
 佛 Buddha.
 章馱 Protector.
 天井 Heavenly Well
 祖堂 Priests' Quarters.
 客堂 Guest Hall.
 正殿 Main Temple.
 觀音 Goddess of Mercy, which gives the name to the Temple.
 文殊 Wen Shu.
 普賢 P'u Hsien.
 井 Well.

CORRELATION: *Centrality enframed.*

The preceding paragraphs re Chinese Architecture are ordered and arranged for those who have never had a Chinese background or foreground; but this same material is here rearranged for those who are familiar with calligraphy, scrolls, painting, ceramics, precious stone work, lattice and other arts of China. The principles, desiderata, examples, corollaries and features can be most clearly displayed in a tabulation or key, connotative words that correlate, order, weigh, and summarize what has been stated in other ways. The writer or translator would again protest that this is not an artificial and meticulous anagram of catchwords, but a careful, faithful, and scientific interpretation of fundamental facts and phenomena of Chinese architecture as found in the "Eighteen Provinces" and beyond. This second distillation of that which is already a high distillate, may no longer appeal as cheap and forced when the 100% distillate is drawn off and offered neat: viz., *Chinese Architecture is essentially the embroidering, the enframing, the enthronement of a central feature and function in construction materials.*

NOTE: The definition may be altered by substituting corresponding correlated pairs of words for "architecture" and "construction materials; e. g., "Chinese ceramics" is essentially the enthronement, the embroidering, the enframing of a central feature and function in "kaolin and pigments". Chinese arts and crafts have had time to act, react, and interact, they have had time to become, and they have become of one piece in a most peculiar and particular way.

It is the picture, not the frame;

It is the arch, not the pier;

It is the doorway, not the axis;

It is THE room, not the building;

It is the altar, not the enclosure;

It is the genes-phylum, not the specific-individual;

It is the idol, not the offering;

It is the spirit, not the symbol;

It is the goal, not the way;

It is the Mecca, not the direction;

It is the Cynosure, not the magnet:

That gives meaning to the whole.

A LAST WORD.

Ruskin's "mistress art" of architecture has been imperial, an Empress Dowager—there is only one to moderns—, dominating the arts of China. She has given the lead, her principles have become their principles, and their success as art is her glory and her crown.

NOTES ON SZECHWAN SPECIALTIES.

BACKGROUND.

Szechwan has been an empire within an empire, she has been self contained. Geographically she is extensive. She has been isolated, yet she has had contacts with the outside world—east, west, north, and south—consecutively or contemporaneously.

The Chinese conquered the *Shuh* people during the fourth century B. C. It is highly probable that the conquerors gained more than mere terrain. The Chinese have had forcible contacts with neighboring tribes through the years. Some of the tribes are still semi-independent. These contacts have been not without stimulating results. There have been several waves of immigration from the northeast, from the east, from the south and from the southeast. Immigrants are not always a deterrent to originality and progress. Internal evidence suggests that the southwest route, the northeast route, the northwest route, and the east or Yangtse route have functioned most largely in stimulating the culture of Szechwan. Trade routes bring culture as well as commerce.

Evidences* of contacts are found in grave-goods, in carvings, in bronzes. Elephants in verisimilitude with mahouts in frieze on the earliest lead glaze known during the Chin Dynasty, 255-209 B. C., winged ram of Han Dynasty in juxtaposition with Wu Chiu and Pan Liang cash of B. C. time, Tree-of-Life-like bronze of the same period with imp and "cash" in the branches, chariots on brick of "Han times," carved stone and bronze mirrors and clay houses present data that is of great value in weighing the relative importance of sundry routes. The present distribution of building styles must likewise be interpreted in terms of contact. "Remains" reinforce what writings there are concerning the evaluation of trade routes.

The Cheo, the Han and the Tang Dynasties attained peaks in culture. It was the Han that established itself in Hanchong, then a part of Szechwan but now a part of Shensi. Szechwan has played a no mean part at various times in the history of the country. Even the first move in the Revolution of 1911 was made in Chengtu.

Szechwan weather is spotted. Along the Yangtse from Suifu to the Lower Gorges, there is much rain and in places that are exposed there is much wind. The topography is quite steep in places. The Red Basin north of the Yangtse and the Chengtu Plain is comparatively flat and without much wind save on hill tops. All places thus far mentioned are below the level of freezing and heavy snow. Then there are the elevations between 7000 and 11000 feet that are

*In any reference to Szechwan grave goods, credit must be given to Rev. T. Torrance whose pioneer studies in the R.A.S. Journal are unexcelled.

occupied by temples like those on Mount Omei, or Jiu Feng, or Pan Long Shan. These places are subjected to rain, snow, wind and freezing. There are places like Tsakaolao, Wenchwan, Wa Si Keo behind the rain-screen with freezing and possible snow. Then there are places like those on the Tibetan Marches where snow and wind are found.

Bamboo is common over much of this region just mentioned. At the higher elevations the bamboo is scrub, but at Hanchong and behind the rainscreen, bamboo is absent. Over the Chengtu Plain and the Red Basin large bamboo is common. *Lannuk* used to be sent as far as Peking for temple timbers. This is a very local wood with main center at Chiongcheo. Cedars are common over most of the region mentioned. Pine is common on the heights.

Humidity, clouds, temperature, and white ants are all to be reckoned with in the rapid turnover of building. This latter item is of real importance in any consideration of change in style of building.

Clay for the making of tile and brick is findable in most places in the province. Iron is also a product of Szechwan. It was used in spears in B. C. times. Iron is still mined just west of Yachow.

All of the above items must be apprehended and appreciated in any serious consideration of the architecture of Szechwan whether of the past or of the present.

HAN ROOFS.

According to the grave goods of the Han times, Szechwan buildings were then more simple, the roofs were more flat, large flat unturned tile were used, colonades were built, straw thatches were used, city gatehouses were built much like modern ones. All eaves were less pronounced, and there were no upturned corners. The ridges were weighted, and the eaves were finished with "facing tile" ends turned down. There were no central ornamentations on the buildings of that time. There was a thatch roof well rounded so that the ridgepole effect was eliminated, even as it is today in the "connected tile". The ridge poles and the corners were weighted even as they are today but not so emphatically. Brick arches were used in burials and in gatehouses, but rectangular wood framing was the norm even as it is today. Arched brick vaults for burials during the Chin of 255-209 B. C. suggest contacts with the further southwest in earlier times.

HAN BRACKET.

During the Han Dynasty there was a tendency to go in for the bulbous round in bronzes and pottery as well. To the writer at least, this is the most pleasing of all lines and shapes that have been produced by any people at any time. There could very well have been a development of this from the Chou and the Chin bronzes, but the amphoral jars of Wenchwan during Han times could well have contributed to this evolution. The bulbous bottle is of shapped clay. The wheel was not used. It is almost barbaric, and it is clearly from a wooden prototype. The shape may be doubly read as so many shapes are in

China. The handles are an extension of the bulb of the vessel and the whole presents an approximate circle, but when the handles are forgotten the bulbous jar is seen. The lip is lozenge shaped. During this same period there emerged the bracket used in the West China Union University buildings. For the last ten years the writer has called this a "Han bracket". It is not so unrelated to the amphora just mentioned. The bracket is a two-pronged or two-armed support which is itself supported by a timber projecting on the level from the framing timbers. The two tips of the bracket may support a stringer or they may support two other pairs of similar brackets. These may support a third set and so on. This inverted pyramid may support a series of stringers which in turn support the roof. It is a most effective device in Memorial Arches or in great buildings. It is unique and striking. The Great North Road between Hanchong and Yachow affected this over one hundred years ago. The third and fourth and fifth compounding is an extension of the simpler bracket of Han days. This same general full-bellied-round shape is still retained in a balustrade which is used in drug shops in Chengtu today. It is termed the Han Line design.

THE ALTAR OF HEAVEN.

The circle of heaven and the square of earth are embalmed in the Chinese cash from pre-Han days. One of the best proportioned and framed cash of China was minted during the Tang Dynasty, but the Wu Chiu and Pan Liang of Early Han were excellent. The symbolism might be translated very freely: "In heaven and earth we trust". So-called chariot axles of precious stone come down shaped in this symbolism. In Hanchong, outside the South Gate, there is one of the largest tumuli in the general shape and proportions of the Altar of Heaven in Peking, with which the writer is acquainted. It is marred by a well and irrigation, and it is farmed today. The local people refer to it as a Han Dynasty Flower Platform. At Chengtu in the same general relation to the city is a more symmetrical one. Near Chiongcheo there is another, whose pattern brick date it as early A. D. in time. Forty miles from Tachienlu toward Yachow is an island in the swift stream marked out in circle and square with a north-south orientation. The great river cobbles have made an enduring monument for some peoples' thought in symbolism. Local people refer or explain these as related to armies and the reviewing of troops by the general. Topographies are not satisfying in their explanations. Each of the "altars" appears to have the earth-square in the neighborhood, but most of them are not so symmetrical. So far as the writer knows there is no province that is thus rich in altars of heaven. The history of the Peking Altar of Heaven seems to be a bit hazy. When came it? Whence came these?

RECTANGULAR FRAMING.

Szechwan like the other provinces depended upon the "heaven balance"—verticality—to support buildings. Right-angled bracing is

not substantial unless the timbers are large and the mortise and tenon system is very well followed. This is the type framing for large buildings where timber can be secured. One-storied buildings can be made to stand up this way. If the buildings must be large and the central part can go up two stories with a clear-storey, then additional lower posts can be put up in the same way, so that the ensemble partakes of the nature of a well-buttressed building. But in Szechwan lesser and larger buildings may be put up with smaller supports and with weaker mortise and tenon, providing the subdivided walls of the bents are filled in with woven *bamboo* and daubed over with mud and whitewashed. When this dries there is virtual triangular bracing. The frame is put up, the roof is put on as soon as the whole is propped up, the wattle is put in, and only after the plaster has set are the props taken down. This reinforcing of the rectangular framing by bamboo wattle differentiates Szechuan building construction from that north of the bamboo line. To illustrate how insistent is this rectangular framing penchant, one can refer to the Wan Nien Si, the temple on Mount Omei at the lower edge of the freezing line. There is a brick building which houses the great elephant. It is built with a dome of brick. It is the only building of the kind that the writer knows about in Szechwan. It is exotic. It embodies features like the Han Bracket in brick, but the dome is foreign. OUTSIDE THIS BRICK STRUCTURE IS A COMPLETE RECTANGULARLY CONSTRUCTED BUILDING WITH WOODEN POSTS AND TILE ROOF, in typical Chinese style.

JAPANESE DIFFERENTIATION.

The Japanese apparently went their own way in construction about the time of the Tang Dynasty. It was at that time that Chinese architecture was more similar to the present Japanese style. The square type of roof or series of roofs rather, one above the other, is seldom found in Szechwan. The best examples, now out of repair, are in Hanchong and in Yachow.

FLATTENED OUT AND PROJECTING EAVES.

The outstanding feature of Szechwan buildings is the far reach of the eaves. At least three natural factors have aided in this development. There is little wind in the Red Basin. The wind at Chengtu for instance is almost negligible. There are seldom more than four or five windstorms per year and they are hardly worthy of mention. There is practically no snow, to weight down and pry off a projecting eave. Then there is much of misty rain. This tendency to push out roof eaves to provide covered walk ways around buildings has been put to the limit in the Chiao Joh Si a few miles outside the North Gate of Chengtu. The style predates the late Great Pure Dynasty. The lower the slope of a roof the further can it be projected. In fact a roof must be flattened out and even lifted to allow of light.

RECURVED ROOFS.

The more or less sharply turned up corners of buildings have also been pushed to the extreme in Szechwan. They are one of the happiest features. It has spread all over China to a greater or less extent, but Szechwan has been able to capitalize it more effectively for she has been blessed with wood and clay. (Winds would have eliminated it.) The roofs are most pleasingly recurvant. The steeper the roof slope, the more sharply does the finial curve. The four corners together with the central ornament are referred to as the "Five Peaks Toward Heaven" suggesting the Five Sacred Mountains of China. The roof line of a typical building of 1900 in Szechwan was visibly curved no matter from what plane or point the roof was viewed. The Chinese are past masters in the ending of line.

CENTRAL ROOF ORNAMENT.

Many buildings in Peking have no central roof ornament, but most buildings in Szechwan have something to demark the center. Often a series of graduated porcelain jars are placed one above another. Supporting chains or/and plaster and tile brackets support these. Disporting dragons often enliven the roof line. The long roof lines were broken with paired animals looking towards the central roof ornament. On the ends of the ridge fish swallowed the ends. This was one type of fire insurance. The water kua or trigitam which is used in Hangchow for the same purpose is seldom seen in Szechwan.

THE ROOF DAI.

The extra weight of tile, or mud and brick, or plaster placed along the joinings of tiles at corners is exceedingly useful as well as ornamental. This is the capitalization of a necessity. Occasionally one sees stones piled on tile near the eaves especially the ends to keep the wind from lifting the tiles from the roof. A wind storm might start this stripping process by surging under the exposed eaves. (Those not familiar with the Chinese tile, should know that these are turned on a bucket attached to a potter's wheel and then broken into four quarters. These are piled up in rows between rafters to make troughs. Then the same number are inverted to make ridge to shed the water into these troughs. Each loose tile in quite light. A strong wind could start one quite easily unless the edges were set in mortar or weighted down.) Weight cannot be added at the extreme edge of the eave, but it can be added immediately above the frame work. These make good secondary borders. The ends of these "dai" do not extend beyond the frame of the building. The ends are upturned slightly. They are sometimes rather blunt.

THE WAVE ROOF.

One of the peculiar roofs that is still effective is the wave roof. A series of buildings are placed crosswise of a lot. Heights are

graded and the main building is the highest. These buildings each join the fire wall surrounding the whole set, in most cases. To speak of the whole line of buildings as a set of corrugations is to belittle what is a pleasing variation in a sea of grey tile roofs as seen from a city wall.

THE FIELD CHARACTER LAYOUT.

There are two good temples in Szechwan built in the form of the word for field (田). It is a cross within a square. There are four "heavenly wells" for light in such an arrangement. The art gallery of the Vatican is built on the same model. On either side of each covered way are the disciples of Shakyamuni Buddha to the number of five hundred. The roof is the feature of most buildings. The famous temple at Sintu has a good roof, but the second at Kiating is on a hill top where the roof can not be seen to good advantage so the roof is mediocre indeed.

THE YANGTSE RIVER CULTURE.

The Big North Road or the Imperial Highway which carried amban and official, tax and tribute from Nepal and Tibet and the provinces to Peking is more or less one in buildings between Hanchong to Tachienlu, as far as architecture is concerned. There are variations that are interesting, but in the main, it is a North China architecture. On the Yangtse the case is somewhat different where the contacts have been with the lower Yangtse Valley and with Canton Delta. The gorges and the steep topography, the wind and the peaks have functioned in the selection of the forms to be used. The fascade building with the feature that is visibly emphasized is the special characteristic through the gorges. Then there is the fire wall that is stepped and featured against the hillsides that is unique. There are buildings with ends in the shape of musk ox horns. This style was most common in Canton. Some of the buildings upon the tops of the low hills along the river catch the wind. Here the high wall is made an integral part of the buildings and then featured.

THE SNOW BOUND ROOF.

On Mount Omei and in other places where worthy buildings are built between 7000 and 10000 feet above the sea, a substitute must be found for loosely laid tile. Scrub bamboo laid thatchwise suffices in many places, whipsawed boards serve in other places and then iron, poured "tiles" are used in the best temples. Lead and pewter roofs are found in some places. The board roofs are short lived. These give characteristic roofs but there is little dignity or grandeur to most of these.

BEHIND THE RAIN SCREEN.

Stone buildings for the most part take the place of the usual buildings of Szechwan. The roofs are often so nearly flat that they are used as the winnowing floor. Heavy slabs are laid and then in some cases covered with clay. The infrequent rains do not give much trouble. The tribes folk retain their own typical buildings.

CHINESE-TIBETAN ROOFS.

The lamasery on the border where the Chinese and Tibetans mix has roofs and buildings that are mongrel. The rectangular fluted pillars are very different from the Chinese rounded pillars. Then the roof employs many Chinese features, but the building itself is largely of the type found upon the Tibetan massif.

BUILDINGS IN THE BACKWATERS.

Some of the most interesting buildings are found in out of the way places off the main routes, where holdovers from past years have persisted without much change of type. The student of Chinese architecture must be willing to spend and have the time to spend in reaching these various vanishing examples of the finest remains.

PRESENT STATUS OF CONSTRUCTION IN SZECHWAN.

Practically no worthy buildings have been erected in Szechwan during the last five years. The temples are disappearing or going into decay very rapidly indeed. The only reconstruction that the writer knows about in temple architecture is that going on at Mount Omei at the present time. The causes of this are rather complex and interesting. It does not indicate a revival of Buddhism however. The prohibitive cost of labor militates against the retention of the old. The western methods are being learned, but the western styles are anything but stylish as they are executed. It requires no prophet to foresee the passing of the best of Chinese architecture during the years that are immediately ahead. The question is "will the Szechwanese come to see that it will be well worth while to retain some of their unique and rare architecture as the Japanese have preserved some of theirs?"

