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PERSPECTIVES OF PHYSICAL ANTHROPOLOGY IN ANDHRA PRADESH

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The paper examines the prevalent perspectives of research, teaching and training in physical anthropology in the United State of Andhra Pradesh. These dimensions are preceded by how the fruits of research of different areas of the Science of Humanity can contribute to the service of society, followed by how physical anthropology is becoming an independent discipline together with its large number of fields.

The updated researches in physical anthropology of the State are visualized in the context of its physical location and characteristics as also the conceptual frame work together with the analytical tools and techniques. The various fields of research carried out in the domain are anthropometric variation including palaecoanthropology and somatometry, morphobehavioural variation, dermatoglyphic variation; genetic traits, blood group systems of ABO, Rh, MNs, Kidd and Duffy; proteins of haptoglobins, transferrins and GC; biochemical markers like G-6-PD, RCAP, PGM, LDH, ESD, GLO-I, AK, MDH, 6-PGD and ADA; and dental variation from the point of dental eruption, dental morphology and dental pathology. The paleoanthropological investigations as of now are based on the craniometric analysis of the male and female crania from the Neolithic Nagarjunakonda and megalithic Yelleswaram sites. The rest of the systems have been analysed with reference to subjects of different social categories: OCs, SCs and STs and other religious groups

The teaching-training in physical anthropology examines the conceptual framework on the theoretical aspects and the status of teaching and training of the subject in the Andhra University, Hyderabad Central University and Sri Venkateswara University respectively at the post-graduate and research levels together with the teaching staff pattern and research output in the form of publications, including monographs books and articles. The paper concludes with 26 pertinent observations on the status of research, teaching and training in physical anthropology in the state in retrospect and prospect.

Service in Anthropology is Service to Humanity

The Southern Regional Centre of the Anthropological Survey of India on the eve of its Golden Jubilee rightly thought of bringing all of us practising anthropology in AP to one place to oversee what best we can do in the service of humanity. I take this golden opportunity to impress upon you the dire need to take the fruits of anthropological researches, including teaching and training to the door steps of the people. It is no doubt a formidable task before us and urgently calls for integrating all our efforts to bring out the right perspectives for the benefit of the society. It is well known that there is a great drain in the anthropological fraternity in view of the prevalence of rapid strides in science and technology. To tide over

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this difficulty, all of us should make serious efforts in the matter of promotion as also practical applications of the subject. All this immediately calls for the responsibility of inculcating in the young minds about the usefulness of the human studies, starting almost from the school curricula.

The common causes of this meet are therefore to share meaningfully our field experiences as well as to review the activities of research and teaching to plan suitable strategies in the promotion and development of the discipline. It is high time that we utilise this occasion to advance our thinking, both individually and together, in order to arrive at a consensus on the strategies and plans for the purpose. Anthropology as the mother of all sciences has the onerous responsibility of interacting with all the closely related divisions of the sciences to arrive at a broad and integrated understanding of the humanity.

During the course of anthropological / human genetic researches and investigations we have to endeavour ourselves not only to establish rapport with the people but also to explain the social significance and relevance of these works and help them in improving the social affairs and remedying difficulties in social relationships. We have to explain to the people the fundamental nature of human institutions and the structure of culture and society as also the part played in them by the customs, beliefs, sanctions, traditions, etc. This helps in widening their mental horizons and in removing their ethnocentric tendencies. It also enables the people to develop the spirit of tolerance and understanding among themselves for harmonious existence. Various dimensions of tribal life - education, economy, folk-medicine, family, marriage, kinship, etc., have to be studied and recommendatory feedback inputs have to be provided to the government policy makers and administrators to implement them as suitable packages in the proper administration of the tribal areas and to improve the quality of life among them.

Human bio-cultural variation is the basis of evolution by the study of which it could be possible to convincingly place before the people that we have descended from a common ancestor, that we belong to a single race and that we should fight against racial/ethnic discrimination on grounds of colour, creed, religion, and tolerate one and all for harmonious, peaceful coexistence. We have to try to fight against superstition and prejudice among the people. People suffering from genetic defects and hereditary diseases have to be counselled to take remedial measures, including genetic therapies wherever possible. During the course of blood group investigations, we have to impress upon the people that partners entering into marriage should know that their blood groups are compatible, there by to prevent the fatalities of the blood group incompatibilities. In the matter of marriages, people have to be advised to avoid consanguineous types of marriages to have normal offspring as far as possible. People prone to blood group related diseases have to be advised to take necessary precautions with regard to diet as well as infections. Scientists in the fields of anthropology, criminology, forensic medicine and forensic

science as well as members of the society have to be apprised of the various methods of criminal investigation and their relevance to them in the matter of their safety and security as also life styles.

Through palaeoanthropological investigations, people have to be made to develop a sense of awareness and joy as also recreation about the culture history of humanity in space and time. Geography of the place, aesthetic appreciation and universal brotherhood are the other dimensions to be inculcated in the people. Discoveries of archaeological sites, monuments as also the objects and their preservation, including their display in the museums have to be shown as matters of national pride and sentiment among the people. Love and respect as well as national spirit have to be created in the minds of young children, adults and old people alike. The concept that the history of the world is the history of one and all, and that the entire humanity constitutes a single race descended from a common biological and cultural ancestry has to be underlined to create the sense of social integration in the humanity.

The Anthropological Survey of India involves us in the observation and study of different communities by participation among them. This interaction with the people is the first hand experience that paves the way for understanding the people's total way of life and helps in the detection and recognition of their requirements. These informations are to be provided to the authorities of Anthropological Survey of India for facilitating necessary action to improve the quality of life of the target groups of people through short- and long-term programmes.

During our investigations on dental variations and dental health among the Indian and overseas communities, we have the chance of working with dental surgeons in our mission to elicit correct data and personal information. These experiences enable the highlighting of the sheer negligence of dental care and the resulting dental diseases. The various factors associated with this situation have to be codified for counselling the respective communities and government agencies for taking suitable ameliorative measures in the country. The study of populations including children and adults of either sex, have to be advised to take necessary precautions like proper brushing of teeth before and after taking food and sweets to prevent dental decay or caries.

In the matter of forensic investigations, we have to provide a kit of crime investigation methods to the police agencies, forensic scientists and others associated with such activity based on our experiences and interactions with agencies and institutions as in overseas countries.

Physical Anthropology: First Human Beginning and Fields of Research - teaching-Training

After the hominid line diverged from the pre-hominid line, the first culture-creating, culture-retaining and culture-transmitting, erect-walking, bipedal creature appeared

on the face of this planet in the beginning of the Pleistocene epoch, the last geological epoch, about 4 million years ago. As an organism of the nature, as a biological animal and as a primate, the "human" in man enabled him to adapt to the vicissitudes of the former in terms of his varied activities for a successful survival, development and continuity in space and time. As the highest product of biological evolution, the human species became the subject of study right from the time of Aristotle about 4th century BC till date.

The human biological study under the term "Physical anthropology" remained "descriptive", "old" or "classical" with no place for theory or interpretation until the end of the 19 century and entered the "analytical stage" with emphasis on reorientation in methodology and comprehension as also interpretation during the 20th century. The task of the 21st century physical anthropology is multifaceted and varied not only in its retention and continuity of the earlier descriptive-analytical aspects in the academic-research domains persist but also mostly on how the relevant fruits of knowledge can be taken to the door-steps of the needy and targeted human social groups.

This traditional branch of the broad discipline of anthropology is emerging and acquiring the status of an independent discipline, without missing its holistic approach, owing to the existence of a vast body of published literature on various dimensions, comfortably elevating each of them to the level of clearly discernable fields of specialisation as in the case of its sister-branches of social-cultural anthropology and prehistoric-protohistoric archeology. The following are the current special fields of study and research of physical anthropology: human evolution, palaeoanthropology, primatology (including primate palaeontology, primate behaviour and primate biology), anthropometry, radiology or human variation, forensic anthropology, dental anthropology, human growth and development, nutritional anthropology, dermatoglyphics, chemical anthropology, demographic anthropology, population structure, ecological or environmental anthropology, physiological anthropology, kinanthropology, man and biosphere, applied physical anthropology and genetic engineering, human genetics (including Mendelian or formal genetics, population genetics, somatogenetics, cytogenetics, extranuclear genetics, mutational genetics, molecular genetics, developmental genetics, evolutionary genetics, medical/clinical genetics, biochemical genetics, immunogenetics, pharmacogenetics, health genetics, genetics of twins, etc.) and so on.

Andhra Pradesh State and Research in Physical Anthropology

State and Researches

The state of Andhra Pradesh is geographically situated between $12^{0}40'$ and $19°50'$ North latitude and $76°45^{1}$ and $84°50^{1}$ East longitude. To the north of the state lie the Orissa, Madhya Pradesh and Chattisgarh states and part of Maharashtra state,

to its south are the Tamil Nadu and Kamataka states, to its east is the Bay of Bengal and to its west are the Maharastra and Kamataka states respectively. The state has an area of 2,57, 068 square kilometres with a population of about nine crore. This is the largest of the South Indian states and is the fifth largest Indian state both in area and population. The northern part of the state is covered by mountains whereas it is covered by dry and arid land as one proceeds towards the south. The major rivers that drain the state are the Godavari, the Krishna and the Tungabhadra, each with a number of tributaries. The principal spoken language of the state is Telugu though other Indian languages and English are also spoken and understood by a considerable proportion of the population. There are 23 districts in the state, nine in Andhra area, four in Rayalaseema region and 10 in Telangana region.

The physical anthropological researches carried out in the state are reviewed according to the appropriate fields of study each with likely trends, followed by the identification of the gaps. The population isolates considered in this connection include castes and tribes. The castes include the so called forward castes, backward castes and scheduled castes. At the same time some Christian and Muslim groups are covered.

Conceptual Framework for Research

It may be worth our while to highlight the importance, relevance and utility of research, in the backdrop of the main objectives of the study. The search for knowledge through systematic investigation with an open mind to establish novel facts is research. This may be basic or applied, and is carried out by using a scientific method. The scientific research provides information and theories for the explanation of the nature and the properties of the world around us as well as the possible practical applications.

Basic research (or fundamental or pure research) is applied to have an increasing understanding of fundamental principles, the end results of which often have no direct or immediate commercial benefits. In the long term this type of research becomes the basis for applied research. New ideas and principles emerge from it. It nourishes the expansion of knowledge.

In the case of empirical research, knowledge is gained by means of direct observation or experience. The emperical questions of this type of research need to be precisely defined and supported by data. Based on the researchers' theory, hypotheses will be proposed and from these hypotheses, predictions about specific events are derived. Such predictions can be tested by a suitable experiment based on the outcome of which it can be known whether the theory on which the hypotheses and predictions are based will be supported or not. The accumulation of evidence for or against any particular theory involves planned research designs for the collection of empirical data. The research design is judged for its merit by academic rigour.

For accurate analysis of data, standardised statistical methods are employed for determining the validity of emperical research. For the formation of logical valid conclusions, statistical formulas such as regression, uncertainty, coefficient, t-test, chi-square and various types of ANOVA (analysis of variance) are employed. If the appropriate statistical formula shows significance of the emperical data, the research hypothesis may be considered as supported and if not, null hypothesis is supported showing no effect of the independent variables is observed on the dependent variables. Thus these statistical methods supporting a hypothesis are only probabilities and are never considered as proof.

Fields of Research

The different fields in which researches have been carried out in Andhra Pradesh are anthropometric variation including palaeonthropology and somatometry, morpho-behaviourial variation, dermatoglyphic variation, genetic traits, blood group systems (including ABO, Rh, MN, MNs, Kidd, and Duffy), serum proteins (including haptoglobins, transferrins and GC) enzyme polymorphisms or biochemical markers (including G-6-PD, RCAP, PGM, LDH, ESD, GLO-I, AK, MDH, 6-PGD and ADA), and finally dental anthropology (including eruption, morphology, and pathology). Each of them is discussed as under.

Anthropometric Variation

This is considered under two separate heads: palaeoanthropology and somatometry. The former is concerned with human skeletal remains of the past while the latter is on the living populations of the state.

Palaeoanthropology

The study of prehistoric-protohistoric human skeletal remains is the most unoerrepresented field of anthropometry among the physical anthropological researches in Andhra Pradesh. The reasons for this situation are two fold: one is because of non-coordination between the excavator-institutions and individuals and the institutions engaged in physical anthropological researches. The 2nd factor is concerned with an almost non-study of human skeletal remains recovered from various excavated sites in the state.

The human skeletal data considered for the present purposes comes form the neolithic site of Nagarjunakonda in Guntur district and the megalithic site of Yelleswaram respectively. These consist of three male crania and a female cranium from the former site and two crania, one each of a male and a female, from the latter site. The skull specimens have been subjected to craniometric analysis by Gupta *et al.* (1970) and Gupta and Dutta (1962)). A glance at the measurements reveals higher cranial length in males than in females. The cranial breadth however does not show consistent variation between the sexes and between the sites. For

instance, the maximum cranial breadth of Yellaswaram male is the highest of all the crania while the female cranium from the same site records the lowest reading. The above variation inconsistencies are clearly reflected in their cranial index values. On the whole, the neolithic Nagarjunakonda crania show higher values in most of their measurements than those of Yelleswaram. The intersex difference between the crania from both the sites is clearly found in respect of all the recorded measurements.

E. H. Hunt in 1924 through his work on the "Hyderabad Cairn Burials and their Significance" (Jr. Roy. Anth. Instt, Vol.4) reported meso-brachycranial skulls from Raigarh megaliths in Hyderabad. According to Sarkar (1960), these skull are closely comparable to their counterparts from Brahmagiri megalithic site. Both the series are characterised by an Australoid element, a medium-statured, mesocephalic robust type probably of a Scytho-Iranian stock. Further, the Piklihal remains studied by Ananthanarayana Iyer (1960) also show robust and primitive features. Iyer thinks that these people could be ancestors of a major element of the present mixed so called Dravidian inhabitants of South India.

Our results on comparison with those of other neolithic-megalithic sites of southern India reveal that the cranial length and breadth values of male series range from 172 mm at Piklihal neolithic site studied by Iyer in 1960 to 193 mm at Nagarjunakonda, 132 mm at Tekkalakota studied by Malhotra (1965) to 146 mm at Yelleswaram of our study. In the female series, the cranial length varies from 169 mm to 181 mm and breadth from 122-140 mm excepting the low value obtained for Kodumanal skull of 116 mm studied by V.Rami Reddy and BKC Reddy (l987). The cranial index varies from 69.90 to 83.2 and from 67.40 to 79.9 for male and female series respectively. The values of our specimens fall within these ranges. This comparative evaluation shows that the specimens of the present study belong to the Australoid racial group like their counterparts of South India (Table 1).

Somatometry

This review on the morphometric profile of the state is the outcome of the somatometric measurements taken on 15,897 individuals, including 4,646 samples earlier measured by the staff of the Anthropological Survey of India during 1961-63 under the All India Anthropological Survey: South Zone (AIAS/SZ) project earlier conceived. The remaining 11,253 subjects were studied by the post-graduate and Ph.D., M.Phil students of the S.V. University departments of physical Anthropology and Prehistoric Archaeology as well as by their counterparts from the anthropology department of Andhra University during 1974 to 1993. A few individual studies made in 1933, 1960 and 1961 are also included for our consideration. The samples represent a total of 132 communities belonging to 70 Other Castes (including forward and backward), 14 scheduled castes, 40 scheduled tribes, 2 Christian and 6 Muslim communities.

TABLE 1 : CRANIA FROM NAGARJUNAKONDA (NEOLITHIC SITE) AND YELLESWARAM (MEGALITHIC SITE) SITES

S. No.	*Measurements/Indices*	*Nagarjunakonda*					
		NEO-3 M	*NEO-7 M*	*NEO-11 M*	*NEO-9 F*	*M*	*F*
1.	Max Cranial Length	193	188	192	174	175	169
2.	Max Cranial Breadth	142	140	137	140	146	129
3.	Nasion-inon Length	188	‘	-	-	-	
4.	Basilo-Bregmatic Height	-	-	-	-	134	-
5.	Auriculo-Bregmatic Height	104	-	-	-	118	111
6.	Least Frontal Breadth	95	-	92	104	96	92
7.	Nasal Height	-	-	-	43	46	-
8.	Nasal Breadth	-	-	-	24	26	-
9.	Orbital Breadth(L)	-	-	-	-	44	3.8
10.	Orbital Height	-	-	34	-	30	29
11.	Maxillo-Alveolar Length	54	-	-	-	-	-
12.	Occipital Foramen Length	45	-	-	-	-	-
13.	Horizontal Circumference	550	-	535	510	-	-
14.	Cranial Index	73.6	74.5	71.4	79.9	83.2	75.5
15.	Length-Height Cranial Index	-	-	-	-	76.5	-
16.	Breadth-Height Cranial Index	-	-	-	-	95	-
17.	Auriculo-Vertical Index	-	-	-	-	67.4	65.6
18.	Nasal Index	-	-	-	55.8	56.5	-

*The measurements are in mm.

Among the OCs, 13 communities are represented by single study groups (Bestha, Devanga, Jalari, Jangam, Kaikala, Kapu, Mudiraj, Nagara, Raju, Telaga, Teli, Velama and Washermen), 7 Communities are represented by two study groups each (Kshatriya, Vysya, Kamma, Medara, Thogata, Muttaracha, and Vaddi), two communities are represented by seven groups each (Balija and Golla), and the communities of Reddi, Brahmin, Padmasale, and Ediga are respectively represented by twelve, eight, five and four study groups. Among the SCs, the Madiga Community is represented by three study group, the Mala by eight study groups, and the Manne by two groups only. Among the STs, nine communities are represented by single study groups (Bagatha, Boya, Dommara, Kapu Bauern, Naikpod, Nuka-Dora, Saora/Savara, Sugali and Yerukala), four communities are represented by two study groups each (Rajgond, Konda Dora/Konda Reddy, Lambadi and Yanadi), two communities are represented by four study groups each (Chenchu and Kolam) and the only community of Boya is represented by two groups. The Muslims contain five study groups followed by the lone community of Dudekula. The subjects of study consist of only adult males in the age range of 20-55 years. The anthropometric characters included are stature, sitting height, head length, head breadth, nasal height, nasal depth, minimum frontal breadth, brizygomatic breadth, bigonial breadth, total facial height, upper facial height, and

head circumference. Mean values of stature, cephalic index, nasal index, and total facial index together with standard error were estimated.

The combined mean stature of OCs (159.10-166.94) is considerably of higher range than those of SCs (150.35-162.22) and STs (149.05-165.44). The Muslims however lie in their stature (162.44-164.10) within the OC range. The cephalic indices of OCs and SCs nearly approximate each other (72.38-78.50 and 73.70-77.54), while that of STs (71.66-78.25) presents a wide range with a considerably lower minimum value of CI In the case of Muslims, the CI shows a very narrow range. The CI value of Christians (76.88) which lies within that of the OCs is the lowest of all the study communities (74.01 in SCs, 78.96 in Christians, and 72.09 in Muslims). Among the STs (91.25) the N.I. value is the highest of all groups. Nearer to this range comes that of OCs (80.49-95.90). The TFI is of a negligible range among the Muslims (84.24-85.18). The TFI of SCs (82.76-88.70) lies within the Christian group (68.81) only.

As compared to the other Indian states, the minimum stature of SCs and STs of Andhra Pradesh (150.35 and 149.05) is much lower than the lowest stature value of the people of Arunachal Pradesh in Eastern India (160.52). Even the highest stature value of Andhra Pradesh OCs (166.94) is lower than that observed in Haryana state of North India (167.8). The cephalic index is however even in its lowest range is higher than that of the lowest value of Kerala (70.91). In the case of other community groups the highest CI value is considerably lower than that of Sikkim (79.68). The nasal index values of the STs and OCs of AP are much higher than the highest value found in Assam (79.36). Even the low index value noticed in UP (70.52) is higher than the corresponding values of OCs and STs. The total facial index which records the highest reading in Kerala (96.78) is higher than the values found among the people of AP with the exception of STs (99.79). The lowest TFI found in Arunachal Pradesh (80.90) corresponds with the values of OCs and STs of the AP. On the whole, the people of AP are of below medium stature, long headed with a medium head height and broad facial profile. Their nose is of below medium height and above medium breadth reflecting nearly broad nose.

Morpho-behavioural Variation

The morpho-behavioral variation plays an important role in physical anthropology. It is primarily based on observations on the surface of the entire human body microscopically and macroscopically both of which tantamount to what is called “morphoscopy”. These observations are variously named by the terms “somatoscopy”, “anthroposcopy”, etc. The observations cannot be represented metrically. The primary importance of observations has been given due importance by such stalwarts as Haddon and Hooton in the thirties of the 20th century itself. These are not only genetically important but they play a crucial role in ethnic identification of the human beings as also in medico-legal cases.

The available published works reveal the study of the following traits among the populations of Andhra Pradesh: arm folding, hand clasping, handedness, leg folding, mid-phalangeal hair, relative length of fingers, cleft chin, tongue pigmentation, tongue rolling, tongue folding, hyertrichosis, and earlobe attachment.

The trait of **arm folding** has been studied during 1970s to 1990s among the caste populations of Brahmins, Palli Reddis and Valmikis besides the religious groups of Christians and Muslims. The tribal populations studied for the trait are Bagatha, Konda Reddy, Kolam, Pardhan, Rajgond, Chenchu, Koya Dora, Parengi Porojas and Yanadis. The work was mainly carried out by the staff and students of anthropology of S.V. University and Andhra University. Both male and female samples were examined for the purpose. The sample sizes range from 50 to 1149 (total Hindus). The R type arm folding ranges between 30.9% among female Kapus to 69.2% among female Palli Reddis, while the left type arm folding fluctuates between 30.3% among the female Palli Reddis to 62.7% among the male Bagathas. The differences in the occurrence of the trait within the population between populations and sexes are statistically significant in a number of populations.

The trait of **hand clasping** has been investigated among a number of caste and tribal communities during 1970s to 1990s by the participation of the staff and students of S.V. University and Andhra University. The 'R' type hand clasping varies from 34.3% among the female Konda Reddis and 66% among the female Rajgonds, while 'L' type hand clasping ranges from 34% of female Pardhans and Rajputs. There are significant variations in the occurrence of the trait at the level of sexes and populations.

The trait of **handedness** has been observed among the tribal populations of Bagathas, Porojas, Koya Doras, Sugalis and Konda Reddis besides the Hindu school children. These surveys were mainly conducted during 1970s to 1990s. The R type handedness is the highest in proportion with 88 to 100% with the exception of Konda Reddis. Accordingly, the left type handedness is insignificantly very low and even totally absent in the case of Bagathas and male and female Konda Reddis. The variation in the proportion of this trait with regard to sex, population and type is highly significant. With regard to leg folding only two populations, viz., Sugali and Poroja tribes have been examined. In both the tribes the occurrence of the trait shows significant variation.

Tongue pigmentation observed in as many as 17 caste populations and seven tribal communities during 1970-1987 has been found to be present between 10% in male Reddis to 45% in Parengi Porojas with the exception of an unknown female sample of 35 persons showing 71%. The trait does not show any ethnic significance in its occurrence. *Tongue folding* has been observed only in four caste communities and two tribal communities. It occurs in as low a proportion as 7% among the Kapus of combined sexes to 60% among the Bagathas of combined sexes. The trait seems to be common in tribes though the communities studies are few. *Tongue*

rolling has been studied with reference to the tribes of Porojaa, Bagathas, Yadavas and Nakkalas and castes of Kapu, Kamma, Vadagalai, Tengalai and Vadabalija. The works were carried out from 1970s to 1990s. The trait occurrence ranges from 23.7% in female Porojas to 87% in female Bagathas. Castes also show considerably higher proportions. No trend can be deduced from the occurrence variation of the trait.

Only a single study is available on **cleft chin.** It was made in 1978 among the Vadagalai Brahmins and Tengalai Brahmins. The trait varies from 8% in female Vadagalai to 16% in male Tengalai.

Only the Pattusalis have been examined for the trait of **"relative length of fingers"** in 1975. The pattern of 4>2 occurs in highest proportions in both sexes (Males: 56.81%, Females : 55.5%). The trait of **"mid-Phalangeal hair"** has been studied among the castes of Kapus, Vadagalai and Tengalai Brahmins, and Palli Reddis and among the tribes of Sugalis, Parengi Porojas and Konda Reddis. The works were carried out during 1971 to 1987. The trait occurs from 24.7% among female Koya Doras to 46% among male Kapus. The trait does not show a consistent trend in its occurrence though it is relatively higher in castes than in tribes.

Hypertrichosis was studied from 1966 to 1987 among both caste and tribal groups. The trait occurs between 0% among non-Brahmins to 50.5% in Malas. Since the communities examined are few no trend can be seen in its occurrence though it is more common in castes than tribes. *Earlobe attachment* was observed among a number of caste groups and among the tribes of Bagatha, Kolam, Rajgond, Pardhan, Andh and Parengi Poroja. The attached earlobe trait varies from 8% in Adi Andhra males and females to 90% in Rajgonds. The trait does not show any consistent trend in its occurrence though it is generally of higher proportions in tribes and Muslims than castes.

Dermatoglyphic Variation

This is based on a total sample of 4951 subjects (M : 3221, F : 1730). It includes 1397 OC subjects (M : 1207, F : 190), 101 Parsees (M : 55, F : 46), and the rest is represented by a bulk sample of 3453 subjects.(M : 1959,F : 1494) from 10 STs with 17 groups.

The OC data is from the four communities of Golla, Reddi, Palle Reddi and Vadabalija. The Reddi caste is represented by the sub-castes of Akuthota, Pedakanti, Panta, Pokanati. The remaining communities include the Parsees and ten STs (Chenchu, Jatapu, Kolam, Konda Dora/Konda Reddy, Koya/Koya Dora, Lambadi, Pardhan, Rajgond, Savara and Sugali). The Konda Dora/Konda Reddi and Koya/ Koya Dora are represented by four groups each, while the Chenchuss are represented by two groups. The remaining seven tribes are represented by only a single group each. All the communities are represented by both sexes. The studies were conducted during 1960 and 1990 by the participation of staff and students of physical

anthropology and anthropology Departments of SV and Andhra Universities and by Kumbnani and Datta in 1971.

Both in castes (59.96%) and tribes (54.85%), loops occur in highest proportions, the former being relatively much higher than the latter. The proportion of whorls is higher in tribes (40.22%) than that of the castes (34.98%). The proportions of arches of the castes (4.45%) and tribes (4.3%) are interestingly very close to each other. Castes and tribes show bisexual variation in respect of all the traits. The average frequencies of these traits fit into the national ranges and lie almost midway between.

The pattern intensity index (PII) values of tribal populations range from 11.06 in Savara females to 15.20 in Koya Dora males. This range is relatively higher than the national range (13-15). The two PII values of Golla community (M = 13.70, F = 13.10) fit into the national range. The average values of TRC available only for the Jatapus, Konda Doras, Koyas, Lambadis, and Savaras range from 110.6 in the Jatapus to 167.8 among the female Koyas. This is a wide range of variation with the lowest range being much less than that of the national value (125.30). Even the highest average value of TRC is also much less than that of national value (178.40).

Genetic Traits

These include three categories : colour blindness, PTC taste ability and ABH secretion. Each of these is considered separately as follows:

Colour Blindness

Two categories of colour blindness, X-linked Duetan and Protan and autosomal total colour blindness, are characteristic of human populations. In A.P., as many as 22 OC communities with about 50 groups, 3 SC communities (Madiga, Mala and Relli) with 8 groups, 22 tribal populations with about 80 groups and Shaik and Syed Muslims have been screened during a span of about three decades (1960-1990) due to the efforts of Dranamraju and Meerakhan, Char and Rao, Ramesh and his associates and Murty, followed by the teachers, research scholars and postgraduate students of the physical anthropology and human genetics department of S.V. University and their counterparts in the anthropology and human genetics, Departments of Andhra University. A huge sample of 30,696 subjects of both sexes of all communities has been screened for colour blindness.

The total number of duetans has been found to be 219 (0.72%) and that of protans is 123 (0.41%) which is far lower than the proportion of duetans. The proportion of colour blinds in OCs ranges from 0.50% in Pokanati Kapus to 16.20% in the male Dravida Brahmins, while in the case of STs the frequency ranges from 0.28% in the Bagatha females to 0.49 in Rajgond males which is much lower than the former. Similarly in SCs, the frequency of colour blindness ranges from 1% in Madiga females to 3.31% in Mala males. The Syed Muslim males (4.7%) are

slightly less affected by colour blindness than the Shaik Muslim males (5.65%). The overall A.P. mean colour blindness proportion is 4.57%.

PTC Taste Ability

A total of 5,420 subjects were screened for taste ability from 7 OC Communities (with four groups in Vadabalija community and 3 in Vysya community), 4 SC communities (with 2 groups representing Harijans and another two groups representing Malas), 9 tribal communities (with 3 groups among Chenchus and 5 groups among Naikpods) and a Muslim community. Both males and females were examined among Brahmins, Reddis, weavers, Harijans and Muslims. The works were carried out during 1953, 1964 and from 1977-79 and a few in 1989. Thus the works are very few as compared to the total population of the state.

The lowest proportion of non-tasters was noticed in the OCs (38.6%) and the highest among (the SCs (59.1%). Next to the SCs come the STs (51%). The Muslim community has been I found to show only 44.7% non-tasters with high bisexual difference. Highest intersex difference is also found among the OCs. Among the SCs and STs sex is not indicated.

The combined picture of the state shows an average frequency of 48.3% non-tasters. As compared to the national picture the average frequencies of non-taster gene (t) lies mid-way between 23.79% of the Tibeto-Burman speaking Ladakhi non-tribal community of Jammu and Kashmir and 78.17% of the Dravidian-speaking SCs of Karnataka. On the whole with the exception of Kerala, the non-taster population is generally higher in SC and ST communities unlike the tribes of the Himalayan belt.

ABH Secretion

For this trait, very few populations of the state have been screened. They consist of only 3 OCs (with 5 groups among the Reddis), 1 SC and 2 STs. Of a total of 2022 subjects screened for the trait show about 42.81% non-secretors among the OCs and STs. But the range is wider among the STs (24.9 to 46.8%) as compared to that of the former (37.99 to 48.51%). The above values lie midway between the national range of 14.1% in Onge tribe of Andaman to 78.10% in the Khond tribe of Orissa. This inconsistent picture lacks a clear pattern of variation. Moreover the number of populations studied is very few. Most of the works in A.P. were carried out in 1990 only.

Abnormal Haemoglobin: Sickle Cell Trait (HbS)

This is the only abnormal haemoglobin found in A.P. The haemoglobin HbE is yet to be detected here. A total of 22 communities represented by 6939 subjects have been studied for sickle cell trait during a span of about 4 decades starting from 1970s. Scholars from various institutions like Osmania University's Human

Genetics Department, Institute of Genetics and Genetic Diseases, Madras University Department of Genetics and Anthropological Survey of India besides Andhra University Departments of Anthropology and Human Genetics. Majority of the subjects (N: 5188) represent 15 tribal communities containing groups of similar number ranging from 2 to 5. The OC and SC communities, each with three of them, are very insignificantly represented (OCs: 834, SCs: 917).

Among the OCs, the trait has been reported to the extent of 0.45% among the Kammas and 0.96% among the Jalaris. It is completely absent among the 4 groups of Brahmins respectively studied by Sampath and his associates in 1981, and J.M. Naidu his associates in 1985. Among the SCs, the trait ranges from 0.20% in the Madigas of Hyderabad to as high a proportion as 14.15% among the Rellis of Visakhapatnam, which however is reported to be as low as 8.15% according to 1978 study of Naidu and Mathew. Among the STs, the trait varies from complete absence (0.0%) in the two Chenchu samples from Kurnool district investigated by R.S. Negi in 1968 and Ramesh and his associates in 1980, and among the Yanadis, Yerukulas from Nellore and Mahaboobnagar districts. The highest proportion of 18.32% was reported among the Pradhans of Adilabad by Blakes and his associates in 1981.

This state picture is comparable to that of the nation with the exception of the incidence of 24.28% in an Indo-Aryan speaking tribe of Panka of Madhya Pradesh. The low incidence of the trait in the tribes of the state in general is comparable to that of other Austro-Asiatic tribes of country (0.00 - 1.30%).

Haemoglobin (HbE) has however been found in the OCs of Sikkim, Assam (5.10 - 40.34%), Manipur (2.80%), West Bengal (0.00 to 3.60%); SCs of Assam (13.37%) and West Bengal (0.00% - 61.20%); STs of Sikkim (0.00% - 4.70%), Assam (0.00 - 64.55%), Manipur (7.10 - 10.91%), Meghalaya (3.42 - 22.50%), Arunachal Pradesh (5.20 - 5.70%) and West Bengal (0.00-17.30%).

Blood Group Systems

The different blood group systems investigated among the populations of the state are ABO system, MN system, MNS system, Rh System, Kidd system and Duffy system. These systems are presented separately as under.

ABO System

This is the most extensively investigated system of physical anthropology in Andhra Pradesh. It all started with the pioneering work of scholars like Dronamraju and Meera Khan in the mid-1960s when they initiated their study on a large sample of 5486 Hindu subjects and 270 Muslims, followed by the contributions of the teachers and students of the Osmania University Genetics Department and of the Hyderabad Institute of Genetics and Genetic Diseases. This tempo was kept up when the staff and the students of the S.V. University Department of Physical Anthropology and

the Departments of Anthropology and Human Genetics, participated in a very big way not only by organising field training for the PG students of their respective departments but also by themselves through their own research projects. Added to this is the participation of the staff of the Anthropological Survey of India. All these efforts resulted in the generation of massive blood group data on 44478 subjects representing 25 OC communities containing 94 groups (N = 24,332 subjects), five SC communities of 20 study groups (N = 3,711 subjects), 22 ST communities with 69 groups (N = 13,663 subjects), and to some extent by the religious communities of Muslims with 1,948 individuals of eight groups and Christians with 324 persons of a single group.

The A gene frequencies generally show wide variation ranging from 3.80% in the Nagaras to 26.14% in Samanthas among the OC communities. Majority of the OCs fluctuate in their A gene frequencies between 10 and 20%. The A_1 frequencies range from as low as 1.80% in the Sengund-Mudaliyar Kaikalons to as much as 5.75% in the Brahmins, while the A_2 frequencies range from 0.33% in the Vysyas to 3.85% in the Jalaris of the state. The highest and lowest frequencies of this gene reported in other Indian populations are no where nearer to our results. Among the SCs, the range of variation is somewhat closer and fluctuates from 10.74% in the Malas to 9.9% in the Mannes. The A_1 and A_2 genes are also of narrow ranges of variation. Among the STs, the lowest proportion of 1.40% was found in the Kuruvikkarans while most of the populations present close ranges of variation. The A_1 and A_2 genes show wide variation. The Muslims and Christians indicate negligible variation from each other in their A gene frequencies. More or less similar pattern can be observed in the B and O gene frequencies. On the whole, in majority of the communities the OBA pattern is characteristically found to be common with exceptions like OAB of Reddis and Samanthas of OCs, and a number of STs (Bagathas, Chenchus, Jatapus, Konda Reddis, Konda Kammaras, Koya Doras and so on) (Tables 2 and 3).

Rh System

The system was screened by using 5-antisera: ant-D, anti-c, anti-C anti-E and anti-e or by employing the first four anti-sera. A total of 1746 subjects representing only two OC communities of Brahmins and Jalaris (N = 538 subjects) and seven ST communities (N = 1208 subjects) were tested with the above anti-sera for the haplotypes of Rz (CDE), R_1 (CDe), R^y(CdE), R^1(Cde), R_2(cDE), R_0(cDe), R^{11}(cdE) and r (cde) respectively.

The results show that the incidence of Rz (CDE) haplotype varies form 0.60% in the Lambadis to 2.11% in the Chenchus. This range is far lower than the maximum average incidences reported from other parts of the country (UP Muslims with 7.87%, Haryana Ahirs with (4.69%; and UP, Assam and Orissa tribes with a range of 4.00-5.27%; and Muslims of Assam with 4.00%). The R_1 (CDe) haplotype occurs

in high proportions as in other parts of the country. It varies from 49.99% in the Brahmins to 89.86% in the tribal Konda Reddis. Our tribes also show higher incidences of this haplotype with an average of 72.30% than in other tribes of the country (above 65%). As expected, the only non -tribal population of Brahmins shows a much lower frequency like those of other parts of the country. The R^y (CdE) haplotype has been noticed only in the Brahmin caste population (1.50%) and the Dravidian-speaking Chenchu tribal population (1.79%) only.

In other tribal populations of our state, it is completely absent as in the case of other Indian populations. This haplotype has also been reported in the Irula and

TABLE 2: PROFILE OF ABO BLOOD GROUPS AMONG OCS AND SCS OF ANDHRA PRADESH

Communities	*Sample Size*	*Number of Groups*	p_1	p_2	p	q	R
OCs:							
Brahmins	4038	23	5.75	1.37	16.67	16.99	66.27
Kshatriyas	234	2	-	-	15.07	24.35	60.59
Vysyas	1523	9	2.13	0.33	4.35	20.98	74.81
Reddis	5940	19	4.58	1.24	19.99	16.84	65.92
Kammas	1523	8	4.01	1.27	13.50	18.82	67.62
Balijas	1523	7	-	-	12.51	19.41	68.11
Gollas/Yadavas	948	5	-	-	10.52	21.08	68.41
Jalaris	677	2	4.99	3.85	16.24	21.86	61.91
Hindus	5486	1	-	-	13.27	20.28	65.45
Devangas	120	1	-	-	5.16	31.89	62.95
Kammaras	9	1	-	-	11.82	13.64	74.54
Velamas	115	1	-	-	15.60	16.10	68.30
Koppula Velamas	248	1	. -	-	12.00	22.10	65.90
Mangalis (Barbers)	187	1	-	-	8.95	24.00	67.05
Nagaras	103	1	-	-	3.80	23.50	72.70
Nagavamsavams	172	1	-	-	16.13	18.24	65.62
Backward Classes	221	1	-	-	18.40	23.00	58.60
Kapus	424	2	-	-	11.98	19.24	68.29
Sales	89	1	-	-	11.92	25.74	62.34
Padma Sales	200	1	-	-	14.86	18.15	67.45
Pattu Sales	330	1	-	-	10.63	29.90	59.47
Rellis	215	1	-	-	10.63	23.72	66.26
Samanthas	325	2	-	-	26.14	25.81	48.03
Sengund-Mudaliyar	232	1	1.80	1.40	6.00	32.40	61.60
Kailkalons							
Oddes	150	1	-	-	19,20	16.35	64.45
SCs:							
Madigas	1725	7	5.01	1.49	13.87	24.44	61.77
Malas	942	9	5.80	4.78	10.74	29.01	59.78
Harijans	285	2			13.52	24.40	61.64
Kummaris	69	1			15.10	14.10	70.60
Marines	690	1			20.99	23.47	55.54

TABLE 3: PROFILE OF ABO BLOOD GROUPS AMONG STS AND OTHER RELIGIOUS GROUPS OF ANDHRA PRADESH

Communities	*Sample Size*	*Number of Groups*	p_1	p_2	p	q	R
STs:							
Bagathas	1374	4	-	-	24.42	23.81	51.48
Chenchus	847	6	10.56	2.10	24.09	21.45	54.86
Jatapus	1030	4	3.95	0.93	17.97	16.08	65.98
Kolams	331	2	-	-	18.59	33.74	47.68
Konda Doras	716	3	6.98	1.56	22.00	22.10	56.72
Konda Reddis	1150	4	3.76	0.42	19.44	18.11	62.46
Konda Kammaras	485	2	-	-	20.81	18.04	56.65
Konda kapus	26	1	-	-	10.14	14.51	75.91
Kuruvikkarans	103	1	-	-	1.40	27.50	71.10
Manne Doras	119	1	-	-	21.99	17.75	60.25
Gadabas	226	1	-	-	22.79	26.93	50.29
Nooka Doras	156	1	-	-	14.96	37.65	47.39
Parengi Porojas	172	1	-	-	24.82	25.22	49.96
Koyas / Doras	1396	6	3.44	0.38	22.96	17.97	58.76
Lambadis/Sugalis	1726	7	3.60	-	13.27	22.16	62.96
Rajgonds	217	2	6.93	0.43	24.49	26.16	49.35
Savaras	621	4	4.64	1.31	18.05	13.98	65.47
Valmikis	997	6	-	-	21.97	19.40	58.61
Yanadis	1067	4	2.15	0.25	8.45	20.03	71.35
Yerukulas	266	3	6.93	0.67	17.38	11.86	70.36
Pradhans	232	2	7.40	1.10	15.80	25.55	58.15
Naikpods	406	4	10.40	3.54	21.13	18.54	61.06
Other Religious Groups:							
Muslims	1948	8	-	-	16.27	23.36	60.38
Christians	324	1	-	-	13.70	18.08	63.22

Kadar of the neighbouring Tamil Nadu state. The R^1 haplotype which is characteristic of Brahmins is also found among the tribes .of Chenchus, Koyas, Lambadis, and Yanadis only. It is generally of low incidence in our tribes (1.90-6.70%) except in the Chenchus (15.44%). The R_2 (cDE) haplotype occurs in all the tribal populations (1.10-13.25%) and in the caste population of Brahmins (2.18%) of the present concern. The prevalence values do not indicate any trend or pattern in their variation. The R_0 (cDe) haplotype has been found in all but the tribes of Konda Reddis in the range of 4.80-13.91%. The highest incidence of AP is much less than in other states of the country. The R^{11} (cdE) haplotype is reported only among the Brahmins (0.74%) and is totally absent in all the tribal populations. Its rare occurrence in AP particularly in tribes is in agreement with the national picture. Even among Brahmins of our state it is of a very insignificant proportion unlike in other parts of the country.

The Rh negative gene or Rh (d) has been investigated among majority of the caste and tribal populations of the state that have been screened for the ABO flood groups. A total of nine OCs with 40 groups (N = 8586 subjects) three SCs with 10 groups (N = 1564 subjects),18 STs with 30 groups (N = 4582 subjects) and Muslims with three groups (N = 514 subjects) formed the study material for the work. The average frequencies of this factor ranges among the caste communities from as low as 7.07% in Gollas/Yadavas to 25.44% in the Kammas, among the SCs from 13.80% in the Mannes to 19.69% in the Madigas, and among the tribal populations from zero percent in the Jatapus, Nooka Doras, Parengi Porojas to as high as 31.00% in the Yerukalas. About 50 percent of the tribes show the Rh negative gene between about 20 and 30 percent of the subjects examined. However, the incidences of the Rh negative gene in the AP tribes are much lower than that found in the Dravidian-speaking Kerala Kadar tribe. Inter-caste and inter-tribe differences in the distribution of Rh negative trait are clearly explicable in the state.

MN System

A total of 2959 subjects representing two OCs with three groups (N = 532 subjects), one SC community with 101 subjects, and 9 STs with 19 groups (N = 2326 subjects) formed the sample for the study of this system.

The average frequencies of M gene vary in OCs from 43.62% in the Brahmins to 50.94% in Jalaris, while among the tribes they range from 52.65% in the Pradhans to 77.84% in the Koyas. Their respective means are 57.73% in OCs, 88.12% in the only SC community, and 71.05% in the STs, the latter two being larger than the first frequency value. These frequencies broadly fit into the national ranges with decreasing trend in A.P as in other South Indian states.

MNSs System

For this system, only a single study by Simmons and his associates was carried out in 1953 on a sample of 108 Chenchu subjects in Kurnool and Guntur districts of the State. The incidences of MS, Ms, NS and Ns haplotypes of the tribe are 21.70, 32.50, 21.30 and 24.40 percents respectively. The MS haplotype incidence of our sample is much lower than that of Tibeto-Burman speaking Mikir tribe of Assam (29.24%) and much higher than the values reported for a number of castes and tribes reported from other parts of the country (their ranges are 5.70% in Muslims of Orissa, Sikkim Tibeto-Burman speaking communities and tribes with 8.71 and 9.18 percents respectively; Khasis of Meghalaya and Andaman Onge tribe of Andamans with 7.25% and Christians of Orissa with 6.20%).

The Ms haplotype in the Chenchus is of much higher incidence than the minimum values of STs of Dadra and Nagar Haveli (23.52%) and much lower

than the maximum values of the Austro-Asiatic tribes of Andaman Nicobarese (70.80%) and many other castes and tribes. The only comparable population with the Chenchus is that of SCs of Himachal Pradesh (32.90%).

The Ns haplotype of Chenchus presents the highest incidence as compared to the proportions found in South India. It is however comparable to the Indo- Aryan speaking tribes of Kokna and Worli of Dadra and Nagar Haveli. The incidence Ns haplotype of Chenchus lies midway between the ranges of 13.21% of the Dravidian-speaking tribes of Kota and Kurumba of Tamil Nadu and 42.93% of the Indo-Aryan Speaking Siddis of Karnataka.

Kidd System

The only population studied for this system is the Lambadis of Hyderabad by Roberts and his associates way back in 1980. This is based on a sample of 61 persons. The average frequency of Jk^a gene in this Indo-Aryan speaking tribe is 44.50% which is much lower than that of Rajput communities of Himachal Pradesh (62.86%).

Duffy System

This system is studied for the frequency distribution of Fy^a and Fy^b genes. It is based on the screening of 24 Chenchu subjects from Guntur and Kurnool by Simmons and his associates in 1953 and 61 Lambadi Subjects from Hyderabad by Roberts and his associates in 1980. The frequencies of Fy^a gene in Chenchus is 100.00% while its frequency in the Lambadi tribe is 68.40%. Both these frequencies are far higher than those of Siddis of Karnataka (22.71%).

The Fy^a gene frequency of the Chenchus is the highest in India, next to which come the frequencies of Mongoloid populations of Central Himalayas and North-East Himalayas (over 75%) and of the Sikkim tribes (88.49%). Our finding supports the observation of a relatively high average incidence of Fy^a gene in tribal populations.

Protein Polymorphisms or Serun Proteins

Under this category are considered the haptoglobins, transferrins and group specific components (GC). Each of these is presented in the following order.

Haptoglobin System

This system has been investigated among five OCs, three SCs and 10 STs mainly by the staff and students of Osmania University and to some extent by those of SV and Andhra Universities. The total sample size consisted of 9912 subjects (represented by 47 groups) of which 3892 subjects are from OCs (represented by 17 groups), 1369 belong to five SCs (from five groups) and the remaining 4651 persons are from 10 STs (with 25 groups).

The average frequencies of Hp^1 gene range from 11.52% in the Kammas to 16.20% in the Vysyas of OCs, from 5.73% in Mannes to 13.94% in Madigas of SCs, and from 8.10% in Yerukalas to 19.15% in Chenchus of STs of the state. The OCs show a narrow range, while the SCs and STs indicate wide ranges in the occurrence of the gene. When the gene frequencies are considered for the whole state, its occurrence range appears to be much larger (5.73 -19.15%). As compared to the all India scene, the gene frequency ranges are much higher in the SCs and STs of the state than their counterparts in West Bengal (0.89%), while those of OCs are relatively less than those of Kerala and Karnataka states (20% and above).

Transferrin System

A total of 6251 persons belonging to five OCs, four SCs, and 11 STs mainly from coastal Andhra and Telangana regions have been typed for variants of Tf^c (Tf^{c1} Tf^{c2},Tf^{c3},Tf^{cr} and Tf^b and Tf^d genes. The work was carried out during a span of three to four decades of 20th century mainly by the scholars of Osmania and Andhra Universities besides some from the ICMR and Germany. Out of the total sample, 1633 subjects represent five OCs, 1314 come from SCs, 3244 individuals were drawn from 11 STs and 60 Muslims.

The results indicate the occurrence of Tf^{c1} in the caste samples of Brahmins (74.10%) and Vysyas (78.70%), while Tf^2 has been found only in the Vysyas to the extent of 18.90%. The Tf^{c2} occurs in all the castes and tribes in the ranges of 97.35-100% with OCs, 97.89-100% in the SCs and 91.52-100% in the STs and 98.33% in the Muslims. The Tf^c variants have been found in the order of Tf^{c1}, Tf^{c2} and Tf^{c3} in the tribes of Konda Kamaras (66.38%, 25.46% and 0.43%), Koyas Koya Doras (72.68%, 20.75% and 0.58%) and Lambadis/Sugalis (75%, 23.96% and 1.04%) only. The last tribe presents higher values in respect of the three variants than those of the first two tribes. The Tf^{cb} was noticed in negligible proportions in the OC community of Jalaris (0.48%) and SC community of Madigas (0.10%) only. T^{fd} type varies from 0.30% in Madigas, Maria Gonds and Lambadis/Sugalis to as high as 29.00% in Koya Doras, but most of the available proportions range between 1.00 and 10.00%. The mean values of this variant in OCs, SCs and STs are 1.59%, 1.20% and 2.56% respectively.

Tf^c is the most common variant not only in AP but also in bulk of the Indian populations, and is generally higher than 90%. Among its variants, Tf^{c1} and Tf^{c2} occur only in some caste and tribal populations unlike in other parts of the country, while Tf^{c3} is completely absent as in other regions of the country. The Tf^b and Tf^d variants also are in comparable ranges in their occurrence with other areas of India.

Group Specific Component System (GC)

A total sample of 3477 subjects, including 326 from two SCs with three groups, 2947 from seven STs (with 22 groups) and 204 Muslims formed the material for

the study of this system. The participant scholars in this research activity include mainly a German scholar, Walter and his associates from Andhra University Human Genetics department and Germany, Papiha and his associates and Goud and Rao from Osmania University. The work was carried out from 1970s to late 1987s. The analyses were made for GC^1 gene frequencies which show the following results.

The average frequency of Gc^1 gene varies from 76.50% in Malas to 81.50% in Madigas of SCs, from 74.40% in Rajgonds to 83.50% in Pardhans of STs and 77.20% in Muslims. The minimum frequency ranges of the AP populations irrespective of their ethnic levels are relatively much higher than those of the Tibeto-Burman speaking tribe of Karbi of Assam as well as those of other states of the country. The maximum frequency values are however closely comparable with those of the OC communities of Sikkim (85.51%) and Karnataka (81.31-84.52%) and of tribes of Sikkim (80.58%) and Orissa (84.40%). This gene on the whole does not present a consistent trend or pattern in its occurrence in the country.

Enzyme Polymorphisms or Biochemical Markers

Considered under this head are G-6-PD deficiency, Red Cell Acid Phosphatase System (RCAP), Phosphoglucomutase System (PGM), Lactate Dehydrogenase System (LDH), Esterase-D system (ESD), Glyoxalase System (GLO), Adenylate Kinase System (AK), Malate Dehydrogenase System (MDH), 6-Phosphogluconate Dehydrogenase System (6-PGD), and Adenosine Deaminase System. Each of these 10 systems is presented as follows with respect to their research output in AP.

Glucose-6 Phosphate Dehydrogenase (G-6 PD) Deficiency

The G-6PD deficiency has been investigated on a total sample 4750 individuals, including both sexes of a Brahmin group of OCs and Yerukala scheduled tribe population. The sample includes 610 persons of three OCs (with six groups), 1436 subjects of three SCs (containing five groups), and the remaining 2704 samples from ten scheduled tribes (with 24 groups). The research was first undertaken by Meera Khan in 1964, followed until the 1990s by different workers from the Osmania, Andhra and Sri Venkateswara Universities besides a UK scholar D.F. Roberts and his Indian counterparts.

The findings consist of frequency distribution of G-6 PD deficiency ranging from a total absence in a Brahmin group to 4.92% in Gollas of OC communities, from total absence in Mala group and Mannes to 3.45% in Madigas of the SCs and again from the complete absence in Kolam and Pardhan tribes to 7.38% in Koyas / Koya / Doras of the ST communities. This distribution pattern of the state as compared with others shows its lowest proportions of the deficiency of the enzyme unlike in the northern parts of the country (Himachal Pradesh: 14.86%, Nagaland: 27.06%, Rajasthan: 16.33%, M.P. : 13.28%, Maharashtra: 12.31, and West Bengal: 14.03%). This countywide distribution pattern is characteristically confined to the

Tibeto-Burman, Indo-Aryan, Dravidian, and Austro-Asiatic tribes of the Northern states of India.

Red Cell Acid Phosphates System (RCAP)

The three genes involved in the polymorphism are p^a, p^b, and p^c for which a total sample of 6077 subjects representing seven OCs with 19 groups (N = 3105), two SCs with four groups (N = 469), 14 STs with 25 groups (N = 2417) and 86 Muslims of a single group have been studied during 1970s to late 1980s by the scholars of Osmania and Andhra Universities, besides two foreign experts of Blakes and Roberts.

The analysis of the data shows that the mean frequencies of p^agene range from 18.30% in Jalaris to 26.52% in Vysyas of the OCs, from 20.10% in Madigas to 20.30% in Malas of SCs, from 13.08% in Naikpods to 28.90% in Chenchus of STs, and 32.00% in Muslims. The p^b gene frequencies vary between 71.19% in Andhras to 81.70% in Jalaris of the caste communities, from 79.70% in Malas to 79.90% in Madigas of the SCs and 67.00 % in Muslims and from 70.90% in Konda Reddys to 85.40%in Naikpods of the STs and 0.60% in Muslims. The frequencies of p° gene fluctuate from 0.37% in Brahmins to 2.54% in the Andhra group of the OCs, absent in SCs and from 0.40% in Lambadis to 1.51% in Naikpods of the STs.

The first two genes, p^a and p^b, show wide range in their incidence while p^c gene is rare in its occurrence as shown by its presence in six population groups, three each of OCs and STs in the state. The limited and low occurrence of the last gene (p^c) is as in other areas of the country. The p^a gene frequencies show higher minimum and lower maximum values in all A.P populations irrespective of their ethnic levels as compared to their counterpart tribal and non-tribal populations of other areas of the country (6.80%) in the Tibeto - Burman-speaking tribe of Pangwalas of H.P. interspersed by the Kerala SC Ezhavas with 24.65% and OCs with 25.17, and those of Maharashtra and Tamil Nadu with 22.8% and 24.60% to 31.76% in the Tamil Nadu tribal Kotas and Kalians of Tamil Nadu. On the whole there appears an increasing trend in the occurrence of this gene from south to north India.

Phosphoglucomutase System (PGM)

The data for this system, identified by $PGM^1{}_1$ gene with its variants (PGM_1^{1+}, PGM_1^{1-}, PGM_1^{2-}, PGM_1^7, PGM_{1-}^2), was drawn from 3216 samples of subjects, including 832 of them from OCs, 2299 from STs and 85 Muslims. The OCs contain 6 study groups while the STs have 20 groups besides a Muslim group. The work was conducted during late 1970s and late 1980s and is the result of the efforts of scholars from Osmania and Andhra universities with the association of some foreign experts.

The average frequencies of the gene vary from a minimum of 65.40% in the Hindus to a maximum of 81.71% in the Vysyas of OCs, from 62.73% in Konda Kammaras to 78.69% in the Chenchus of the STs, while the only Muslim group shows 73.50% of PGM_1^1 and 25.90% of PGM_1^2 and 0.60% of $PGM_1^{r(r)}$ The PGM_1^7 gene is noticeable only in a OC non-tribal community (0.50%), and in the tribal population of Yerukalas (7.70%). As in the RCAP system, the minimum and maximum mean incidences of this gene are respectively higher and lower than those of other populations of the country (58.35%-85.90%), excepting the Western Region.

Lactate Dehydrogenase System (LDH)

As in other parts of India, in A.P. too, a small number of populations have been screened by the participation of a few workers from Osmania, S.V. and Andhra Universities for this enzyme system. They comprise an Andhra OC community (N: 108) and 8 tribes with 10 study groups (N : 1296).

Out of the total subjects tested, only 12 tribals, 6 each of Chenchus (4.32%) and Yanadis (1.11%), were found to be deficient for LDH, while the bulk of the sampled individuals have been observed to be normal. As compared to the North Indian populations (0.00-7%), the two values of the incidence of A.P. groups occupy intermediate position. The frequency of Chenchus is however closely comparable to the values reported for Karnataka Siddis and Tamil Nadu Brahmins (more than 4%).

Esterase - D System (ESD)

This system has been investigated with the help of a total sample of 5847 subjects (OCs with 16 study groups comprising 3363 subjects, SCs with 3 study groups comprising 476 subjects, STs comprising 15 study groups with 1572 subjects, and 436 Muslims of two groups). The populations were screened from late 1970s to late 1980s mainly by scholars from Osmania and Andhra Universities with the participation of a foreign scholar Roberts to some extent.

The mean frequency values of ESD^2 gene vary from 19.44% in Kammas to 40.19% in Vysyas of OCs, from 29.40% in a Scheduled caste to 40.50% in Malas of SCs, from 8.27% in Chenchus to 74% in Kuruvikkarans of STs, and 43.60% in the Muslims. The variation in the occurrence of the gene is the largest of all the groups. The highest mean value of 74% of the tribe of Kuruvikkarans of A.P. has not been reported anywhere in the country. The usually prevailing values of 12.80% as in the Pangwala tribe of HP, 16.10% as in the Sherpa scheduled caste of Sikkim, 36.10% as in the tribes of Andaman and Nicobar, 31.30% as in the Oraon tribe of West Bengal and 38.10% as in Maharashtra tribes are broadly comparable to those of A.P. populations.

Glyoxalase System (GLO-I)

This system has been investigated for the presence of GLO^1 gene among three OCs with three groups (N = 2864), another three SCs with one group each (N = 375), two STs with three groups (N = 309) and 350 Muslim subjects, the total study sample size being 3898 subjects.

The GLO^1 gene average frequencies present close ranges in all the three categories, of populations: 27.50% in Brahmins to 30% in Jalaris of OCs, 25.20% in the scheduled caste populations to 35.65% in Malas of SCs and 7.73% in Konda Kammaras to 20.36% in Koyas/Koya Doras of the STs. The Muslims show a mean frequency of 32.70% of the gene. The mean frequency values of the four categories of populations of A.P. portrayed above are much larger than those of many other Indian populations (13% in Sikkim Gurungs, 34.60% in West Bengal Oraons, 7.50% in Bhotias of Sikkim, etc.). These are however broadly comparable to the SCs of Tamil Nadu (above 20%).

Adenylate Kinase System (AK)

The AK^1 gene of this system has been analysed from a total sample 2790 subjects representing four OC populations (N = 749 from four groups) and 11 tribal populations (N = 2041 from 17 groups). The populations are mainly distributed in Coastal Andhra and Telangana regions. The work was carried out during a period of about two decades from early 1970s to late 1980s. A number of foreign scholars along with their Indian counterparts mainly from Osmania and Andhra Universities participated in the activity.

The AK^1 gene frequencies on the average lie within a narrow range of 86.14% in Jalaris ana 91.20% in the Hindus of OC communities, whereas among the tribal populations, the range is some what wider from 86.90% in Sugalis to 97.30% in Kolams. These frequencies lie within the national ranges of 83.42% in Kerala SC Ezhavas and Pulayans to 100% in some tribes of HP and in those of the Himalayan belt. The observation that the non-tribal populations invariably possess lower values than those of the tribes may not hold good at this stage which calls for more systematically designed work.

Malate Dehydrogenase System (MDH)

This enzyme system has been studied among two non-tribal populations (Andhras and Nagavamsams), with a sample of 203 subjects and five tribal populations (Kolams, Kuruvikkarans, Lambadis, Rajgonds and Yanadis) with a sample of 845 subjects over 60% of whom are Yanadis (N = 542). The work was made during 1970s and early 1980s by Indian as well as foreign scholars. All our populations have shown a hundred percent mean frequency of the normal variant of the MDH^1 gene as in all other Indian populations representing the states of Bihar, H.P., M.P., Maharashtra and Delhi.

6-Phosphogluconate Dehydrogenase System (6-PGD)

This system of 6-PGD polymorphism is known by the genes of PGD^a, PGD^C and PGD^r. The sample of subjects for the study of this system consisted of 2103 (485 from 4 OCs, 1532 from 11 STs and the rest 86 of Muslim religious community). Osmania and Andhra University scholars are the main contributors to this system besides some associated foreign scholars. The data were gathered and published during about a decade.

The results show the total absence of the gene PGD^r in A.P. unlike its occurrence in some other Indian populations (to the tune of about 4%). The mean frequencies of PGD^a gene range from 62.94% in Brahmins and 97.60% in the caste population of (OCs, and from a close range of 98.37% in Konda Reddys to 100% in Jatapus, Pardhans and Savaras of STs. The average gene frequency of Muslims (98.30%) also approximates the frequency values of STs. As compared to populations from other regions of the country, the average gene frequencies of tribal Nagas (78.91%) and those of the Tibeto-Burman populations of the Central and North-East Himalayas (78.91% - 90.99%) are much lower than those of A.P. non-tribal as well as tribal populations.

Adenosine Deaminase System (ADA)

The ADA^1 gene of this system has been investigated on a sample of 618 persons, 413 of them belonging to three caste communities, 119 to two tribal populations and the rest 86 are Muslims. The data gathered has been analysed and published during the 1980 by scholars from Andhra University in association with Roberts from UK. The average frequencies of the gene closely range from 87% in Hindus and 98.53% in Jalaris of the OCs, while among the tribes the average frequencies (86.50 in Lambadis to 88.30% in Savaras) are much lower than those of non-tribal populations. The trend of higher occurrence of the gene in caste populations is comparable to the one observed in other parts of the country.

Dental Variation

Importance

The special interest evinced on dentition may be due to its diachronic capability to know about our species and racial origins, ease of direct comparison with living as also past populations facilitating a much greater time-depth in micro. and macro-evolutionary investigations and number of synchronic purposes. Moreover the teeth are the hardest and most durable of all parts of the body and hence account for a large proportion of the human and prehuman fossil remains available for study. As a matter of fact, virtually all fossil forms of primates now known are represented by teeth which as one of the anatomical systems help in understanding the

relationship between the different groups of primates. Teeth are readily accessible in the living populations. They incorporate limited and recognisable environmental effects as viewed Turner by in 1967 and therefore have proven to be the best epigenetic tool in the study of genetic admixture, dental morphology and in establishing biological relationship between the living and fossil human and non-human primates. They are the least biased to subjectivity unlike other anthroposcopic traits regularly studied.

Thus with the unique qualities that make them valuable for evolutionary as well as for other biocultural studies, the teeth have found an esteemed place in the subject of physical anthropology. The different aspects that can be studied are morphology, metrics, health, evolution, growth, genetics, usage, forensics and ethnographic treatment. The teeth are studied by the methods of direct examination, radiography, photography, and dental impressions and casts. The large genetic component and high heritability of dentition have been demonstrated by a number of genetic studies which facilitated the postulation of the modes of inheritance for various dental traits. In most of the foreign countries dental anthropological researches till recently were devoted to bring to light phenotypic trait frequencies and their distribution pattern basing on which attempts were made to contemplate on the question of population interrelationships. In recent years, however, emphasis has been shifted to the study of dental genetics and development to deduce conceptual models explaining the ways in which the genes operate in bringing about dental variations and their adaptive nature.

Research Findings and Publications

Based on my experience in dental anthropological researches through the project on **Dental Eruption, Morphology and Pathology Among the People of Gulbarga, Karnataka** during 1971 to 1976, I initiated researches into this area under the auspices of the S.V. University, Department of Physical Anthropology and Prehistoric Archeaology, Tirupati, by organising field-training to post-graduate students and also encouraging them to gather data during a month long field work on specified topics among different communities of the state. This effort bore fruit when a number of students had undertaken field trips, gathered the relevant data, analysed it and prepared and submitted dissertations to the S.V. University as part of the M.Sc. Degree in the subject. The studies made were related to dental morphology and pathology among different communities (Muslims, Brahmins, Pattusalis, Balijas, Madigas and Christians, and so on). Some dissertations were also attempted on review works in dental anthropology. Another study of significance was made on the **Eruption of Permanent Teeth Among the Children of Tirupati With Reference to the Estimation of Age of the** *Individual*, which has been submitted to the Tirupati-based S.V. Medical College by a doctor for his M.D. degree in Forensic Medicine in 1988. This was followed by another work on

Sex *Determination of Mandible* on which a thesis was submitted for the award of M.D. Degree to the above Medical College in 1992.

Further, I had the chance of organising a **National Seminar** in 1984 on **Dental Anthropology: Application and Methods,** sponsored by the UGC during March 10-12, followed by an **International Symposium on Dental Anthropology and its Applications** sponsored by the UGC and held at Zagreb (Yugoslavia) under the auspices of the 12th IUAES from July 24-31,1988. Further I was also invited by ORSTOM, Paris (France) for four months in 1995 during which I carried out a study on *Dental Variation and Dental Health in Cameroon (Africa)*. The proceedings of the first Seminar was published as a book under my editorship in 1985 Dental Anthropology : Application and Methods. New Delhi Inter India Publication. This was followed by the publication of another book in 1986 on dental anthropology of Gulbarga. Dimensions of Anthropology : Dention, Pathology and Crown Morphology. 2 Vols. Set New Delhi : B.R. Publishing Corporation. The other works are being processed for publication as books. I have given special lectures on dental anthropology in 1985 at Sagar (M.P.), at Calculatta in 1986, at Ranchi (Jharkhand) in 1988, again at Sagar (M.P.) in 1989, and at the Southern Illinois University, Carbondale (USA.) in 1999. These works are significant besides a large number of papers published in national and international journals. Scores of papers were also presented in national and international conferences/seminars / symposia in India and abroad.

The results of studies made on tooth eruption, morphology and pathology, including periodontal diseases are as follows. The studies on eruption of deciduous teeth reveal that in A.P. the teeth erupt in the children by 7-8 months and the full complement of teeth by 36 months. There is no sexual dimorphism in the eruption time among them. Well nourished children show earlier eruption times and greater number of teeth than the undernourished children of each age group. Children of high income group had experienced earlier eruption and completion times than those of middle and low income groups.

Cross-sectional studies on dental caries have been carried out among different communities such as Vysyas, Madigas, Brahmins, Pattusalis, Muslims, Balijas, Valmikis, Kammas, Yadavas, Pallis by me and my students and associates. The results of the studies show a wide range of variation in caries prevalence from 15% in the students of Andhra University to 69.1% in the Vysyas. The DMF/df lie between very low and low levels and occasionally between moderate and high to very high levels as in Gulbarga children with deciduous teeth, and Vysyas of A.P. Generally the female mandibular teeth, molars and occlusion aspects have been found to be more affected by the disease than their counterparts.

This increasing trend in the prevalence of caries in the A.P. populations as in other Indian populations is due to the factors such as modernisation, urbanisation,

eating habits, and other social-cultural factors. Therefore preventive steps have to be taken to eliminate the disease after assessing its prevalence.

Among the dental morphological traits usually considered for investigation are the supernumerary teeth, Carabelli's cusps, shovel-shaped incisors, diastema, crowding, cingulum or lingual cusp and occlusion. The proportions of supernumerary teeth range from 0.25 to 2.35% in the A.P. castes of Vysyas and Balijas. For Carabelli's cusps, the A.P. populations studied by us include Pattusalis, Muslims, Balijas and so on, whose proportions are 26.15% and 13% respectively. These proportions are far less than those of Hindus of Gujarat (64.6%), human crania from Eastern India (26.4%) and the people of Gulbarga (36%). The AP proportions are far lower than those of other populations of the country. Deciduous 2nd molars (42.1%) and permanent 1st molars (25.3%), as expected, have shown the highest proportions. However, the trend in the pattern of variation of the trait is not consistent in Indian populations. The shovel-shaped incisors have been noticed among the Pattusalis (50%), Muslims (5.74%) and Balijas (7%). These reveal not only inconsistent trend but also show lower proportions than those of Eastern India, Haryana Jhats (72.2%) and people of Gulbarga (6.5%) in subjects with deciduous teeth and 28.5% in those with permanent teeth. This trend on the whole conforms to that of the Caucosoids in general. The incidence of diastema has been noticed only in small proportions among the Muslims (5%), Pattusalis (3.25%) and Balijas (4.3%). These incidences are far lower than those of the people of Gulbarga (21.1%) in subjects with deciduous teeth and 33.7% in those with permanent teeth. The incidence of the trait is higher in males than in females. The trait of crowding shows variation in its occurrence between the jaws, sexes, castes, and religions as has been found among the people of Gulbagra. The dental tubercle of cingulum or lingual cusp has been found to show negligible proportion among AP populations (around 4%), whereas in Gulbarga its incidence was observed to be enormously high ranging from 39.3% in persons with deciduous teeth and 54.7% in those with permanent teeth showing significant sex, jaw, caste and religion variation in the occurrence of the trait. Works on dental occlusion in AP show low proportion of malocclusion cases as a result of least exposure to processed food stuffs in spite of the existence of people's contacts with the urban and industrial centres. Children of lower socioeconomic group, mainly of rural origin, showed significantly better dental occlusion with broader maxillary arches as in developed countries.

The foregoing account clearly shows that the quantum of research output on dental variation in India is extremely meagre except the above works in A.P. We need to strengthen this line of research in Andhra Pradesh as also in other parts of the country to have eruption age standards in different populations instead of relying on European or American standards - for proper and planned scheduling of treatment by orthodontists, for evaluation of the stage of maturation of teeth in different ethnic groups by the biologists, for determination of age by the forensic

anthropologists, for working out standards for the sizes and shapes of dental arches to enable orthodontists to make dentures satisfactorily, for evaluation of age and sex of teeth in medico-legal cases, to assess prevalence rates of caries and other pathological conditions to suggest preventive measures for incorporation in the heath care schedule of the nation including the states, to use dental morphology for racial comparison and classification as also in the microvolutionary studies of the modern form of human teeth in the background of environmental and behavioral adaptations.

The researches in the fields of **Demogenetics, Growth and Development, and Consanguinity and Inbreeding** have been carried out by many of my students in the department of physical anthropology. The relevant data was gathered from the OC communities of Reddis, Balijas, Kaikalas, Kammas; SC communities and Muslims and Christians inhabiting the Rayalaseem and Nellore districts of Southeastern Andhra Pradesh during mid 1970s till date. Two other studies at doctoral level call for our attention: one is on **Growth and Physical Changes During Adolescence among Bhil Boys of Rajasthan by K. Nirmalananda Reddy.** The second one is on **Growth Pattern Tribal Groups in Different Ecological settings of M.P. by D. Hanumantha Rao.** We are inclined to share the credit for these works since they have been carried out under the auspices of the **Department of Physical Anthropology and prehistoric Archaeology of S.V. University.**

The former faculty (K.N. Reddy), who was earlier on the staff of an SI and TRI (Ooty), has also done his work on the demography of the Irula tribe; on the food systems and nutritional conditions among the tribes of Todas, Kurumbas, Kotas and Irulas; on the bioanthropology of the Kota tribe -- all inhabiting the Nilgris of Tamil Nadu state. His other works were on the changing food systems and nutritional patterns among the tribes of Yanadis, Sugalis, Chenchus and Yerukalas; on the demographic and demogenetic aspects of the Jatapu and Savara tribes; and on inbreeding among the fishermen of coastal regions of Nellore and Prakasam districts of the state.

My latest study on **Type 2 Diabetes Among the Offspring of Consguineous and Conjugal Diabetic Parents in and around the Pilgrim City of Tirupati, South India** (2005-2007) was sponsored by the UGC under the Emeritus Fellowship Programme. The results of the analysis of the different non-clinical and clinical variables indicated the impacting role of consanguinity rather than conjungality in the development of type 2 *Diabetes mellitus* among the people, as shown by higher proportions of consanguineous marriages, including cross-cousins and uncle-niece types, higher trends of inbreeding coefficients, higher proportion of the commonly associated diabetes-causing symptoms, and higher prevalence of overweight BMI and 0.90 WHR categories besides elevated levels of biochemical, lipid and haematological variables. This work has been published (Rami Reddy, 2012). A

few of my other books published in 2012 which speak well of the subject of Physical Anthropology in A.P. are *Foundations of Physical Anthropology and Human Evolution, Current Trends in Human Genetics and Physical Anthropology and Anthropology in the service of Humanity*.

Teaching - Training in Physical Anthropology

Conceptual Framework for Teaching

Based on the learning needs and requirements of class room environments, a number of teaching methodologies have to be devised by the teachers. One of the most important methods of teaching is explicit teaching which helps the students to progress in a particular area, enables them to gain specific knowledge and skills. These act as tools in their learning process in all areas of curriculum. The explicit teaching practices of the teachers help the student-learning a purposeful activity. The learning culture can be built in class rooms only when teachers and students jointly engage themselves in teaching and learning. Then alone learning will become purposeful and clearly defined. The teachers engaged in explicit teaching should know the social dimension of the class room life, which is nothing but an interactive practice in the context of class room teaching between teacher and student. The patterns of class room interactions can be conducted through transcript or video technology. This involves the purpose of the lesson, how lessons progress and whether the students are reconnected to learning tools. Such explicit instructional talk enables students to have the opportunity to invest in their own learning. It shapes the learning needs of the students and helps to assist them to achieve the required outcomes. Such teaching method can be applied to both whole class and small focussed group teaching sessions. A framework for explicit teaching includes introduction covering a brief lesson orientation, elaboration which introduces the connections between new and known concepts, practice covering skills as well as knowledge and finally a review of the lesson.

Training is a formal and systematic modification of human behaviour through learning due to education, instruction, development, and planned experience. Development is also a learning activity usually directed towards future needs rather than the present works. It is concerned more with career growth than immediate performance. Through training the employees are permitted to acquire technology on the basis of which they can perform the present job to standards. The purpose is to improve human performance on the job in which the employee is presently engaged. In the case of development, the people are trained to acquire new horizons, technologies or view points through training and development as well as education. These aspects can help the growth of individual employee.

Physical Anthropology in A.P. Universities, Facult y, Training and Research

With the above theoretical concepts, let us examine the status of teaching and training in Physical Anthropology in A.P. The subject is taught at the post-graduate level for a Masterate Degree as well as researched in only three Universities of the State: *Andhra f University at Visakhapatnam, Hyderabad Central University at Hyderabad and Sri, Venkateswara University at Tirupati.* The first and the last are the only State Universities out of the total 32 and odd Universities as on date. These account for a low proportion as 6.25% of the total Conventional Universities, including the Universities catering to the requirements of Professional Courses. This is the most amazing situation as compared to the largeness of the state with numerous tribes and castes, including the scheduled castes, and the religions communities of Christians and Muslims. This is the level of recognition accorded to us and our discipline being the **mother of all sciences.** It is however a matter of satisfaction that the three regions of the state are represented by at least, one University each, where the subject exists!

Physical Anthropology became a teaching subject in 1969, eight years after the *Department of Anthropology* was established for the *first time in South India in Andhra University in 1961.* This Department has completed 50 years of its existence and is planning for its Silver Jubilee celebrations.

Physical Anthropology is offered as a core course in the first two semesters of the post-graduate programme. In the third and fourth semesters, the subject is offered as an area of specialization. During fourth semester, the students are expected to carry our field work on specific topics under the guidance of the concerned teachers for three weeks in a tribal area. They have to analyse the data collected in the field and submit dissertation to the University as part of the post-graduate programme in the subject. A glance at the course content and the distribution of marks shows that the area is adequately represented both in theory and practical courses. The Department has at present four teachers in Physical Anthropology out of the total of eight of them. Both in terms of qualifications, training and expertise, all the teachers possess the required competence to train the students for the post-graduate degree as well as extending guidance to the students for acquiring higher degrees like M.Phil. and Ph.D.

The candidates offering M.Phil. and Ph.D. Degree Programmes have to undergo course curricula in four papers each carrying 100 marks: Advanced Biological Anthropology, Research Methodology and an optional paper based on the topic and areas of research (such as Genetic Demography, Sero-biochemical Anthropology, Physiological Anthropology, Forensic Anthropology, Sports Anthropology, Genetic and Clinical Epidemiology, Human Growth and Nutrition). The candidates have to take written examination in the above three courses. The fourth paper consists of dissertation/thesis, which is to be based on the research work.

The four working and two former teachers published about 300 papers in Journals of National and International repute besides the presentation of about 150 papers in conferences. About 25 Ph.Ds. 15 M.Phil. and a large number of M.Sc. dissertations have been supervised by different teachers. A few conferences and seminars have also been organised by the department. Teachers have participated in workshops and refresher courses. Over 20 research projects sponsored by different funding agencies have been successfully completed. Teachers have undertaken trips to foreign countries under different programmes.

In S.V. University, Physical Anthropology as a special area was introduced in 1971 when a composite department of Anthropology and Sociology was started. This arrangement continued until 1976 when a *new Department of Physical Anthropology and Prehistoric Archeology* was established based on UGC Fourth Plan recommendation. The department started functioning with a Reader as Head of the Department and two lecturers. Two more lecturers were added to the department in 1979. All the teachers have the necessary training and experience in the subject. For admission into M.Sc. degree in the subject, B.Sc. degree holders with biology background were made eligible. The two year M.Sc. course contains one theory paper in Physical Anthropology and a practical paper in the first year. The final year programme included, two theory papers in the subjects and the fourth as an optional paper of specialisation Besides a practical paper a month long field work-based dissertation and viva voce become part of the degree. Each of these courses carries 100 marks. The intake of students into the M.Sc. course was limited to 20. The students can opt for specialisation in Physical Anthropology during the final year of the programme.

The department was recognised by the UGC for Special Assistance Programme in 1990. This is the first department in S.V. University to get the UGC approval for Special Assistance.

Under the auspices of this department, besides teaching the subject for four weekly man hours, weekly *Students Seminar Programme* was experimented for over two decades which has been found to be an innovative method that helps the student community to understand the subject much better and to qualitatively improve its communicative skills within and outside the classroom situations. The pattern of the said programme involving the students to assume the roles of *Chairperson, Paper Reader* and *Discussant* as well as the efforts they put in to prepare the paper for presentation on the stipulated date in the seminar under the supervision of the concerned teachers had a far-reaching impact on the career-making as also on the responsible roles they are called up on play in their adult life.

These seminars, providing different roles for each of the students and group discussions among themselves and with the faculty, resulted in making the student community not only in grasping the subject matter easily but also in overcoming their inherent fear-complex.

Field work for gathering data on topics and populations of their interest and carrying out the task by themselves as a group enables them to develop original thinking about the contents of the courses of their study as well as on the topics of their research investigations. Both the experiences facilitate them to account for the correctness of the research data they collect as well as in the proper understanding, utility and relevance of the same to the human communities they investigate and to the academicians-researchers and institutions. These three methods of teaching-learning process - weekly seminars, group discussions and tutorials and field training and collection of original data for dissertation writing - are of signal importance and have tremendous positive impact on the learning process. The programme has been acclaimed as the best one within the University and outside. Of course, it needs lot of hard work on the part of the students as well as the teachers.

The Forensic Sciences Institutes/Departments in different states, some Dental Colleges, Forensic Medicine and Anatomy Departments of some Medical Colleges availed our services in providing instruction as well as training, including guidance in the matter of personal identification from skeletonised human remains of persons involved in medico-legal situations. Further, we had the opportunity of offering our expertise in connection with the application of standards and observations of the science of anthropometry including somatometry, cephalometry, and somatoscopy in the identification of individuals from populations involved in wars, floods, air crashes, train accidents, murders, rapes, etc.,

The present set-up of Anthropology Department contains five teachers in Physical Anthropology. The subject has provision for M.Phil. and Ph.D. programmes. The working and retired staff published about 25 books and 500 papers in National and International journals. About 400 papers were presented in conferences. As many as 35 Ph.Ds., 25 M.Phils. and about 300 M.Sc. dissertations have been supervised by different teachers. About 15 seminars/conferences have been organised by the department. About 10 workshops/refresher courses have been attended by teachers. About 30 special lectures and guest lectures were organised by the participation of Indian and Foreign scholars. Similarly about 30 special lectures/memorial lectures, keynote addresses, guest lectures, etc. were given by teachers in other institutions and universities in India and abroad. About 15 projects, including the one under the UGC Emeritus Fellowship Programme, in different fields were completed. Foreign trips were undertaken by teachers under UGC visiting programme and on invitation by foreign countries and on deputation were undertaken by teachers.

The Andhra University-Department of Human Genetics came into existence in 1972 under the Faculty of Life Sciences. The research and training activities of this department are leaning more towards medical sciences with emphasis on human variation in health and disease. Genetic medicine and genetic health are the

hallmarks of the department. It is at present involved itself with the Human Genome Diversity Project (HGDP). There are four teachers working in the department apart from four retired teachers. The department offers the courses of a two year M.Sc. Human Genetics with an intake of 28 candidates, a semesterised M.Sc. course in Molecular Genetics with 16 seats, and an advanced PG Diploma in Genetic Counselling with 26 seats. Besides, the department offers M.Phil. and Ph.D. programmes in different areas of the subjects. The department has fairly well organized laboratories. The teachers make visits to colleges to give lectures on biology. The candidates who pass out from here have ample scope of securing jobs in National Laboratories and Institutions. About 200 papers were published and 100 papers were presented in conferences by different teachers and researchers of the departments. 20 Ph.Ds., 10 M.Phils. and about 150 M.Scs. were supervised by different teachers. About 10 projects were completed by the department.

The *Hyderabad Central University Department of Anthropology* was founded in 1988. The department does not have provision for teaching staff in Physical Anthropology. However, the M.A. Programme with 16 semesters has a single course on Physical Anthropology and a half course in practicals.

Concluding Observations

The preceding account on the status of research, teaching and training in physical anthropology in the state of A.P. prompts us to offer the following observations:

1. The research is limited to certain fields like anthropometry and blood group Systems (ABO, MN, MNSs and Rh). To some extent works were conducted on morpho-behavioural traits, dermatoglyphics, some genetic traits (colour blindness, PTC taste ability and ABH secretion), sickle cell trait (HbS), Serum Proteins (Haptoglobins, trainsferrins and GC) and 10 biochemical systems.
2. The interpretation of the data is mostly done in terms of frequencies rather than going into the factors responsible for their variation.
3. The ethnic identity of most populations has not been based on well defined criteria.
4. The research generally suffers from methodological rigour.
5. The intra-institutional interactions and collaborations have been nearly given a goby.
6. Almost all works are devoid of holistic approaches both at the level of field data collection and at the level of analyses and report writing.
7. The academics-researchers must update their knowledge periodically.
8. Uni-disciplinary approaches to the study of human societies have to be replaced by interdisciplinary and multidisciplinary approaches.

9. All kinds of research have to be planned and carried out from the angles of application to the human societies.
10. All research projects have to be designed carefully in consultation with knowledgeable biostatisticians.
11. Thrust areas of research have to be reviewed and revised from time to time in tune with the human requirements and technological advances.
12. Problems relating to human health and disease have to be given top priority in research and teaching and have to be investigated in close collaboration and consultation with medical and paramedical experts.
13. The subject should have strong feedback right from the school level. This is possible only when the anthropological fraternity pursues the matter with the administrators and policy makers at government level until it bears fruit.
14. It is our responsibility to see that the subject is introduced at PG and UG levels in all the conventional universities of the state.
15. All physical anthropological studies, including teaching, should have a strong biogenetic base.
16. Weekly PG students seminar prgorammes and tutorials must become part and parcel of all the teaching programmes of all the departments in the universities.
17. All theoretical courses at the PG level should have practical courses too.
18. We must think of providing career-making chances for our students in non-anthropological institutions.
19. It has to be seen that the facilities of campus interviews and placements are extended to deserving candidates from our Departments and Institutions too.
20. Students and teachers at the time of their entry into our institutions have to be imparted compulsory training for about 4 to 8 weeks.
21. The teachers and the taught should work with a missionary zeal to enjoy the fruits of knowledge of the humanity.
22. All medical institutions and universities should have teaching-research departments of anthropology.
23. Human skeletal studies of extinct populations as also those of historical populations are scanty. This area has to be strengthened by establishing regular collaborative contacts with the concerned institutions.
24. The Hyderabad National Institute of Nutrition has to be involved not only for imparting short-term training to all our post-graduate students, more particularly to those specializing in human biology and genetics, but also

to collaborate with the anthropology-human genetics departments of the universities in the state on research projects relating to nutritional anthropology from the point of the prevailing problems of malnutrition and undernutrition in the context of growth and development among the tribal and rural children of the state.

25. The Hyderabad-based AP state 'Tribal Cultural, Research and Training Institute' is a premier institute in "anthropological sense", but its research and training activities of signal importance are least known to us in the university departments of the subject in the state, particularly in the context of anthropological-genetic researches and studies. I strongly feel that this is the appropriate forum to extend our helping hand in the matter of galvanising the research-training activities of this institute for the benefit of our budding scholars as also for the benefit and well-being of the state and the people.
26. Kinanthropology (concerning human size, shape, proportion, composition, maturation and gross function) is important in physical anthropological researches and training from the point of physical performance of the people. The Punjabi University Department of human biology and allied institutions have done commendable works in this area as reported by Singh and Malhotra in 1989. This area needs to be taken up by us atleast from now onwards to promote physical anthropology at the school-college-university level, particularly in the field of national games and sports besides considering it in the health care and disease.

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