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早期新石器时代贾湖遗址人类的体质特征及与其他地区新石器时代人和现代人的比较

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摘　要

河南省舞阳县贾湖村遗址是新石器时代早期文化遗存。根据非测量性特征，贾湖人具有一般蒙古人种的特点，其人种属性应归属于蒙古人种。根据测量性特征，贾湖人的体质特征主要表现在颅指数属于圆颅型；颅长高指数 I 和 II 都属于高颅型；颅宽高指数属于中颅型；全面指数（M395）属于狭面型；上面指数（pr）属于中上面型；眶指数 I（mf-ek）和眶指数 II（d-ek）都属于中眶型；鼻指数属于中鼻形；腭指数属于阔腭型；枕大孔指数属于阔型；总面角属于平颌型（下限）。把贾湖人与其他新石器时代人组和现代人组（共 15 组，11 个体质特征项目），运用多元统计分析方法的系统聚类、BIPLOT 法及判别分析法加以统计并作比较分析，可把所比较群体划分为 3 大类群：①新石器时代组的北方类群；②新石器时代组的南方类群；③我国现代人类群。贾湖新石器时代人属于新石器时代组的北方类群。在新石器时代组的北方类群这个小范围内，贾湖新石器时代人的体质特征与本省内的下王岗新石器时代人的体质特征又较接近些。通过比较，可看到现代人类与新石器时代人类之间的区别大于现代南方人和现代北方人之间的区别；在从新石器时代人类向现代人类进化发展的几千年过程中，处于南方、北方地理位置上的人类在体质上的差异有趋于缩小的趋势；此外，在此进化发展过程中，各地不同的新石器时代人类基因的扩散速度、范围和方向也都不尽相同。

关键词　非测量性特征，测量性特征，系统聚类法，BIPLOT 法，判别分析法

1　前　　言

河南文物研究所于 1983 年至 1987 年间在河南省舞阳县贾湖村发掘了一个新石器时代遗址，其中发现有墓葬 300 座左右，共计有 350 多个个体的人骨。经碳十四年代测定，贾湖遗址的时代为距今约 7500－8500 年（树轮校正）的新石器时代早期墓葬群，属于裴李岗文化层，贾湖人所代表的文化类型与周围地区文化有密切的联系。中原地区历来被认为是中华民族的发祥地，贾湖遗址是除下王岗遗址和石固遗址（就保存有人骨材料而言）外在中原地区河南省发现的又一个新石器时代早期文化遗存，对贾湖人的研究可进一步揭示该地区新石器时代人的体质特征，而且本文运用多元统计方法把贾湖人与国内其他地区新石器时代人组和现代人组作比较以便更深入地探讨他们之间的关系。

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2 材料与方法

2.1 材料

贾湖遗址中所保存的人骨材料达350多个个体，头后骨骼材料保存的情况尚好，但头骨材料保存得不是很好，其中完整的头骨有M394和M395。M394为一个40-50岁左右的中年男性个体，M395为一个30岁左右的壮年男性个体。

作为比较材料，在本文研究中考虑到希望了解贾湖人与邻近地区，特别是与本省地区发现的新石器时代遗址人类的关系；另外，还想了解一下与国内其他大致相同时代的新石器时代遗址人类的关系；再考虑到要把这些较早期的新石器时代遗址人类与我国现代人的头骨资料加以比较、以便更进一步地了解我国人类在从新石器时代人类向现代人的演变过程中，体质特征所发生的变化及其他们之间的关系，为此，选择的几组对照比较材料组有：

(1) 作为河南省同一地区较小范围的新石器时代人类群体被比较的有：河南省长葛县石固新石器时代人类（陈德珍，吴新智，1985），河南省淅川县下王岗新石器时代人类（张振标、陈德珍，1984）及河南省陕县庙底沟新石器时代人类（韩康信、潘其风，1979）。

(2)作为国内其他地区新石器时代大致相同时期文化人类遗址的群体而加以比较的有：山东省泰安县大汶口新石器时代人类（颜闇，1972）（山东省泰安县大汶口新石器时代人类与山东省曲阜县西夏侯新石器时代人类（颜闇，1973）的体质特征较为相似，所以取其中一个作为对比组）、陕西省宝鸡市的宝鸡新石器时代人类（颜闇等，1960）（陕西省宝鸡市的宝鸡新石器时代人类与陕西省华县新石器时代人类（颜闇，1962）和陕西省西安半坡的新石器时代人类（颜闇等，1960）的体质特征也较为相似，所以也取其中一个作为对比组），陕西省华阴县横阵新石器时代人类（考古研究所体质人类学组，1977）（横阵组虽然也在陕西省内，但在以往研究中（陈德珍，1986）曾发现此组处于特殊位置，有待于进一步研究，故特意选出作为一对比组），另外还有福建省闽侯县昙石山新石器时代人类（韩康信等，1976），广东省佛山县河宕新石器时代人类（韩康信等，1982），广西省桂林甑皮岩新石器时代人类（张银运等，1977）、浙江省余姚河姆渡新石器时代人类（韩康信、潘其风，1983）及内蒙古自治区察右旗庙子沟新石器时代人类（朱泓，1994）。

(3) 作为我国现代人的群体代表加以对比的有现代太原人（王令红等，1988），现代香港人（王令红，1989）和现代广西壮族人（朱芳武等，1989）。

2.2 方法

采用多元统计方法：(a) 系统聚类法，(b) BIPLOT 法，(c) 判别分析法。

3 贾湖遗址墓葬人骨的性别、年龄分布

贾湖遗址墓葬人骨共计有350个个体，男性212个，女性108个，性别不明的有5个，未成年个体25个。从表（表1）中可看出，未成年个体占成年个体的比例为25（6+9）：325（212+108+5），等于1：13，一般来说，未成年个体的骨骼较难保存下来。

从整个材料（男女合计）来说，各年龄期（幼儿期、少年期、青年期、壮年期、中年期、老年前期、老年期和只能判成年）个体所占全部个体的比例分别为：1.71%，5.43%，3.71%，21.71%，16.29%，20.00%，3.14% 和 28.00%（图 1-a）。从中可以看出，壮年

表 1　贾湖遗址墓葬人骨的性别年龄分布

The neolithic Jiahu man's distribution of sex and age in graves

年龄分期(岁)	个体数			合计
幼儿期(7 以下)	6			6
少年期(7—17)	19			19
	性　别		性别不明	
	男	女		
青年期(18—23)	6	7		13
壮年期(24—35)	51	25		76
中年期(36—45)	36	21		57
老年前期(46—55)	49	21		70
老年期(56 以上)	8	3		11
只能判成年	62	31	5	98
合计	212	108	5	350

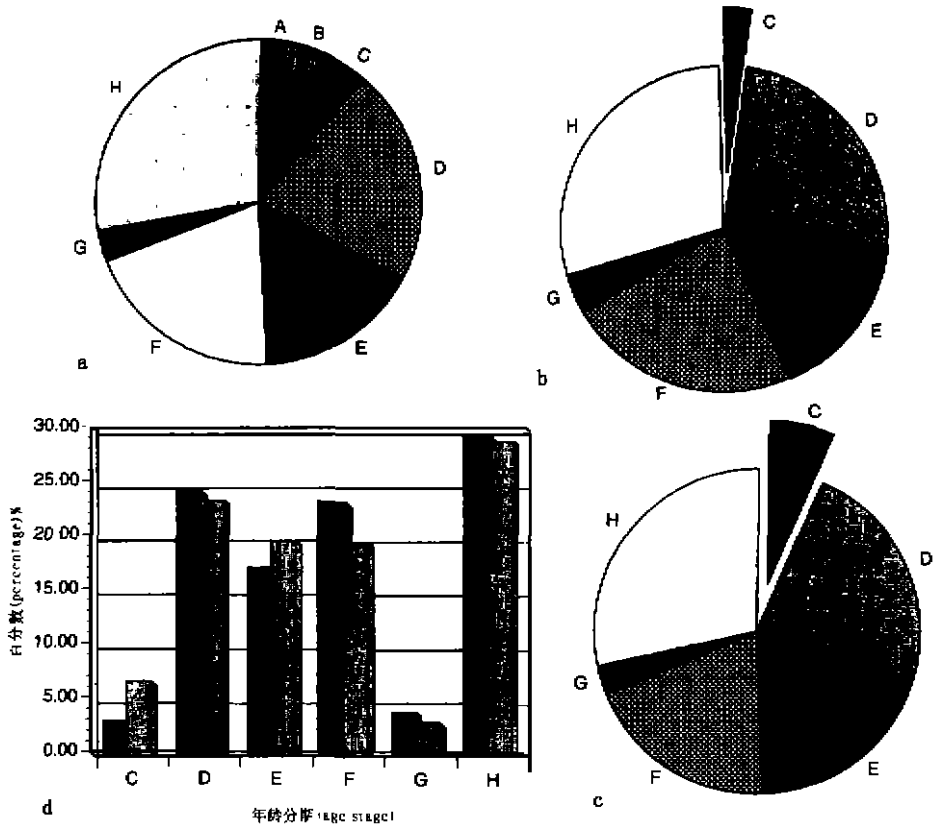

图 1　贾湖遗址墓葬人骨性别、年龄分布图　The distribution of sex、age in Jiahu man

a　各年龄期个体占全部个体的比例图　The proportions of individuals at each age stage

b　男性成年个体各年龄期比例图　The proportions of individuals in adult male

c　女性成年个体各年龄期比例图　The proportions of individuals in adult female

d　男、女各年龄期比例比较图　The comparisn of proportions between male and female

期、中年期和老年期三组的比例是高的，而老年期的比例是低的，说明当时人类的生活水平低下，寿命较短，因而达到老年期的个体甚少。

进一步看，男性成年各年龄组个体（青年期、壮年期、中年期、老年前期、老年期和只能判成年）占其整个成年个体的比例分别为：2.83%，24.96%，16.98%，23.11%，3.77%和 29.25%（图 1-b）。同样，女性成年各年龄组个体占其整个成年个体的比例分别为：6.48%，23.15%，19.44%，19.44%，2.78% 和 28.70%（图 1-c）。从男女间各年龄期比例的比较来看，基本上差不多，但差别较大的是青年期，男性为 2.83%，女性为 6.48%（图 1-d），那个时期的女性死亡率比男性高得多，这可能与女性的生育死亡有关。

4 贾湖遗址墓葬人骨的特点及古病理现象（图版 I）

1. 额中缝。具有额中缝的个体有 M267。据吴定良（1941）作的统计，额中缝的出现率在蒙古人中为 5.1%，中国人（云南）为 13.7%. 现代太原人男性占 11.3%，女性占 14.3%. 西安地区现代人（郑靖中，1988）额中缝长达 1/3 以下的为 15%，长达 2/3 以上的为 0.71%，达全长的为 9.29%. 昙石山新石器组为 33.3%，而贾湖新石器时代人的额中缝比例就所保存的额骨总数来说还是很少的。

2. 肱骨下端鹰嘴窝穿孔。肱骨下端鹰嘴窝穿孔的个体有：M9 甲，M12 乙，M54，M240，M322，M366，M394，M487，M306。

3. 卡氏尖及异常齿尖。M61 的右 M^2，在原尖的近中舌侧近齿颈处多出一齿尖，此尖通常被称作卡氏尖；在前尖的颊侧面上又多出一鳞片状小尖，该尖比前一个尖要小些。M353 甲的右 M^2，在前尖和后尖之间的颊侧面上多出一鳞片状小尖。

4. 受外伤的骨头。M21 有两块砍伤的头骨片：一片的伤面长约 2cm，宽为 1cm，未被击穿；另一片的伤面长宽各为 1cm 左右，已被击穿。M61 上利器所致的凹坑长约 1.8cm，宽为 1cm，但未被击穿。M327 的 4 号头骨的左顶骨面有致命击伤凹坑，呈椭圆形，长径达 4cm，短径达 1cm，骨面塌陷，部分已被击穿。

5. 骨折愈合。受伤骨折后有愈合痕迹的有 M306，位于肱骨下端骨干处。

6. 病理性骨骼。

（1）骨髓炎。M389 的胫骨和腓骨骨干异常变粗，骨面有瘘管口。

（2）M395 锁骨的胸骨端异常扩大，也许是由于疾病引起骨质增生。

（3）M327 下颌髁突的顶面变平，不呈圆弧形，其外侧有骨瘤。

（4）牙周病及齿槽脓瘘。此类牙病的例数不少，有 M13，M313，M322，M328，M359 等。

（5）龋齿。患龋齿的个体较多，如 M31，M328 等

5 贾湖人的体质特征

5.1 非测量性特征（表 2）

贾湖人的中门齿和侧门齿（上、下）都呈深铲形，鼻前棘稍显，梨形孔下缘呈鼻前窝形，颧骨和上颌骨下缘处的转弯呈明显转折，面部较扁平，犬齿窝不显著，颧骨缘结节发

达，从以上特征来看，贾湖人具有一般蒙古人种的特点，其人种属性应归属于蒙古人种。

5.2　测量性特征（表 3、表 4）

贾湖人的体质特征主要表现在其颅指数为 82.87%，属于圆颅型；颅长高指数 I 为 80.11%，颅长高指数 II 为 66.58%，都属于高颅型；颅宽高指数为 96.68%，属于中颅型；全面指数（M395）为 92.86%，属于狭面型；上面指数（pr）为 53.43%，属于中上面型；眶指数 I（mf-ek）为 80.62%，眶指数 II（d-ek）为 84.96%，都属于中眶型；鼻指数为 48.27%，属于中鼻型；腭指数为 93.25%，属于阔腭型；枕大孔指数为 91.09%，属于阔型；总面角为 86.0°，属于平颌型（下限）。

表 2　贾湖新石器时代人非测量性特征

The neolithic Jiahu man's nonmetric characteristics of skull

项目	贾湖(M394)	贾湖(M395)
颅形	楔形	楔形
额中缝	无	无
颅顶缝(1)前囟段	深波	骨缝基本愈合
(2)顶段	锯齿形	颅顶缝形状模糊
(3)顶孔段	锯齿形	
(4)后段	锯齿形	
颅顶形状	两面坡式	圆穹式
颅侧壁形状	垂直	垂直
翼区　左	窄 H 型	宽 H 型
右	窄 H 型	宽 H 型
缝间骨	人字缝处左 2 块	
右 1 块		无
	有印加骨	
眉弓突度	显著到特显	显著到特显
眉弓范围	等于或大于 1/2	等于或大于 1/2
眶形	长方形	正方形
眶口倾斜	垂直	垂直
犬齿窝	浅	中等
鼻前棘	稍显	稍显
梨状孔下缘	鼻前窝	鼻前窝
鼻骨形状	自上向下渐增宽	自上向下渐增宽
鼻额缝和额颌缝	弧形上突	曲折上突
颧骨缘结节　左	强	强
右	强	强
颧骨上颌骨下缘	转角明显	转角明显
腭形	U 字形	抛物线形
腭圆枕形状	嵴状	嵴状
卡氏尖	无	无
上内侧门齿　左	深铲形	深铲形
右	深铲形	深铲形
上外侧门齿　左	深铲形	深铲形
右	深铲形	深铲形
上智齿萌出　左	有	无
右	有	有
枕外隆突	显著	显著
顶孔	双孔全	双孔全(左小右大)
顶孔间区	有平凹	有平凹
乳突	大	中等到大

表3 贾湖新石器时代人头骨测量值 (单位:毫米,度)

The neolithic Jiahu man's metric values of skul (unit:mm., degree)

马丁号	项 目	贾湖(男) M394	贾湖(男) M395	平均值 $\bar{x}$	标准差 δ_{n-1}
1	颅最大长(g-op)	181.0	181.0	181.00(2)	0.00
2	颅长(g-i)	173.0	180.0	176.50(2)	4.95
5	颅底长(enba-n)	102.0	113.0	107.50(2)	7.78
8	颅宽(eu-eu)	154.0	146.0	150.00(2)	5.66
9	额最小宽(ft-ft)	97.0	90.0	93.50(2)	4.95
10	额最大宽(co-co)	125.0	120.0	122.50(2)	3.54
11	耳点间宽(au-au)	130.0	136.0	133.00(2)	4.24
12	星点间宽(ast-ast)	117.0	108.0	112.50(2)	6.36
7	枕大孔长(enba-o)	33.0	35.0	34.00(2)	1.41
16	枕大孔宽	29.0	33.0	31.00(2)	2.83
17	颅高(ba-b)	148.0	142.0	145.00(2)	4.24
18	颅高(ba-v)	151.0	142.0	146.50(2)	6.36
21	耳上颅高	129.5	114.2	121.85(2)	10.82
20	耳门上缘到前囟点高(b)	126.5	114.5	120.50(2)	8.49
29	额骨弦(n-b)	119.5	115.0	117.25(2)	3.18
30	顶骨弦(b-1)	106.0	103.5	104.75(2)	1.77
31	枕骨弦(1-o)	114.0	98.0	106.00(2)	11.31
26	额骨弧(n-b)	136.0	130.0	133.00(2)	4.24
27	顶骨弧(b-1)	115.0	115.0	115.00(2)	0.00
28	枕骨弧(1-o)	135.0	115.0	125.00(2)	14.14
25	颅矢状弧(n-o)	388.0	356.0	372.00(2)	22.63
24	颅横弧(po-b-po)	350.0	325.0	337.50(2)	17.68
23	颅围长(g-op-g)	530.0	522.0	526.00(2)	5.66
47	全面高(n-gn)		130.0	130.00(1)	
	上面高(n-sd)	74.0	81.0	77.50(2)	4.95
48	上面高(n-pr)	70.0	77.0	73.50(2)	4.95
45	颧宽(zy-zy)	135.0	140.0	137.50(2)	3.54
55	鼻高(n-ns)	56.5	58.5	57.50(2)	1.41
54	鼻宽	27.5	28.0	27.75(2)	0.35
52	眶高 左	31.5	36.0	33.75(2)	3.18
	右	30.0	36.0	33.00(2)	4.24
51	眶宽(mf-ek) 左	40.0	42.0	41.00(2)	1.41
	右	41.5	42.0	41.75(2)	0.35
51a	眶宽(d-ek) 左	38.0	40.0	39.00(2)	1.41
	右	39.0	40.0	39.50(2)	0.71
60	上齿槽弓长(pr-alv)	57.5	59.0	58.25(2)	1.06
61	上齿槽弓宽(ecm-ecm)	67.8	70.0	68.90(2)	1.56
62	腭长(ol-sta)	48.0	48.5	48.25(2)	0.35
63	腭宽	43.0	47.0	45.00(2)	2.83

续表 3

马丁号	项　目	贾湖(男) M394	贾湖(男) M395	平均值 $\bar{x}$	标准差 δ_{n-1}
64	腭深	9.5	13.0	11.25(2)	2.47
50	眶间宽(mf-mf)	21.5	20.0	20.75(2)	1.06
	鼻梁至眶间宽的矢高(mf-mf)	7.0	6.5	6.75(2)	0.35
	眶间宽(d-d)	24.0	21.0	22.50(2)	2.12
	鼻梁至眶间宽的矢高(d-d)	11.0	11.0	11.00(2)	0.00
57	鼻骨最小宽	9.5	7.0	8.25(2)	1.77
	鼻骨最小高	3.5	4.0	3.75(2)	0.35
43	上部面宽(mft-mft)	109.5	107.0	108.25(2)	1.77
43(1)	两眶内宽(fmo-fmo)	99.0	97.0	98.00(2)	1.41
	鼻根点至两眶内宽矢高	16.0	16.0	16.00(2)	0.00
77	鼻颧角(fmo-n-fmo)	144.5	143.0	143.75(2)	1.06
46	中部面宽(zm-zm)	104.0	103.0	103.50(2)	0.71
	中部面宽(zm'-zm')	104.0	100.0	102.00(2)	2.83
	颧上颌高(zm-sd-zm)	34.0	34.0	34.00(2)	0.00
	颧上颌高(zm-ss-zm)	25.0	21.5	23.25(2)	2.47
	颧上颌高(zm'-sd-zm')	33.0	35.0	34.00(2)	1.41
	颧上颌高(zm'-ss-zm')	22.0	21.5	21.75(2)	0.35
	颧上颌角(zm-ss-zm)	129.0	135.5	132.25(2)	4.60
	颧上颌角(zm'-ss-zm')	134.0	133.5	133.75(2)	0.35
40	面底长(pr-enba)	100.0	105.0	102.50(2)	3.54
72	总面角(n-pr∠FH)	85.0	87.0	86.00(2)	1.41
73	鼻面角(n-ns∠FH)	88.0	91.0	89.50(2)	2.12
74	齿槽面角(ns-pr∠FH)	84.0	67.0	75.50(2)	12.02
	额侧面角(m-g∠FH)	83.0	64.0	73.50(2)	13.44
32	额侧面角(n-m∠FH)	89.0	77.0	83.00(2)	8.49
	前囟角(b-g∠FH)	53.0	43.0	48.00(2)	7.07
	颏角(m-g-op)	81.5	68.0	74.75(2)	9.55
72(5)	伏格脱面三角(pr-n-ba)	68.0	64.0	66.00(2)	2.83
	(n-ba-pr)	40.0	41.0	40.50(2)	0.71
	(n-pr-ba)	72.0	75.0	73.50(2)	2.12
33	枕角(1-o∠FH)	71.0	65.0	68.00(2)	4.24
33(4)	枕骨曲角(1-t-o)	121.0	125.0	123.00(2)	2.83
	鼻骨最小宽	8.5	7.0	7.75(2)	1.06
	鼻骨最大宽	19.0		19.00(1)	
	颧骨高　左	47.0	50.0	48.75(2)	2.47
	右	46.0	49.5	47.75(2)	2.47
	颧骨宽　左	31.0	27.0	29.00(2)	2.83
	右	32.0	27.0	29.50(2)	3.54

表4　贾湖新石器时代人头骨指数值(%)

The neolithic Jiahu man's index values of skull(%)

编　号	项　目	贾湖(男) M394	贾湖(男) M395	平均值 $\bar{x}$	标准差 δ_{n-1}
1	颅指数	85.08	80.66	82.87(2)	3.13
2	颅长高指数 I	81.77	78.45	80.11(2)	2.35
3	颅长高指数 I	69.89	63.26	66.58(2)	4.69
4	颅宽高指数	96.10	97.26	96.68(2)	0.82
5	全面指数		92.86	92.86(1)	
6	上面指数(sd)	54.81	57.86	56.34(2)	2.16
7	上面指数(pr)	51.85	55.00	53.43(2)	2.23
8	面突度指数	98.04	92.92	95.48(2)	3.62
9	眶指数(mf-ek)　左	78.75	85.71	82.23(2)	4.92
	眶指数(mf-ek)　右	72.29	85.71	79.00(2)	9.49
10	眶指数(d-ek)　左	82.89	90.00	86.45(2)	5.03
	眶指数(d-ek)　右	76.92	90.00	83.46(2)	9.25
11	鼻指数	48.67	47.86	48.27(2)	0.57
12	鼻根指数	36.84	57.14	46.99(2)	14.35
13	上颌额指数	32.56	32.50	32.53(2)	0.04
14	前颌指数	32.69	33.01	32.85(2)	0.23
15	腭指数	89.58	96.91	93.25(2)	5.18
16	枕大孔指数	87.88	94.29	91.09(2)	4.53
17	垂直颅面指数(sd)	50.00	57.04	53.52(2)	4.98
18	垂直颅面指数(pr)	47.30	54.23	50.77(2)	4.90
19	横的颅面指数	87.66	95.89	91.78(2)	5.82
20	额骨弦弧指数	87.87	88.46	88.17(2)	0.42
21	顶骨弦弧指数	92.17	90.00	91.09(2)	1.53
22	枕骨弦弧指数	84.44	85.22	84.83(2)	0.55
23	额宽指数 9/8	62.99	61.64	62.32(2)	0.95
24	上齿槽指数	84.81	84.29	84.55(2)	0.37
25	鼻颧指数	16.16	16.49	16.33(2)	0.23

6　统计结果与比较分析

为了更深入地探讨贾湖人的体质特征，现就贾湖新石器时代组与所选的其他新石器时代组和现代人组（共15组），运用多元统计分析方法（张尧庭，方开泰，1982）的系统聚类、BIPLOT法及判别法进行统计并作比较分析。所采用的变量有颅长（g-op）、颅宽（eu-eu）、颅高（ba-b）、额最小宽（ft-ft）、颧宽（zy-zy）、上面高（n-pr）、眶高、眶宽（mf-ek）、鼻宽、鼻高（n-ns）、总面角（n-pr∠FH）等11个项目。

6.1　系统聚类法

系统聚类中，各组间的距离采用绝对距离，由样品间的距离阵得到聚类图（图2-a，b，c）。图2-a采用最远距离法，图2-b采用ward法，图2-c采用可变法。从3张图上可以看

到聚类的结果基本上大致相同，也就是可分 3 大类群。组成第一类的有：贾湖组，下王岗组，庙底沟组，大汶口组，宝鸡组和横阵组；组成第二类群的有：昙石山组和甑皮岩组；组成第三类群的有：庙子沟组，现代香港人组，现代广西壮族人组和现代太原人组。不过，所参与的 15 个样品中还有 3 个，即石固组，河姆渡组及河宕组与以上 3 大类群的距离较远，其归属有待进一步分析。但从中可看到贾湖新石器人与其同一省份的下王岗组始终是聚在一起的，因此可以说贾湖人与下王岗组人的关系最为接近。

6.2 BIPLOT 法

这是一种把样品和变量处于同一空间平面位置上的方法。15 个样本间的距离以欧几里德距离来表达，从而得出 BIPLOT 图（图 3）。从图中可看到除石固组、河姆渡组及河宕组处于边缘外，其他几组大致上可划分为 3 个大类群。划为第一类群的组有：贾湖组，下王岗组，庙底沟组，大汶口组，宝鸡组和横阵组；划为第二类群的有：昙石山组和甑皮岩组，但彼此间的距离较远；划为第三类群的有：庙子沟组，现代香港人组，现代广西壮族人组和现代太原人组。这样的构图模式基本上与系统聚类方法所得结果一致。此图再次表示出贾湖人的体质特征与下王岗人的体质特征是较为接近的；贾湖人与黄河中、下游地区的新石器时代人有着比与其他地区新石器时代人更为密切的关系。

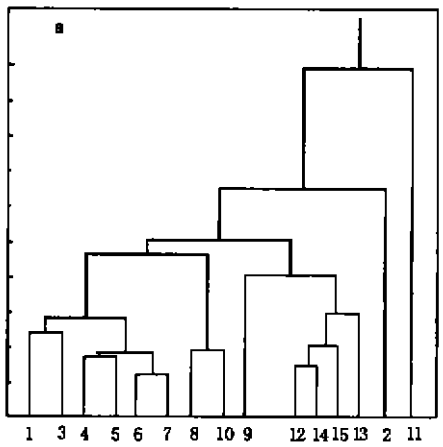

图 2　贾湖新石器时代人与其他各组的系统聚类图

The cluster figures of Jiahu man and other samples

a 最远距离法 (futhest neighbor method)

b ward 法 (ward method)

c 可变法 (flexible method)

1 贾湖 (Jiahu)　2 石固 (Shigu)

3 下王岗 (Xiawanggang)　4 庙底沟 (Miaodigou)

5 大汶口 (Dawenkou)　6 宝鸡 (Baoji)

7 横阵 (Hengzhen)　8 昙石山 (Tanshishan)

9 河宕 (Hedang)　10 甑皮岩 (Zengpiyan)

11 河姆渡 (Hemudu)　12 庙子沟 (Miaozigou)

13 太原人 (Taiyuan ren)　14 香港人 (Xianggang ren)

15 广西壮族人 (Guangxi zhuang people)

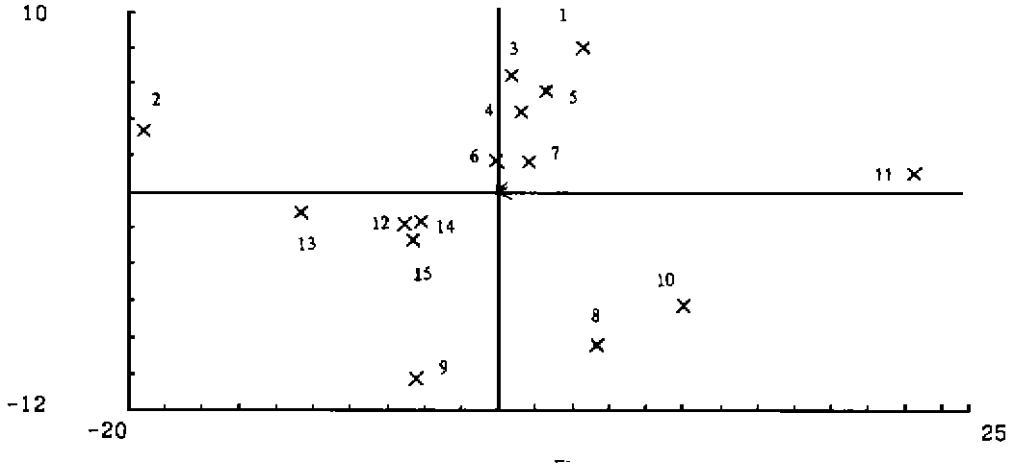

图 3 贾湖新石器时代人与其他各组的 BIPLOT 图 (BOPLOT figure of Jiahu man and other samples)

1 贾湖 (Jiahu) 2 石固 (Shigu) 3 下王岗 (Xiawanggang)
4 庙底沟 (Miaodigou) 5 大汶口 (Dawenkou) 6 宝鸡 (Baoji)
7 横阵 (Hengzhen) 8 县石山 (Tanshishan) 9 河宕 (Hedang)
10 甑皮岩 (Zengpiyan) 11 河姆渡 (Hemudu) 12 庙子沟 (Miaozigou)
13 太原人 (Taiyuan ren) 14 香港人 (Xianggang ren)
15 广西壮族人 (Guangxi zhuang people)

6.3 判别分析法

从上面两种分析方法中有待于进一步加以分析的有石固组，河姆渡组及河宕组，因为它们在聚类图中与其他组的距离较远，因此合并得较晚，在 BIPLOT 图中也与其他组的距离较远，处于图的边缘。另外还有一个特殊的组，即庙子沟组，它属于新石器时代仰韶期文化人类，却在聚类图和 BIPLOT 图中与现代人组，特别是现代香港人组接近，为此采用判别分析方法作进一步分析。

首先要把 12 个有确实归属的已知样本作初步的原始类别划分，采用 3 类逐步判别法，也就是根据已有知识把参与的样本先假设分为 3 类，然后通过计算判别，可了解按如此的初步分类其判别的准确率能达到多少？其判别效果又是如何？并且可根据所得到的判别函数对有怀疑的样本作为未知样本加以判断，找出它们的类别归属。

设为第 I 类别的有：贾湖组，下王岗组，庙底沟组，大汶口组，宝鸡组和横阵组，作为新石器时代组的北方类群。设为第 II 类别的有：县石山组，甑皮岩组及河宕组，作为新石器时代组的南方类群。设为第 III 类别的有：现代香港人组，现代广西壮族人组和现代太原人组，作为现代人类群。这里要说明的是河宕人，河宕人在 BIPLOT 图中处于与构成第 II 类别的县石山组、甑皮岩组和构成第 III 类别各组的距离大致相等的位置，但考虑到河宕人属于新石器时代人类，因此把它与县石山组、甑皮岩组组合在一起作为第 II 类原始类别的成员是较为合理的。以上已有 12 个样本列为已知样本，作为待判样本的有石固组、河姆渡组及庙子沟组。

根据计算结果得到判别函数如下：

$$Y(1) = -14020.8 - 106.781X(1) + 66.5732X(2) - 4.4088X(3) + 558.956X(8) + 172.344X(11)$$

$$Y(2) = -12552.7 - 81.2336X(1) + 48.8024X(2) + 6.7211X(3) + 480.584X(8) + 149.403X(11)$$

$$Y(3) = -14354.8 - 112.606X(1) + 69.3390X(2) - 9.3555X(3) + 580.197X(8) + 181.433X(11)$$

此判别函数说明只有 X (1)，X (2)，X (3)，X (8)，X (11) 这几个变量在判别函数中起作用，也就是说，这 3 个类别之间的区别主要表现在颅长 X (1)、颅宽 X (2)、颅高 X (3)，眶宽 X (8) 和总面角 X (11) 这 5 个特征上。从判别效果（表 5）来看，经检验得出，第 I 类和第 II 类间（新石器时代组的北方类群和新石器时代组的南方类群间）的判别效果及第 II 类和第 III 类间（新石器时代组的南方类群和现代人类群间）的判别效果为最好，达到 $P < 0.01$，也就是说在 $P < 0.01$ 水平上达到差别显著。而第 I 类和第 III 类间（新石器时代组的北方类群和现代人类群间）的判别效果稍差些，不过也达到 $P < 0.05$。换言之，新石器时代组的北方类群和新石器时代组的南方类群间的判别效果很好，现代人类群和新石器时代组的南方类群间的判别效果也很好，而现代人类群和新石器时代组的北方类群间的判别效果就没有现代人类群和新石器时代组的南方类群间的判别效果那么好，可能是由于在北方类群中存在有像庙子沟那样的新石器时代组的缘故。总之，所参与的 12 个样本的最后判别分类（表 5）都与原始分类类别一致，没有误判率，这也说明了当初把河宕组设在第 II 类别中也是合理的。

表 5　判别效果，判别分类及后验概率

The discriminant effect, the discriminant categories and the probability of test

判别效果			
类别	DD 值	F 值	P 值
第 I 类和第 II 类	360.719	80.1579	<0.01
第 I 类和第 III 类	47.4541	10.5454	<0.05
第 II 类和第 III 类	555.452	92.5754	<0.01

No.	原始类型	判别类型	后验概率
1	1	1	1
2	1	1	1
3	1	1	1
4	1	1	1
5	1	1	1
6	1	1	1
7	2	2	1
8	2	2	1
9	2	2	1
10	3	3	1
11	3	3	1
12	3	3	1

为了把持有怀疑的石固组、河姆渡组及庙子沟组加以判别，求得其分类归属，把它们的特征值分别代入判别函数，得到的结果是石固组和庙子沟组都被判为 I 类，即新石器时代组的北方类群；河姆渡组被判为 II 类，即新石器时代组的南方类群。

根据以上 3 种多元统计方法分析可看出贾湖新石器时代人在体质特征上属于新石器时代组的北方类别，在该类群中，它与下王岗人的体质特征是较为接近的。贾湖人在判别函数上的几个主要指标（表 6）：颅长为 181.0mm，颅宽为 150.0mm，颅高为 145.0mm，眶宽为 41.5mm，总面角为 86.0°。

表6　判别函数中3个类别的主要指标值　（单位：毫米，度）

The values of main items in 3 categories of the discriminatory function　（unit：mm.，degree）

分类类别	体质特征指标值				
	颅长 (g-op)	颅宽 (eu-eu)	颅高 (ba-b)	眶宽 (mf-ek)	总面角 (n-pr∠FH)
贾湖组	181.00	150.00	145.00	41.50	86.00
第Ⅰ类(新石器时代北方类)	179.65	145.65	143.52	42.42	83.84
第Ⅱ类(新石器时代南方类)	188.13	138.30	141.57	42.38	82.43
第Ⅲ类(现代人类)	177.70	139.30	137.32	42.81	85.46
3类总平均值	181.28	142.22	141.48	42.51	83.89

贾湖人的颅长在所属的北方类别中是较长的，它与大汶口人的值181.11mm相当，也与3个类别的总平均值相当，但比新石器时代组的南方类别中的几个组的平均值小得多，而比现代人类别的颅长大得多，现代人颅长有明显减少的趋势。贾湖人的颅宽不仅在新石器时代组的北方类别中是最大的，而且比新石器时代组的南方类别和现代人类别都大得多，超过3个类别的总平均值。新石器时代组的南方类别的颅宽大致与现代人类别的相等，但两者都比新石器时代组的北方类别小得多。贾湖人的颅高在新石器时代组的北方类别中也是较高的，仅次于下王岗组，但大于该类别的平均值。现代人类别的颅高值较低，低于3个类别的总平均值。贾湖人的眶宽在新石器时代组的北方类别中是狭窄的，与下王岗组和庙底沟组的相当，此值既小于3个类别的每个平均值，也小于3个类别的总平均值。贾湖人的总面角在所属的北方类别中属中上水平，此值大于新石器时代组的北方类别的平均值，因此面部显得不突出。新石器时代组的南方类别的总面角值是最小的，比新石器时代组的北方类别和现代人类别在面部显得较为突出些。

在作贾湖新石器时代人与其他新石器时代人类和现代人类的比较分析中，还发现些值得作进一步探讨的问题，即现代太原人和庙子沟新石器时代人的问题，现分述如下：

关于现代太原人问题。一般说，从理论上推测，由于体质上有差异，所以当把新石器时代组的人类与现代人组的人类放在一起聚类的话，不同时代的组将各自聚在一起，成为两大体系，每一体系内又各自分为南北两大类群；经研究，这种南北类型的差异又可追溯到我国旧石器时代晚期两个南北不同的地方类型-柳江人和山顶洞人（陈德珍，1986）；这是到目前为止我国人类进化发展自旧石器时代晚期以来的宏观模式。但在本文中出现了现代太原人组与现代香港人组、现代广西壮族人组聚在一起的现象，这里就现代太原人组问题作些推测，可能有几种解释：

1. 现代人类与新石器时代人类之间的区别以及新石器时代人类内部之间的差异一般来说要大于现代的南方人和北方人之间的区别，故而当现代人与新石器时代人类被放置在一起聚类的话会出现新石器时代人类远离现代人组，并且南、北两组的分野明显，而现代人的南、北两组却混在一起的现象。

2. 在从新石器时代人类向现代人类进化过程中，处于南北地理位置上的人类在体质上的差异随着时代的发展其差异有缩小的趋势，这与基因交流，相互混杂有关，现今世界上各地区的人们正在越来越趋于混杂。

3. 可能现代太原人组的取样有些问题，也许取样时并非严格地只选取祖籍是太原地区的人，因为在现代人南迁北移频繁交往中随时可能有南方因素的渗入。作者查阅太原人材

料的来源，在“太原地区现代人头骨的研究”（王令红等，1988）文中写道：“……收集的现代人骨骼，未附籍贯、性别和年龄的记载.”可见这个原因还是有必要考虑的.

关于新石器时代庙子沟组问题。无论在系统聚类中还是在 BIPLOT 图中都处于与现代香港人组、现代广西壮族人非常接近的位置，说明在某些特征上庙子沟组与它们较为接近，这也许是由于庙子沟仰韶期文化人类在参与现代人的形成中，特别在现代香港人和现代广西人的形成中有一定的影响，可能庙子沟组人类在向南迁移扩散过程中基因的扩散速度较其他地区的新石器时代组的人为快。另一方面，虽然庙子沟组，无论在系统聚类中还是在 BIPLOT 图中都处于与现代香港人组、现代广西壮族人组非常接近的位置，具有接近现代南方人的某些特点，但在判别分析中，预先被安排作为未知类别样本的庙子沟组最终仍被判别为 I 类（新石器时代组的北方类群），这个结果，无论在时代上还是在地理位置上都是符合客观事实的。

7 结　论

1. 根据非测量性特征研究，贾湖新石器时代人呈现出一般蒙古人种的特点，其人种属性应归属于蒙古人种。

2. 根据测量性特征研究，贾湖人的体质特征主要表现在颅长为 181.0mm，颅宽为 150.0mm，颅高为 145.0mm，眶宽为 41.5mm，总面角为 86.0°。其颅指数属于圆颅型，颅长高指数 I 和颅长高指数 II 都属于高颅型，颅宽高指数属于中颅型，全面指数（M395）属于狭面型，上面指数（pr）属于中上面型，眶指数 I（mf-ek）和眶指数 II（d-ek ）都属于中眶型，鼻指数属于中鼻型，腭指数属于阔腭型，枕大孔指数属于阔型，总面角属于平颌型（下限）。

3. 在距今大约 5 000 年左右的新石器时代，那时的居民依他们所居住的地理位置不同在体质上有一定的差异，其差异主要表现在以南北分野的两大类群的差异上。此外，随着时间的推移，新石器时代人类向现代人类发展，南、北两大群的新石器时代人类在体质特征上也都随之发生变化，变化是明显的，新石器时代人与现代人的体质特征存在一定的差异。根据多元统计和比较分析可使这些差异充分表现出来。贾湖人与之比较研究的其他新石器时代人类和现代人类（共 15 个样本，11 项体质特征指标）可划分为 3 大类群：①新石器时代组的北方类群，包括贾湖组，石固组，下王岗组，庙底沟组，大汶口组，宝鸡组，横阵组和庙子沟组；②新石器时代组的南方类群，包括昙石山组，河宕组，甑皮岩组和河姆渡组；③现代人类群，包括现代香港人组，现代广西壮族人组和现代太原人组。根据判别函数说明贾湖新石器时代人以其颅长、颅宽、颅高、眶宽和总面角这 5 个主要特征被判别为属于新石器时代组的北方类群。在新石器时代组的北方类群这个小范围内，贾湖新石器时代人的体质特征与本省内的下王岗新石器时代人的体质特征又较接近些。

4. 通过贾湖新石器时代人与其他新石器时代人类和现代人类的比较研究，可看到现代人类与新石器时代人类之间的区别大于现代南方人和现代北方人之间的区别。另外，在从新石器时代人类向现代人类进化发展的几千年过程中，处于南方、北方地理位置上的人类在体质上的差异有趋于缩小的趋势，也许是基因混杂、频繁交流的结果，故而当现代人类与新石器时代人类被放置在一起聚类的话，会出现新石器时代人类的南、北两组分野明显，

而现代人南、北两组却混在一起的现象，会出现现代北方的太原人与现代南方人聚在一起的现象。此外，在从新石器时代人类向现代人类进化发展过程中，各地不同的新石器时代人类基因的扩散速度、范围和方向都不尽相同，推测庙子沟新石器时代人对现代南方人的形成过程，在溯源意义上说，有一定的影响，或者比其他新石器时代组人有较多的参与。

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图版 I 说明

1. (M267) 额中缝 (metopism)；2. (M306) 肱骨下端骨折愈合及鹰嘴穿孔 (the healed bone from fracture and the perforation of olecranon fossa in the humerus)；3. (M54) 肱骨鹰嘴穿孔 (the perforation of olecranon fossa in the humerus)；4. (M389) 腓骨、胫骨骨髓炎 (osteomyelitis in the fibula and tibia)；5. (M61) 卡氏尖及颞侧面上的鳞片状小尖 (carabelli tuberculum and abnormal tuberculum)；6. (M353 甲) 前尖和后尖之间颞侧面上的鳞片状小尖 (abnormal tuberculum)；7. (M21)，(M61) 被砍伤的头骨片 (the wounded fragment of skull by weapons)；8. (M327) 被砍伤的头骨片 (the wounded fragment of skull by weapons). (1 和 8 约为×1/2，其余均约为×2/3)

THE PHYSICAL CHARACTERISTICS OF THE EARLY NEOLITHIC HUMAN IN JIAHU SITE AND THE COMPARISON WITH OTHER NEOLITHIC HUMANS AND MODERN MAN

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Summary

1 Preface

The Jiahu Neolithic site was excavated in 1983-1987 at Jiahu Village, Wuyang County, Henan Province, including more than 300 graves and more than 350 individuals. According to C^{14} dating, the site belongs to the Peiligang cultural layer (B. P. 7500-8500 year, tree ring correction), the pattern of which has close relations with the culture of surrounding areas. Henan Province is considered a birthplace of the Chinese nationality. The Jiahu site is a new early Neolithic human site besides Xiawanggang site and Shigu site as far as preserved human materials are concerned. Using the method of multivariate analysis, it is possible to bring to light the characteristics of Jiahu man and its relationship with other Neolithic humans and Modern man of China.

2 Materials and method

2.1 Materials

There are more than 350 individuals excavated. Most of them are postcranial skeletons and only two skulls are well preserved. M394 is a male about 40-50 years old and M395 is a male about 30 years old. In order to obtain more information, such as the relationship between Jiahu man and other Neolithic humans of surrounding areas, especially of the same province, the relationship between Jiahu man and Neolithic humans of approximately same period and the relationship between earlier human and Modern man, several comparisons are performed to reveal the changes of physical characreristics further in the evolutionary process from Neolithic human to Modern man. The materials for comparisons are :

(1) Neolithic humans as a group from the same province: Shigu man of Changge County; Xiawanggang man of Xichuan County and Miaodigou man of Shan County.

(2) Neolithic humans as a group from approximately the same period: Dawenkou man of Taian County, Shandong Province; Baoji man of Baoji City, Shanxi Province;

Hengzhen man of Huaying County, Shanxi Province; Tanshishan man, Minhou County, Fujian Province; Hedang man of Foshan County, Guangdong Province; Zengpiyan man of Guilin City, Guangxi Province; Hemudu man of Yuyao County, Zhejiang Province and Miaozigou man of Chayouqi, Inner Mongolia Autonomous Region.

(3) Modern man as a group of Chinese modern man; Taiyuan man of Shanxi Province; Hongkong man of Hongkong area and Zhuang minority people of Guangxi Province.

2.2 Method

Multivariate analysis: (a) cluster analysis , (b) BIPLOT , (c) discriminant analysis.

3 The distribution of sex and age in Jiahu man

More than 350 individuals at the Jiahu site consist of 212 men and 108 women and 5 undetermined in sex and 25 children. The distribution proportions (Table 1, Fig. 1-a,b, c,d) illustrate that the individuals of young age are difficult to preserve; the longevity of the people at that time was shorter; the death ratio of women is higher than that of men, maybe due to the death during childbirth.

4 The characteristics of skeletons and the phenomena of paleopathology in Jiahu man

The special traits are the presence of metopism, the perforation of olecranon fossa in the humerus, the presence of carabelli tuberculum and abnormal tuberculum in teeth. Also found are several wounded fragments of skull which were hit by some weapons, the healed bone from fracture, et cetera.

The diseases in paleopathology are osteomyelitis in the tibia and fibula; hyperplasia in the clavicle; osteoma in the mandibular condyle; periodontosis , fistula and dental caries in the teeth.

5 The physical characteristics of Jiahu man

5.1 The nonmetric characteristics (Table 2)

The shape of both the middle incisor and the lateral incisor (upper and lower) is a deep shovel; the spina nasalis anterior is slightly developed; the structural type of aperture piriformis is fossae praenasales; the turn of the lower edge of the zygoma and maxilla is sharp; the face is rather flat; the fossa canina is not deep; the tuberculum of the zygomatic edge is obvious; so Jiahu man presents the traits of the Mongoloid population, belonging to the Mongoloid Race.

5.2 The metric characteristics (Table 3, 4)

The cranial length-breadth index of 82.87% indicates brachycrany. The cranial length-height index I of 81.11% and the cranial length-height index II of 66.58%, both show hypsicrany. The cranial breadth-height index of 96.68% shows metriocrany. The total facial index (M395) of 92.86% is leptoprosopic. The upper facial index (pr) of

53.43% is mesenic. The orbital index I (mf-ek) of 80.62% and the orbit index II (d-ek) of 84.96%, both are mesoconchic. The nasal index of 48.27% is mesorrhinic. The palatal index of 93.25% is brachystaphyinic. The index of occipital foramen of 91.09% is of broad type. The total profile angle of 86.0° is orthognathous (lower limit).

6 Statistical results and comparisons

Based on 11 metric items and 15 groups of materials, including Jiahu man and other Neolithic humans and Modern man, statistical analyses (cluster analysis, BIPLOT and discriminant analysis) are performed. The metric items are: maximum cranial length (g-op), maximum cranial breadth (eu-eu), basion-bregmatic height (ba-b), minimum frontal breadth (ft-ft), bizygomatic breadth (zy-zy), upper facial height (n-pr), orbital height, orbital breadth (mf-ek), nasal breadth, nasal height (n-ns), total facial angle (n-pr∠FH).

6.1 Cluster analysis

The chosen distance between every pair of samples is absolute distance. Obtained are three figures (Fig. 2-a,b,c): fig. 2-a uses the furthest neighbor method, fig. 2-b uses the ward method, fig. 2-c uses the flexible method.

The results of cluster in these three figures are almost the same. The 15 samples group into three large categories. The first category consists of Jiahu man, Xiawanggang man, Miaodigou man, Dawenkou man, Baoji man and Hengzhen man. The second category consists of Tanshishan man and Zengpiyan man. The third category consists of Miaozigou man, modern Hongkong man, modern Guangxi man and modern Taiyuan man. Only three samples, that is, Shigu man, Hemudu man and Hedang man are farther away from above three categories; therefore their classification needs to be analyzed further on another occasion. Anyway, Jiahu man and Xiawanggang man are always classified together in the figures, so the relationship of these two samples is closer than all others.

6.2 BIPLOT method

This method puts samples and variables together on a same plane. The BIPLOT figure (Fig. 3), using Euclidean distance, shows almost the same classification patterns as the cluster analysis figures. The BIPLOT figure explains again that the physical characteristics of Jiahu man and Xiawanggang man are more similar and the relationship between Jiahu man and Neolithic humans of the middle reach and the lower reach of the Yellow River is much closer than to any others.

6.3 Discriminant analysis

In brief, based on above two methods, three samples — Shigu man, Hemudu man and Hedang man, need to be analyzed further, because of their greater distance from other samples. Another one which also needs to be analyzed further, is Miaozigou man, because it, as a Neolithic group sample of Yangshao culture, is put together with Modern groups, whether in the cluster figures or in the BIPLOT figure.

Firstly, 12 samples as known samples are entered in a stepwise discriminant analysis and hypothetically there are three categories. The first hypothetical category I, as a Neolithic northern category, covers Jiahu man, Xiawanggang man, Miaodigou man, Dawenkou man, Baoji man and Hengzhen man. The second hypothetical category II, as a Neolithic southern category, covers Tanshishan man, Zengpiyan man and Hedang man. The third hypothetical category III, as a Modern category, covers modern Hongkong man, modern Guangxi Zhuang people and modern Taiyuan man. It is Hedang man that needs to be particularly mentioned, because Hedang man is situated at a place which has roughly equal distance from the second category and the third category on the BIPLOT figure. Considering that Hedang man is a Neolithic sample, so now Hedang man is combined with Tanshishan man and Zengpiyan man as the member of the second hypothetical, original category. The unknown samples, which need to be discriminated according to the discriminatory function, have three samples — Shigu man, Hemudu man and Miaozigou man.

The discriminatory functions are as follows:

$$Y(1)=-14020.8-106.781\,X(1)+66.5732\,X(2)$$
$$-4.4088\,X(3)+558.956\,X(8)+172.344\,X(11)$$
$$Y(2)=-12552.7-81.2336\,X(1)+48.8024\,X(2)$$
$$+6.7211\,X(3)+480.584\,X(8)+149.403\,X(11)$$
$$Y(3)=-14354.8-112.606\,X(1)+69.3390\,X(2)$$
$$-9.3555\,X(3)+580.197\,X(8)+181.433\,X(11)$$

The functions mean that only these five variables— x(1), x(2), x(3), x(8) and x(11), are important in this discriminant analysis. The discriminant effect (Table 5) between I and II and between II and III is better ($P<0.01$) than between I and III ($P<0.05$), indicating that the discriminant effect between Neolithic northern groups and Neolithic southern groups and between Neolithic southern groups and Modern group are better than that between Neolithic northern group and Modern group. To a certain extent, maybe we should attribute it to some samples like Miaozigou man, which exists in the Neolithic northern group. In short, the final discriminatory classifications of 12 samples (Table 5) are the same with the original discrimination without erroneous discrimination and it also illustrates that the determination, which put Hedang man into the second category II on the initial stage, is quite reasonable.

After the values of unknown samples for discrimination (Shigu man, Hemudu man and Miaozigou man) are put into the functions separately, the results are: Shigu man and Miaozigou man are discriminated as first category I (Neolithic northern category) and Hemudu man is discriminated as second category II (Neolithic southern category).

Based on the above three methods of multivariate analyses, the physical characteristics of Jiahu man (Table 6) belong to the Neolithic northern category with cranial length 181.0 mm, cranial breadth 150.0 mm, cranial height 145.0 mm, orbital breadth 41.5 mm and total profile angle 86.0°. Moreover, these characteristics are much closer to that of

Xiawanggang man than others.

The cranial length of Jiahu man is rather long in the Neolithic northern category. It is almost equal to that of Dawenkou man (181.11 mm) and to the mean of population in three categories, but much smaller than the average of Neolithic southern category and larger than the average of Modern man category. The latter has a trend of reduction in cranial length. The cranial breadth of Jiahu man, beyond the mean of population in three categories, is not only the largest one in the Neolithic northern category, but also much larger than the average of Neolithic southern category and Modern man category. The cranial breadth of Neolithic southern category is roughly equal to the average of Modern man category, but both of them are much smaller than that of Neolithic northern category. Compared with the other Neolithic northern category, the cranial height of Jiahu man is high and only a little lower than that of Xiawanggang man, but larger than the average of its own category. The cranial height of Modern men category is lower than the mean of population in three categories. Compared with the other Neolithic northern category, the orbit breadth of Jiahu man is narrower and almost equal to that of Xiawanggang man and Miaodigou man. The value of orbit breadth of Jiahu man is not only narrower than the each average of three categories, but also narrower than the mean of population in three categories. The size of the total facial angle is situated at the middle level and above in its own Neolithic northern category, so its value is larger than the average of its own category and the face is not projecting. The total facial angle of Neolithic southern category is the smallest one, so its face is more projecting than both the Neolithic northern and Modern man categories.

There are some questions that need to be discussed.

One is about Taiyuan man. Theoretically, when Neolithic human samples and Modern man samples are put together to do cluster analysis, accounting for the physical differences, they would be divided into two large categories according to their different times, and every large category could be redivided into its own southern and northern small ones separately. These differences between the southern type and the northern type could be traced to the differences between two different local patterns —Liujiang man and Upper-cave man of late Paleolithic period (Chen Dezhen 1986). Up to now, this is the macroscopical model of evolution and development of Chinese people since the late Paleolithic period. However, here occurred a phenomenon, that is modern Taiyuan man is assembled together with modern Hongkong man and modern Guangxi Zhuang people. As far as Taiyuan man is concerned, there could be several explanations:

1. The differences between Modern man and Neolithic humans and the differences within Neolithic humans, in general, are much larger than that between Modern southern man and Modern northern man, so when Modern man samples and Neolithic human samples are put into classification, the Neolithic samples plot farther away from the Modern samples; the Neolithic southern man and Neolithic northern man are also quite widely sep-

arated; but, in contrast, the Modern southern man and Modern northern man are mixed each other.

2. In the course of evolution from Neolithic human to Modern man, there is a trend; that is, the physical differences existing in the southern man and the northern man are being reduced, becoming smaller and smaller, due to the genetic exchange and mixture with each other. Nowadays, the peoples all over the world are becoming more and more mixed.

3. Maybe the Taiyuan man sample is not totally from a pure local population and the permeation of southern components at any time into them is responsible for this kind of distribution. The author verified the source of Taiyuan man materials again and found that there were not any records concerning the ancestral home, sex and age in the article (Wang Linghong et al. 1988). Therefore, it is necessary to consider this reason.

Another question is about Miaozigou man. Whether in the cluster figure or in the BIPLOT figure, Miaozigou man is always situated closer to modern Hongkong man and modern Guangxi Zhuang people. This implies that they are quite similar in some characteristics and this Miaozigou man, which belongs to the Yangshao cultural people, participated significantly or greatly in the formation of Modern man, especially in the formation of modern Hongkong man and modern Guangxi Zhuang people. Perhaps the speed of spread of genes of Miaozigou man was a little quicker than that of other Neolithic humans in the course of migration southwards. On the other hand, though Miaozigou man with some traits similar to Modern man is situated at a place quite near to modern Hongkong man and modern Guangxi Zhuang people in both the cluster figure and the BIPLOT figure, Miaozigou man, in advance as an unknown sample, is finally discriminated as the first category (Neolithic northern category). This result is quite reasonable and accords with the objective facts, whether of time period or of geographic locality.

7 Conclusions

1. According to the nonmetric characteristics, Jiahu man presents the traits of Mongoloid population, belonging to the Mongoloid Race.

2. According to the metric characteristics, the physical characteristics mainly are: the cranial length 181.0 mm, the cranial breadth 150.0 mm, the cranial height 145.0 mm, the orbital breadth 41.5 mm and total profile angle 86.0°. The cranial index indicates brachycrany, both the cranial length-height index I and the cranial length-height index II hypsicrany, the cranial breadth-height index metriocrany, the total facial index (M395) leptoprosopy, the upper facial index (pr) meseny, both the orbital index I (mf-ek) and the orbit index II (d-ek) mesoconchy, the nasal index mesorrhiny, the palatal index brachystaphyiny, and the index of occipital foramen is broad type. The total profile angle 86.0° is orthognathous (lower limit).

3. At the time of Neolithic culture, about 5 000 years B. P., there were some physical differences among the Neolithic humans according to their different geographic localities

(north and south), and those differences would make them form two large categories. Furthermore, as time went on, both Neolithic northern humans and Neolithic southern humans changed and developed into Modern man. The changes make it obvious that some differences existed between Neolithic humans and Modern man. Multivariate analysis exposes these differences quite clearly. Jiahu man and other compared Neolithic human samples and Modern man samples (cover 15 samples and 11 physical items) can be divided into three large categories: ①Neolithic northern category, including Jiahu man, Shigu man, Xiawanggang man, Miaodigou man, Dawenkou man, Baoji man, Hengzhen man, and Miaozigou man; ② Neolithic southern category, including Tanshishan man, Hedang man, Zengpiyan man and Hemudu man; ③ Modern man category, including modern Hongkong man, modern Guangxi Zhuang people and modern Taiyuan man. On the basis of five characteristics of the discriminatory function (cranial length, cranial breadth, cranial height, orbital breadth and total facial angle) Jiahu man is discriminated as a member of the Neolithic northern category. Within this small Neolithic northern category the physical characteristics of Jiahu man are more similar to that of Xiawanggang man in the same province than to any others.

4. The comparison among Jiahu man, other Neolithic humans and Modern man, indicates that the differences between Modern man and Neolithic humans are much larger than those between Modern southern man and Modern northern man. Moreover, in the course of evolution, sustained as long as 5 000 years, from Neolithic humans to Modern man, there is a trend; that is, the physical differences existing in the southern man and the northern man are being reduced, becoming smaller and smaller, due to genetic exchange and mixture with each other. Therefore, when Neolithic human samples and Modern man samples are put together, there are some distinctive distances which differentiate the Neolithic northern category from the Neolithic southern category so as to make their own categories; contrarily, Modern northern man with Modern southern man are mixed each other; and Modern northern Taiyuan man mixed with Modern southern man. Meanwhile, In the course of development from Neolithic men to Modern men, the speed, the range and the direction of genetic spread in different Neolithic samples were not totally equal; therefore, hypothetically Miaozigou man had a certain effect in the course of making Modern man, as far as the trace to source is concerned, or had more participation than other Neolithic humans.

Key words Nonmetric characteristics, Metric characteristics, Cluster analysis, BIPLOT method, Discriminant analysis