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Distribution of the human blood groups among the Pueblo Indians of New Mexico

Waldemar D. Schaefer

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DISTRIBUTION OF THE
HUMAN BLOOD GROUPS AMONG
THE PUEBLO INDIANS OF
NEW MEXICO
Waldemar D. Schaefer

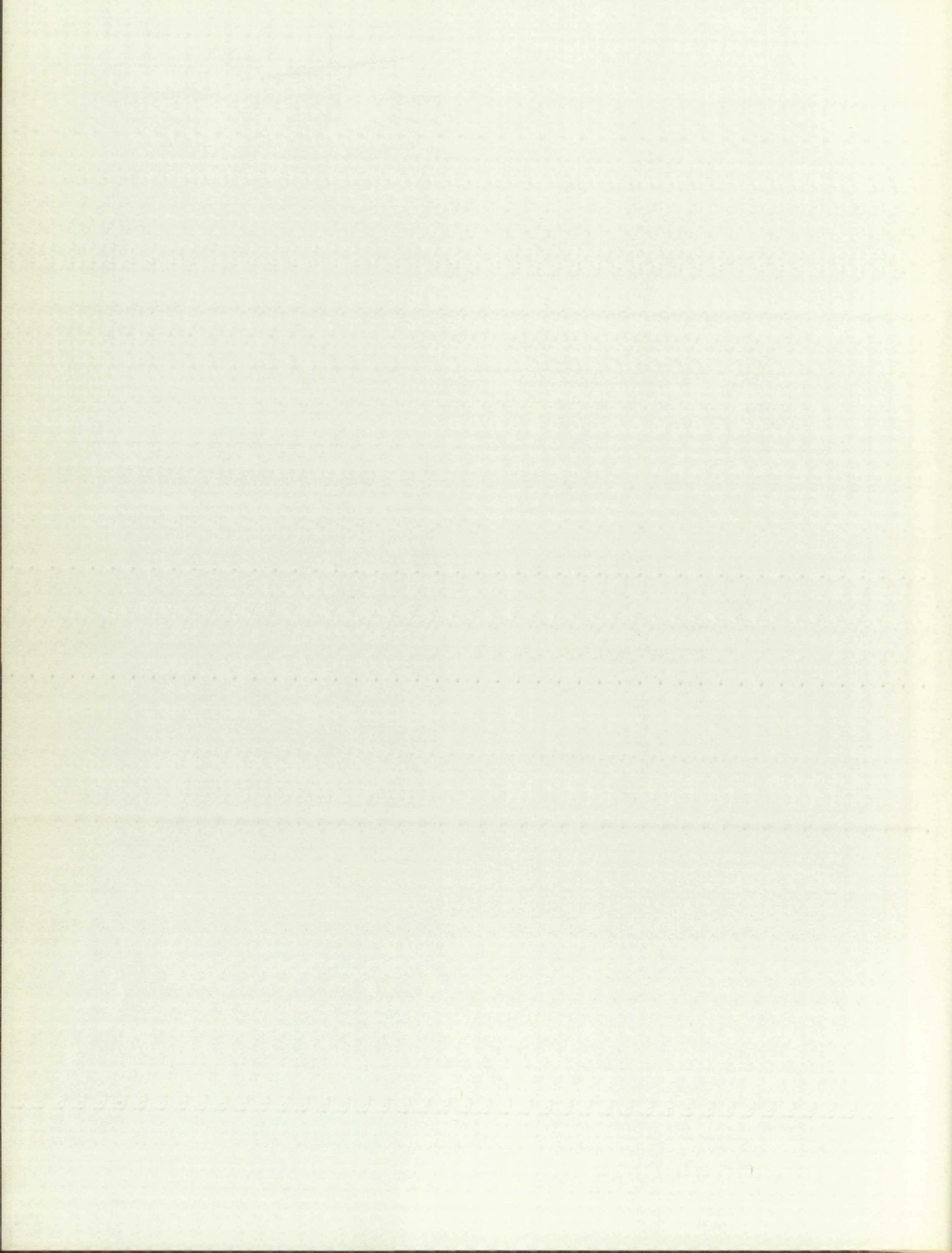
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DISTRIBUTION OF THE HUMAN BLOOD GROUPS
AMONG THE PUEBLO INDIANS OF NEW MEXICO

by

Waldemar D. Schaefer

A thesis submitted for the
degree of Master of Science
in Biology

University of New Mexico

1935

REMARKS OF THE PRESIDENT
ON THE STATE OF THE UNION

W

Washington, D. C.

A. Lincoln

January 8, 1863

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ACKNOWLEDGEMENTS

The writer wishes to express his appreciation to Indian Commissioner Collier and the Medical Offices of the United States Indian Bureau for their cooperation. Supt. Lem Towers, Supt. C. M. Blair, Supt. C. E. Faris, and Dr. J. F. Lane of the Pueblo Indian Service deserve thanks for their cooperation and assistance in carrying on this investigation. For her aid in enabling us to secure blood samples from certain Pueblos the writer wishes to thank Dr. S. A. Aberly of John Hopkins University.

To Miss Jean Conrad, Miss Jane Blair, Miss Katherine Lane, and Mr. Horace Gardner, the writer is also greatly indebted for assistance throughout the entire project.

The writer wishes to take this opportunity to express his appreciation to Dr. E. F. Castetter and Dr. F. W. Allen for helpful criticisms and suggestions during the course of the investigation and in the writing of this thesis.

DISTRIBUTION OF THE HUMAN BLOOD GROUPS AMONG THE PUEBLO INDIANS OF NEW MEXICO

INTRODUCTION

The purpose of this paper is to show the distribution of the human blood groups among the Pueblo Indians of New Mexico. Upon reviewing all available literature concerning the distribution of the human blood groups, it was noticed that very little work had been done on the American Indian. Most of this work, although indictative of what really exists, cannot be accepted because of the insufficient number of Indians investigated and the failure to use an accepted standard method. In work that had been done previously, little attempt was made to secure a single homogeneous group of American Indians. Any data concerning the distribution of the human blood groups to be used as an important additional criteria in determining races, and in throwing light upon the origin of the American Indians, must consist of a large number of people from a single homogeneous group. In view of this, the Pueblo Indians of New Mexico were selected, since a large number of Indians are available

DISTRIBUTION OF THE BLOOD GROUPS AMONG THE

INDIAN TRIBES OF MEXICO

INTRODUCTION

The purpose of this paper is to show the distribution of the blood groups among the Indian tribes of Mexico.

During the past few years, the blood groups of the Indian tribes of Mexico have been studied by various investigators.

Upon reviewing all available literature, it was found that the distribution of the blood groups among the Indian tribes of Mexico has not been thoroughly investigated.

It was noticed that very little work had been done on the blood groups of the Indian tribes of Mexico, and that the results of the few studies that have been made were not in agreement.

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and because they are regarded as a homogeneous group. From the results obtained, it is obvious that these data are of value, particularly to the Ethno-anthropologist, since it gives an additional measurement of race heretofore not employed. Also, the blood of an individual is less subject to environmental conditions, and does not change from one generation to another as might many of the cultural factors, and for that reason is more reliable in tracing lineage, particularly, since its inheritance is completely known.

and because they are reported as a contemporary story.
from the native point of view, it is a story that is
not one of value, particularly to the African-American
people, whose it gives an excellent example of that
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HISTORICAL

Iso-agglutination is not new to the knowledge of man. According to Furuhashi (6), this fact has long been known in China, having been first mentioned there in a four volume treatise entitled Sen-en-roka, dated 1247. This work, however, dealt with very uncertain practices which have no connection whatever with modern scientific ideas. In 1869 Crete (6) noted the haemo-agglutinating power (the ability of one blood to clump together the cells of another) of normal serum but his work was not recognized at the time and was soon forgotten. The first reliable data on this subject goes back to 1899 when Shattock (6) published his observations, which he had communicated to the Pathological Society of London in the previous year. He reported that the serum of persons suffering from certain diseases has the power of agglutinating the corpuscles of healthy persons. A careful study of Shattock's work shows that the reaction which he described is not true agglutination, but, according to Kennedy and Zinsser and Coca (10), it is what we now term pseudo-agglutination due to rouleau-formation.

HISTORICAL

The organization is not a religious body, according to its own statement. It has been known in China, having been in a form of Chinese translation since 1847. This work, however, has no practical value which have no connection with the scientific ideas. In 1908 the Chinese translation power (the author of the book) was not recognized as the author of the first edition. The first edition was published in 1892 when Shastock (8) published which he had commented on the book of London in the previous year. The power of analyzing the book is a careful study of the book and the reaction which he described in the book, according to Kramet's work. It is what we now call the book of London.

In 1900 Landsteiner (6) discovered the iso-agglutinating properties of normal blood and found that they were not the same in all individuals. The groups which he described are the following:

- "I. Those persons whose red corpuscles were not agglutinated by the serum of Groups II and III, but whose serum agglutinated corpuscles of Groups II and III.
- II. Those whose corpuscles were agglutinated by the serum of Groups I and III, and whose serum agglutinated Group III corpuscles.
- III. Those whose corpuscles were agglutinated by sera I and II, and whose serum agglutinated Group II corpuscles."

This work of Landsteiner was soon confirmed by Decastello and Sturli, Langer, Bezzola, Capogrossi, Landsteiner and Leiner, Hektoen, Dudgeon and many others (6). In 1902 Decastello and Sturli, Hektoen (6) and others noticed that there were rare exceptions to the three groups described by Landsteiner; that is, persons whose serum contained no iso-agglutinins for corpuscles of any sort.

In 1903 Langer (10), while studying the iso-agglutinating properties of blood, thought of the possible heritability of the individual blood groups, although his work was quite superficial. In 1908 Ottenberg and Epstein (6) reported that they had discovered identical blood groups in two brothers and had since then tried to find out whether this property of the blood was hered-

In 1900 Landsteiner (8) discovered the fact that the blood of some individuals is not the same as all individuals. The groups which he called the "A", "B", "AB" and "O" groups.

- I. Those persons whose red corpuscles were agglutinated by the serum of Group II and III, but whose corpuscles were not agglutinated by the serum of Group I and III.
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- III. Those whose corpuscles were agglutinated by sera I and II, and whose serum agglutinated Group II corpuscles.

This work of Landsteiner was soon confirmed by Decastello and Sturtevant, Bessie, Landsteiner and Sturtevant, and others. In 1902 Decastello and Sturtevant (9) and others noticed that there were rare exceptions to the three groups described by Landsteiner; that is, persons whose serum was found to be agglutinating for members of any one of the three groups.

In 1903 Landsteiner (10) and others noticed the fact that the blood of some individuals is not the same as all individuals. The groups which he called the "A", "B", "AB" and "O" groups. In 1903 Landsteiner and Sturtevant (11) reported that they had discovered a fourth blood group in two persons and named this group "D". To find out whether this property was inherited or not, they

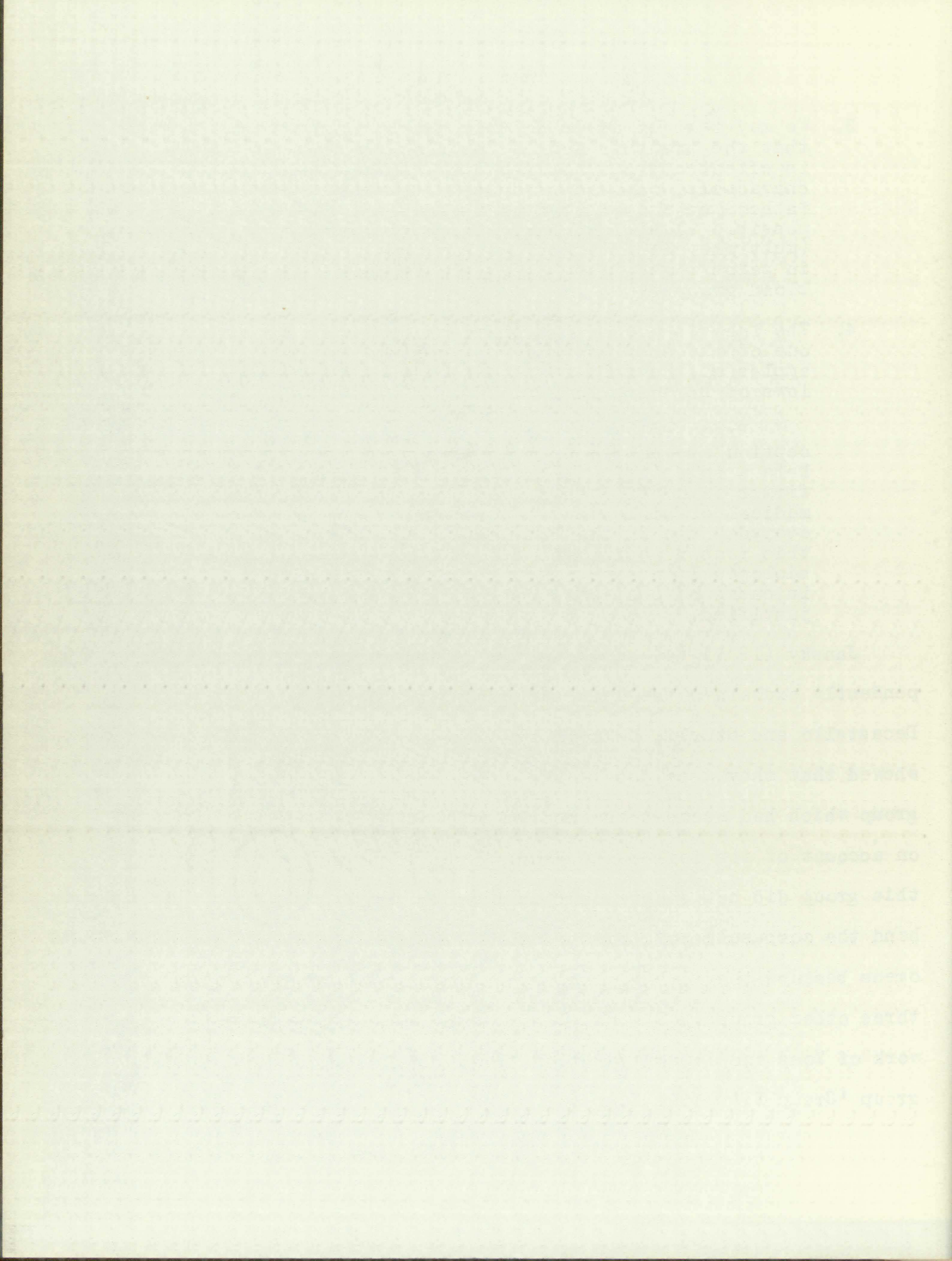
itary or not. They did not go very deeply into the question but from the results obtained they thought that the blood groups may be hereditarily transmitted; while urging the need for more extensive investigations they expressed the opinion that if they were indeed hereditary they might serve as an excellent example of Mendelian inheritance. In 1910 Dungern and Hirszfeld (6) published the first systematic investigation into the inheritance of the individual properties of the blood in man. An analysis of the statistical data obtained by these writers convinced them that the transmission of the agglutinins in the blood obeyed Mendel's laws, and that all possible contingencies in the transmission of blood groups from parents to children could be completely explained in this manner. Their work formed the basis of much further research along these lines, until today almost every race has been studied in the light of the heritability of the blood groups. A discussion of the inheritance of blood groups is, however, not within the scope of this paper. It is sufficient to quote these conclusions as arrived at by Lattes: (6)

1. "The hereditary transmission of the blood group is an established fact.
2. This transmission takes place according to Mendel's law, and the iso-agglutinable properties A and B behave as Mendelian dominants.

3. We may take it as definitely established that the transmission of the blood group is effected by means of two allelomorphic characters, one being derived from the father and the other from the mother; the possible allelomorphs are three in number (multiple allelomorphs), their combination in pairs gives rise to six genotypical blood groups.
4. The inheritance of the blood groups affords one of the simplest and most certain examples of the validity of the Mendelian laws of heredity in man.

Practically all observers without exception are of the opinion that we have here a scientific theory resting on a much firmer foundation than many other so-called medical or biological 'facts' which are in everyday use in the law courts, and that for this reason, quite apart from the very great biological interest of this theory, its use in cases of contested paternity is fully justified."

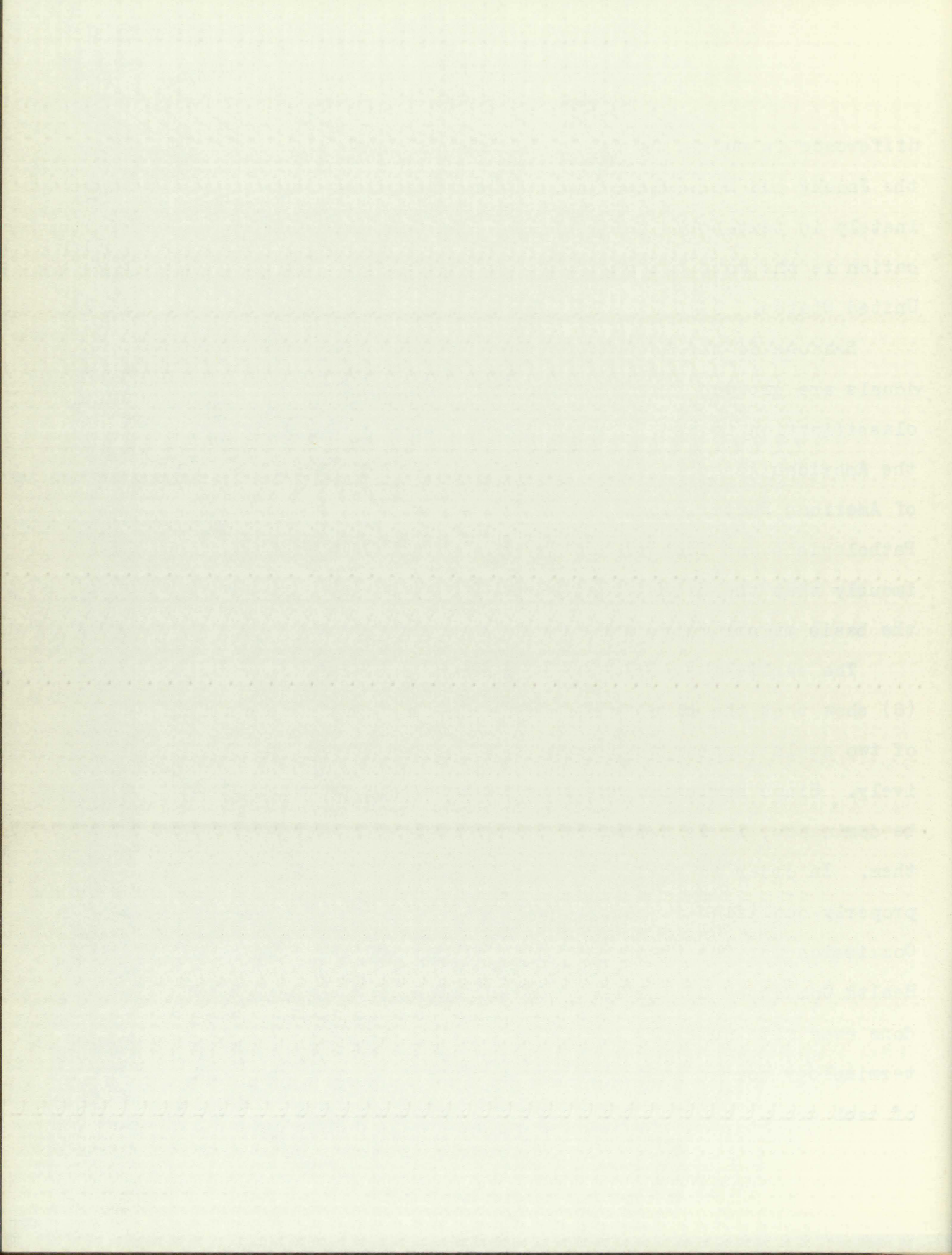
Jansky (1907) (4) and Moss (1910) (4) working independently explained the apparent exceptions found by Decastello and Sturli, Hektoen and others (6), and showed that they were due to the existence of a fourth group which had escaped the notice of earlier observers on account of its infrequent occurrence. The serum of this group did not contain agglutinins but on the other hand the corpuscles of this group did contain agglutinogens because they are agglutinated by the sera of the three other groups. The only difference between the work of Moss and Jansky was that Jansky called this new group 'Group IV' while Moss called it 'Group I'. This



difference in numbering has caused much confusion. Both the Jansky and Moss classifications appear indiscriminately in text-books and manuals. The Moss classification is the more common in France, England and the United States.

Because of the serious results possible when individuals are grouped I or IV without knowledge of the classification in use, a special committee representing the American Association of Immunologists, the Society of American Bacteriologists and the Association of Pathologists and Bacteriologists has recommended unanimously that the classification of Jansky be used on the basis of priority.

The earliest experiments of Dungern and Hirschfeld (6) show that the blood groups were due to the presence of two agglutinogens which were named A and B respectively. Since agglutinogens A and B have been proved to be dominants, it is customary to use capital letters for them. In order to remove any possible confusion, the properly qualified international authority, namely, the Commission for the Standardization of Sera of the Public Health Committee of the League of Nations, has entirely done away with numerals and has adopted an alphabetical terminology corresponding to the agglutinin content of each group, namely, O, A, B, AB. The corresponding



agglutinins are denoted by 'anti-A' and 'anti-B' respectively. All three classifications will be given here for purposes of comparison, after which the Landsteiner classification will be used throughout the paper. The demonination of the various groups would be as follows:

Table #1

Nomenclature of			Agglutinogen Substance in cells	Agglutinin Substance in serum
Landsteiner	Jansky	Moss		
O	I	IV	--	anti-A and anti-B
A	II	II	A	anti-B
B	III	III	B	anti-A
AB	IV	I	AB	-----

Contemporary with this work, quite a few investigations were carried on to determine the effects of environment and sickness upon the stability of the blood groups. The conclusion which can be drawn from this work is that the blood groups are stable and can not be affected by anything once they are established. The chief value of most of this work, however, is historical.

The first investigations into the frequency of the groups showed the constancy of the relative proportion and a very significant agreement in populations far apart

from each other, such as the Germans examined by Dungen and Hirszfild (6) and the Americans of the United States studied by Moss (4). In 1914 H. and L. Hirszfild (6), working with the allied forces in Macedonia, noticed that there was a connection between blood groups and Ethno-anthropology, when they discovered that the percentages between the various races differed. These men were able to study quite a number of different races, being as they were, in the medical service of the allied armies. The sera used on all their tests were the same, thus eliminating any possible error due to sera. With the observation that the various races have more or less distinct blood groupings of their own, the work along this line has progressed very rapidly until today nearly every race or distinct group of people has been blood-typed. A complete table of the work which has been done so far may be found in Lattes' Individualities of the Blood. (6) In making a study of the above mentioned table, one notices a marked predominance of A over B which is characteristic of the western European races, and of those derived from them throughout the world, for example, the white races in the United States and in Australia. In the United States Buchanan and Higley (4) obtained very similar results after eliminating all foreigners and restricting their investigations to American

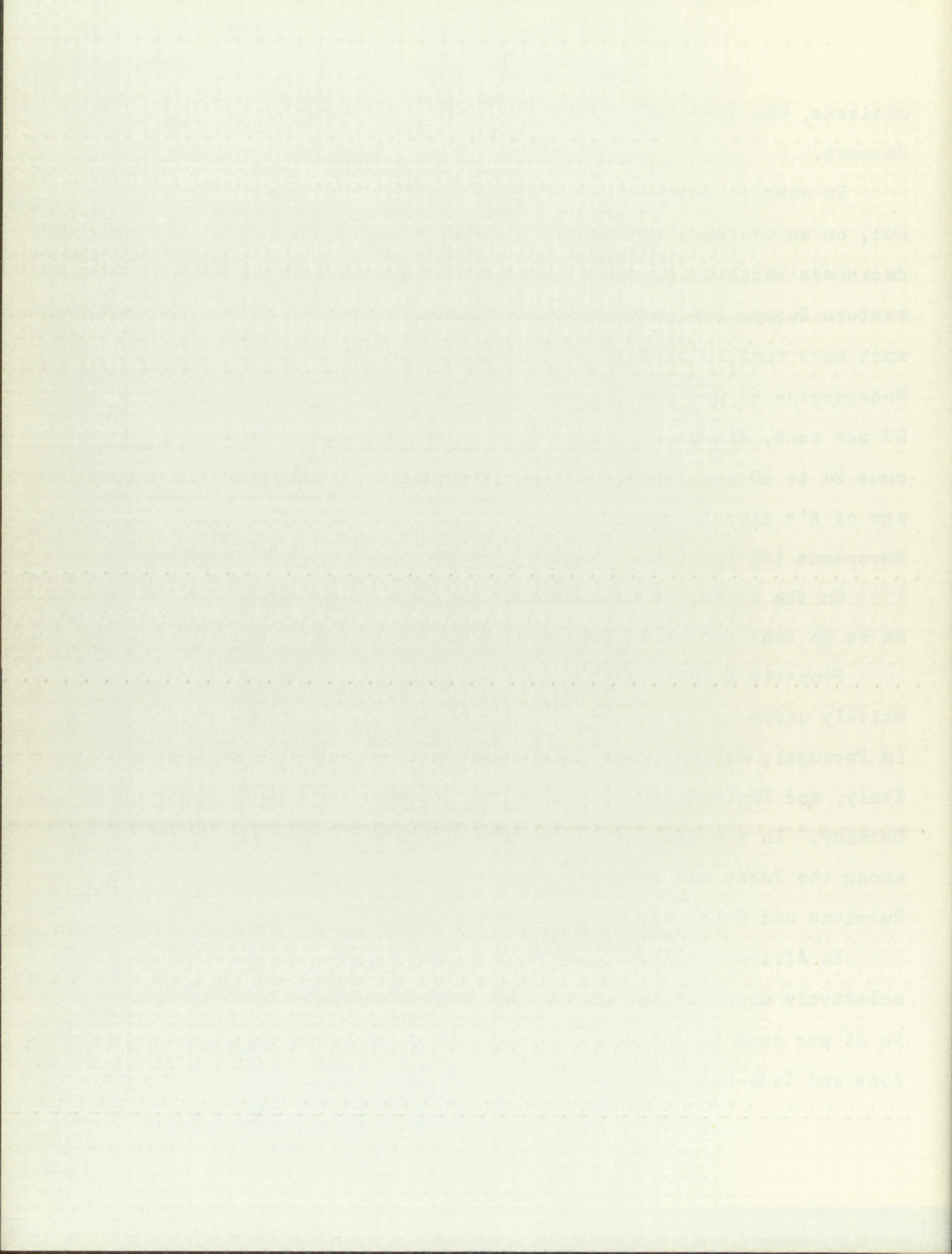
citizens, who were, of course, ultimately of European descent.

In western Europe the percentage of Group A works out, on an average, between 40 and 45 per cent. It decreases slightly as we go towards western and southwestern Europe (Poland, Russia, the Balkans, etc.), and much more rapidly in Africa and Asia (Arabs 37 per cent, Madagascans 30 per cent, Indo-Chinese 28 per cent, Negroes 27 per cent, Hindus 27 per cent, Chinese, Koreans, Manchus 24 to 30 per cent). The Japanese show a percentage of A's closely comparable with that found among Europeans (4) (6) (10).

On the whole, we may say that property A decreases as we go east and south from western Europe.

Property B follows the reverse order: it is relatively uncommon in the west of Europe (10-12 per cent in Portugal, Holland, and Belgium; 14 per cent in France, Italy, and England; 12-16 per cent in Scandinavia and Germany. In the Balkans it rises to 20-30 per cent; among the Turks and Arabs to 25 per cent, and among the Russians and Poles to 28-30 per cent) (4) (6) (10).

In Africa and Asia property B, which is in the main relatively uncommon in Europe, increases considerably up to 28 per cent in the Madagascans, 34 per cent in Negroes and Indo-Chinese, 30-36 per cent in the Japanese,



39 per cent in the Koreans, 40-44 per cent in the Chinese, 47 per cent in the Manchus, and up to 49 per cent in the Hindus (4) (6) (10).

The marked prevalence of Group O among the Philippines, Indians, Lapps, and the Australian Aborigines reduces the percentage of Groups A and B. Nevertheless, in these races, which are so definitely separated from the other, B is extremely uncommon, so that, although A is also uncommon, it far exceeds B (4) (6) (10).

The predominance of A over B, apart from these particular cases, is the more marked the nearer we get to the west of Europe, whereas in Africa and Asia, and especially in India and the Far East, the two frequencies tend to become more nearly equal, and B even comes to exceed A. The races living between Europe on the one side, and Asia and Africa on the other, show intermediate figures (4) (6) (10).

Hirszfeld (4) attempted to classify the races on the basis of the racial index (the ration of all A's to all B's, i.e. $\frac{A}{B}$).

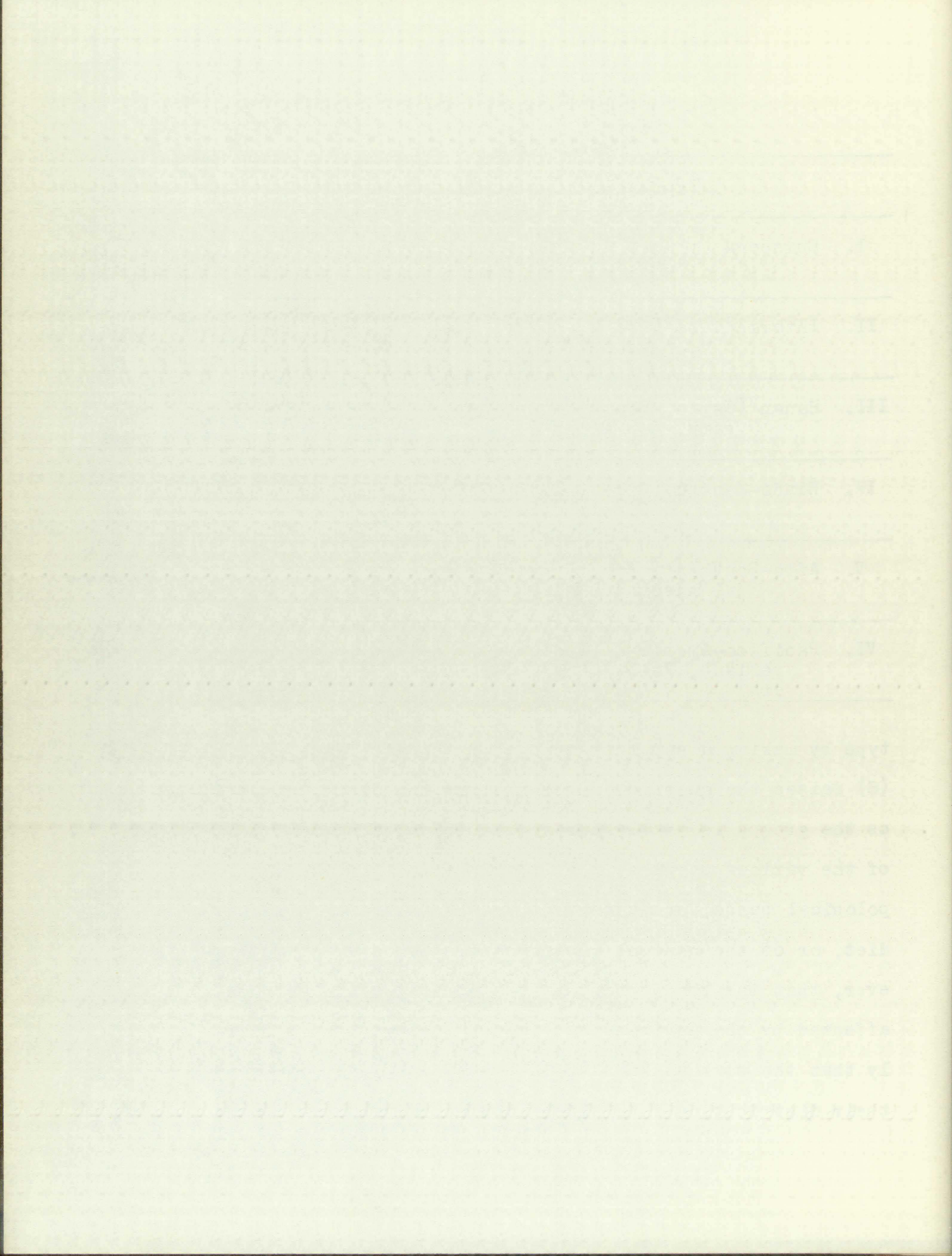
Ottenberg (4), in studying the work of H. and L. Hirszfeld, attempted a classification of the human races. This classification consisted of six distinct groups. (See Table #2)

Snyder (9) further divides the Pacific-American

Table #2

Types	O	A	B
I. European	39	43	12
II. Intermediate (Arabs, Turks, Russians)	40	33	20
III. Hunan (Japan, South China, Hungary, Roumanian Jews)	28	39	19
IV. Hindo-Manchu (Corea, North China, Gipsies, Hindus)	30	19	39
V. Afro-South Asiatic (Negroes, Madagascarans, Malaysians)	42	24	28
VI. Pacifico-American (Indians, Australians, Philipinos, Icelanders)	67	29	3

type by making a separate type of the Australians. Lattes (6) raises the question as to whether the distribution of the groups is really due to the ethnological origin of the various peoples, i.e. to the 'race' in the anthropological sense, or whether it is the result of climate, diet, or of the general environment. Since we know, however, that the blood groups are hereditary, and are not affected by the environment, it is a priori hardly likely that the surroundings would exert much influence on their distribution in a given population. They are more



likely to be due to cross-breeding.

Without wishing to trespass on the field of anthropology in the strict sense, it is clear that the study of the blood groups must be of immense importance to that science, and amply justifies scientific expeditions for the ever-increasing extension of our knowledge on this subject. Moreover, it may help to clear up the problems relating to the origin of certain races, such as the Indians of North and South America, as to whose ultimate origin, whether Asiatic or Australo-Pacific, discussion is still rife. Mazza and Franke (4) remark that the infrequency of Group B in American aborigines is an argument against their being of Asiatic extraction, since this group is usually common in Asia.

The ultimate cause of the varying distribution of the blood groups in relation to anthropogeny is not yet clear. H. and L. Hirszfeld (5) put forward the theory of a separate origin for Groups A and B, the former having arisen in the West, the latter in the East; in this way the present-day distribution of the groups would be due to the migration and consequent infiltration in varying proportions of one group by another, especially, according to Steffen (6), of the European races by the Mongols.

Bernstein (4) postulates three primitive races A,

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Barstow (4) points

B, and R, corresponding to the three hereditary factors. Race R (that which corresponds to Group O) is the most numerous in almost every country and is found in a nearly pure state among some remote peoples, such as the Indians, the Philipinos, the Australian aborigines, and the Eskimos. Bernstein, therefore, believes (and Snyder (9) definitely asserts) that race R or O is the original race, and that races A and B were developed later. The almost total absence of B among the Indians of North America would suggest that they probably separated off from the main Asiatic trunk before the development of this property, or that this race was developed independently, which would imply a polygenetic origin for the various races (Bais and Verhoef) (6).

Property A decreases from West to East but is not uncommon even among Asiatic peoples; conversely B decreases very rapidly as we go from East to West. This might lead us to think that property B was more recent than A (Bernstein, Bais and Verhoef) (6); unless we suppose that mutation A occurred in a larger number of individuals than B, or possibly independently in Europe and in Asia (Snyder (9), Hirschfeld (4)), or that the migrations of European races into the East have been more numerous than those in the opposite direction. On the other hand, the view that O is the original race is

difficult to fit in with the fact that properties A and B have been found in animals, and particularly in anthropoid apes (Dungern and Hirszfild (6), Landsteiner and Miller (6)).

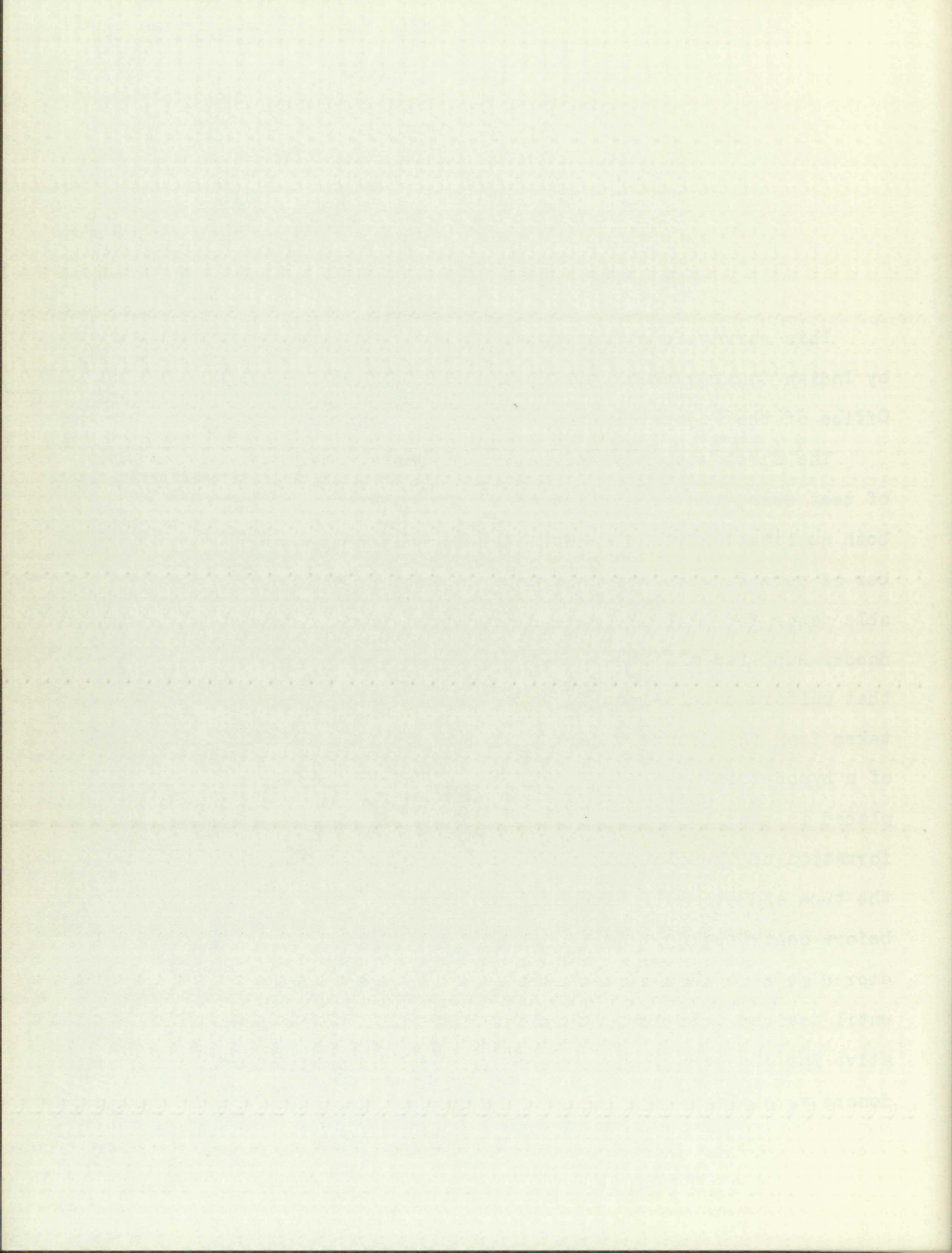
The investigations on the Ethno-anthropological value of the blood groups are being carried out on a very large scale, but for the present only temporary conclusions are warranted.

Hirszfild has said (6): "There can be no doubt that serology has provided us with an instrument which, with the other sciences, may help to solve the most difficult problems relating to the origin of the various races of mankind, but the evidence at our disposal is as yet too fragmentary and too heterogeneous to permit of synthetic treatment. Postulates as to three or more primitive races, discussions as to whether the Indians separated from the mongols before or after the development of property B or whether the Northern Mongols remained unaffected by mutation B; whether the Indians are autochthonous in origin; whether exactly similar mutations have occurred in various places, &c., all raise important questions which can only be answered when we know which was phylogenetically the more primitive condition: The presence or the absence of agglutinin; i.e. whether Group O arose by Mendelian inheritance from the cross-breeding of races A and B, or whether it was due to a mutation by default; or again, whether the dominant properties were developed in the human species by mutation, or are due to some specific relationship between each race of mankind and certain species of anthropoid apes. The results obtained so far are sufficiently important to make it highly desirable that homogeneous investigations should be organized on an international basis." and Lattes (6) states: "From now on, it is clear that any statistical investigations on the blood groups must take into account the ethnological origin of the persons examined (which has not always been done). These racial differences alone, and not alterations in environment, or disease, can, in the present state of our knowledge, account for the variations in the frequency of the blood groups in man."

MATERIALS AND METHODS

This survey is a project which has been approved by Indian Commissioner Collier and the Medical Director's Office of the Federal Indian Service.

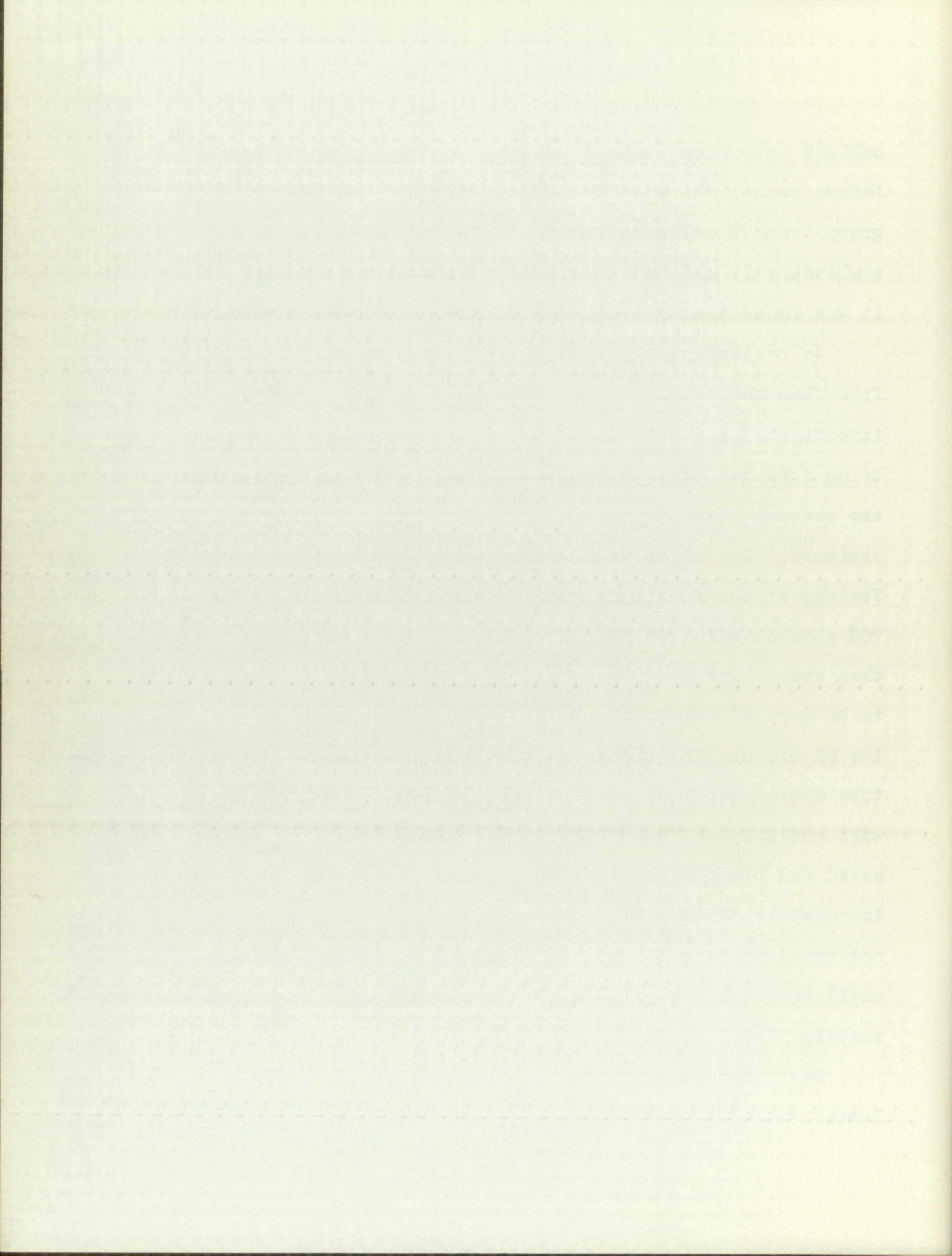
The first step was the selection and preparation of test sera, the properties of which are known and are both qualitatively and quantitatively suitable. A number of persons were typed in order to determine a suitable donor for both the anti-A and anti-B sera. Two donors supplied all the sera for the survey in order that uniform conclusions could be drawn. The blood was taken from the donors under sterile conditions by use of a hypodermic needle and syringe. The blood was then placed in sterile tubes and allowed to clot. After the formation of the clot, it was freed from the sides of the tube and stored in the refrigerator for a few hours before centrifuging. After centrifuging, the sera was stored at zero degrees centigrade in the refrigerator until desired. It was not necessary to use any preservative for the sera when done in the above manner. The donors were always available so it was not necessary to



collect more than about 15 c.c. of each sera at one time. Before using, the sera was always tested with selective group A and B cells to determine whether it was both qualitatively and quantitatively suitable. In all cases it was found that a 1-4 dilution gave the best results.

In collecting the Indian blood samples the person from whom the sample was to be taken was always first investigated for racial purity, this information always being obtained from the nurses, doctors, the sisters of the various teaching orders, and the Indian Service Supervisors. The blood was secured in the following manner. The tip of the fourth finger was first sterilized with 70% alcohol solution and then dried. The finger was then stuck with a #20 hypodermic needle, which was found to be very efficient in obtaining the necessary drop or two of blood. The blood was then put into a small test tube containing 1 c. c. of a solution of physiological salt and 0.1% sodium citrate. The tubes were then stoppered and brought into the laboratory where they were immediately typed. If, for some reason, the bloods were not typed at once, they were placed in the refrigerator until the next day. All tests were performed at approximately 20°C.

The method used in typing the samples of bloods collected was that which is recommended by the National Re-



search Council. A glass slide was divided into two parts, on the left side of the slide being placed a drop of group A serum and on the right side of the slide a drop of group B serum. Into each of these was placed a drop of 2% cell suspension of the blood to be typed. The slide was then gently rotated and agitated to stimulate the agglutination. The slides were then examined both macroscopically and microscopically. These reactions can be read in from one to ten minutes, although it is better to give them the full ten minutes before making any definite decision. If no agglutination occurred on either side of the slide, it was termed a group O. If the cells were agglutinated by group A serum, it was termed group B. If the cells were agglutinated by group B serum, it was termed group A and if the cells were agglutinated by both A and B serum, it was termed AB.

RESULTS

It will be noticed that in the review of literature no mention was made of the work done on the North American Indians. This discussion was purposely omitted because of its more direct relation to the work which has been done on the Pueblo Indians of New Mexico.

Before going into the discussion of the work done on the North American Indians, it is necessary that a standard of values be agreed upon. The standard of values which will be used in this paper is the follow-

ing which is taken from Lattes (3). "Naturally, observations carried out on too small a scale are also a source of extensive variations. In order to obtain a reliable basis for comparison, at least 500 individuals should be included. In this way, according to Wellisch's calculations, the mean error does not exceed 2 per cent. If it is desired that the error should not exceed 1 per cent, the number of observations must be increased from 1,700 to 2,000. This is clearly shown in Table LXXXVI relating to 1,100 Germans from Cologne investigated by Wiechmann and Paal and sub-divided into groups of 100."

(See Table #3)

"In spite of these discrepancies, however, the figures so far collected, and which are increasing daily, suffice to show that, on the whole, the distribution of the blood groups in a given population is related to its Ethno-anthropological constitution."

Following is the table showing the work which has

Table #3

Germans from Cologne. (Wiechmann and Paal)

No.	O	A	B	AB
1-100	50	43	7	0
101-200	42	43	12	3
201-300	36	52	7	5
301-400	42	47	8	3
401-500	35	42	20	3
1-500	41	45.4	10.8	2.8
501-600	41	43	16	1
601-700	48	41	13	3
701-800	37	50	10	3
801-900	46	46	8	0
901-1,000	44	42	10	4
501-1,000	42.2	44.2	11.4	2.2
1,001-1,100	46	42	10	2
1-1,100	42	44.5	11	2.5

been done on the North American Indian up to the pre-date. (See Table #4).

The first work done on the North American Indian

Table #4

BLOOD GROUPS OF AMERICAN INDIANS

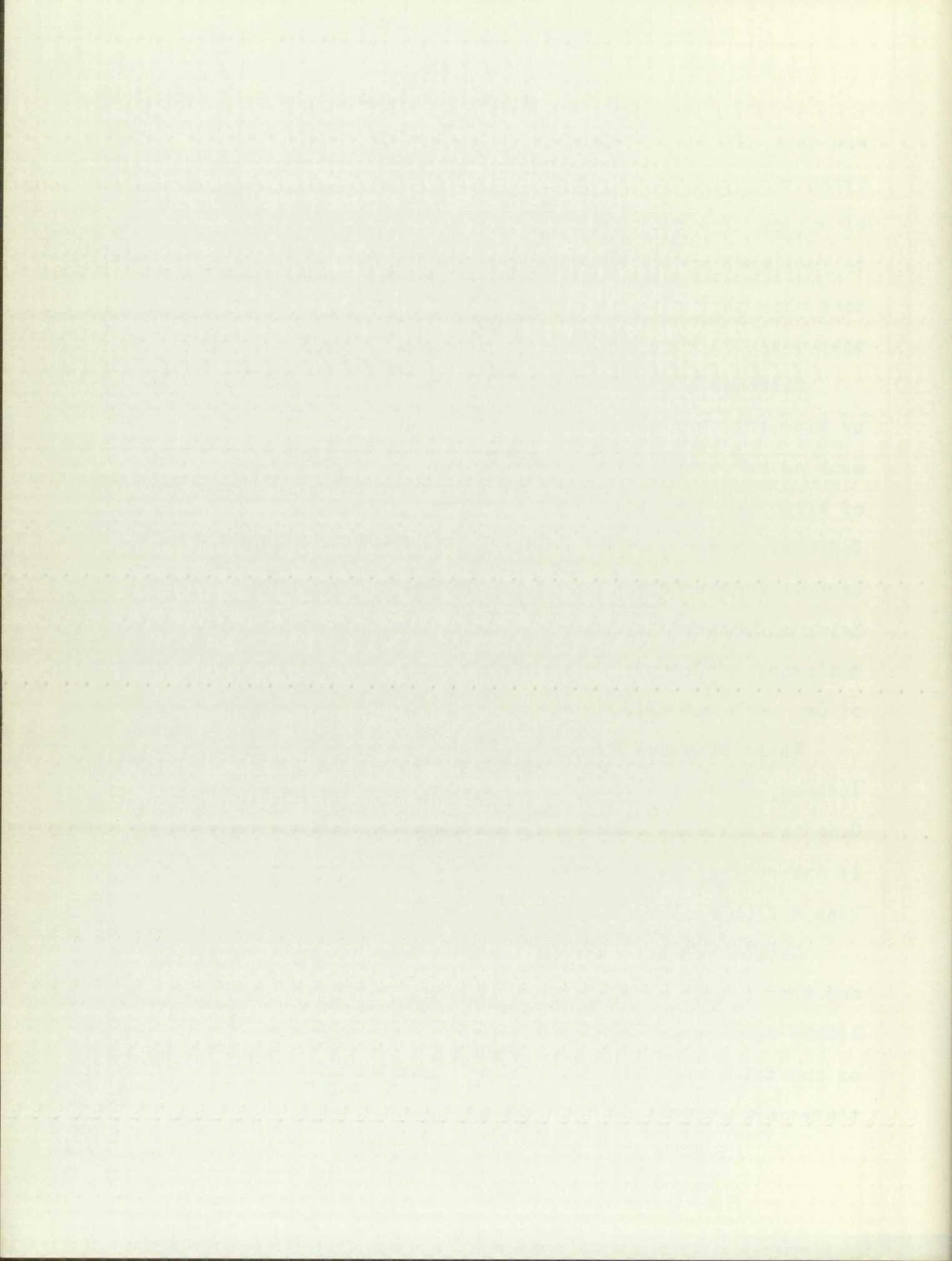
AUTHOR	PEOPLE	NO.	O	A	B	AB
a-Diebert	N.American	862	77.7	20.2	2.1	
g	Navajo	457	72.7	26.7	..2	.2
g	Haskell I.S.	316	70.7	27.2	1.6	
es	Canadian	300	86.7	12.7	.6	
e-Furuhata	Canadian	203	74.8	23.6	1.5	
son-Schrader	Blackfeet (Pure)	115	23.5	76.5		
son-Schrader	Blackfeet (Mixed)	235	45.5	50.0	2.1	1.8
son-Schrader	Alberta (Pure)	24	16.7	83.3		
son-Schrader	Flatheads (Pure)	23	78.3	8.7	4.3	8.7
son-Schrader	Flatheads (Mixed)	238	51.5	42.2	4.7	1.6
son-Schrader	Sioux (Pure)	48	89.6	10.4		
son-Schrader	Sioux (Mixed)	31	84.0	16.0		
son-Schrader	Oregon (Pure Many tribes)	33	78.8	15.2	3.0	3.0
son-Schrader	Oregon (Mixed)	64	54.7	38.8	9.4	3.1
der	Many tribes (Supposedly pure)	453	91.3	7.7	1.1	
der	Many tribes (Mixed)	409	64.8	25.6	7.1	2.4
en & Korber	Navajo	622	69.13	30.6	.16	
en & Schaefer	Pueblo (Supposedly pure)	1175	83.6	14.3	1.7	.25
	Americans (White)		45.0	42.0	10.0	3.0

was that of Coca and Diebert (9), the number of Indians typed by these two men being sufficiently large to be of value. The only question which might be raised is to just what groups of North American Indians the persons whom they studied belonged, and whether or not they were all supposedly of pure blood.

Although only 457 Navajo Indians were investigated by Nigg (7), her work can be considered of value inasmuch as her results are almost identical with those of Allen and Korber (1) who typed more than 600 Navajo Indians. However, the work done by Nigg (7) at the Haskell Indian School is of little value other than being indicative of the true condition. (A great predominance of Group O, Group A, and very little, if any, of Groups B and AB).

While Ride and Furuhashi (6) worked on the Canadian Indians, Gates (6) also investigated certain groups of Canadian Indians, but the number typed in either case is not sufficient to come up to the standard which has been set up as the criterion for good work.

Matson and Schrader (6) have worked on many tribes and that is one of their weak points for they did very little work on any one of them. Had they concentrated on one tribe and obtained a large number of results, their work would have been of much more value. However,

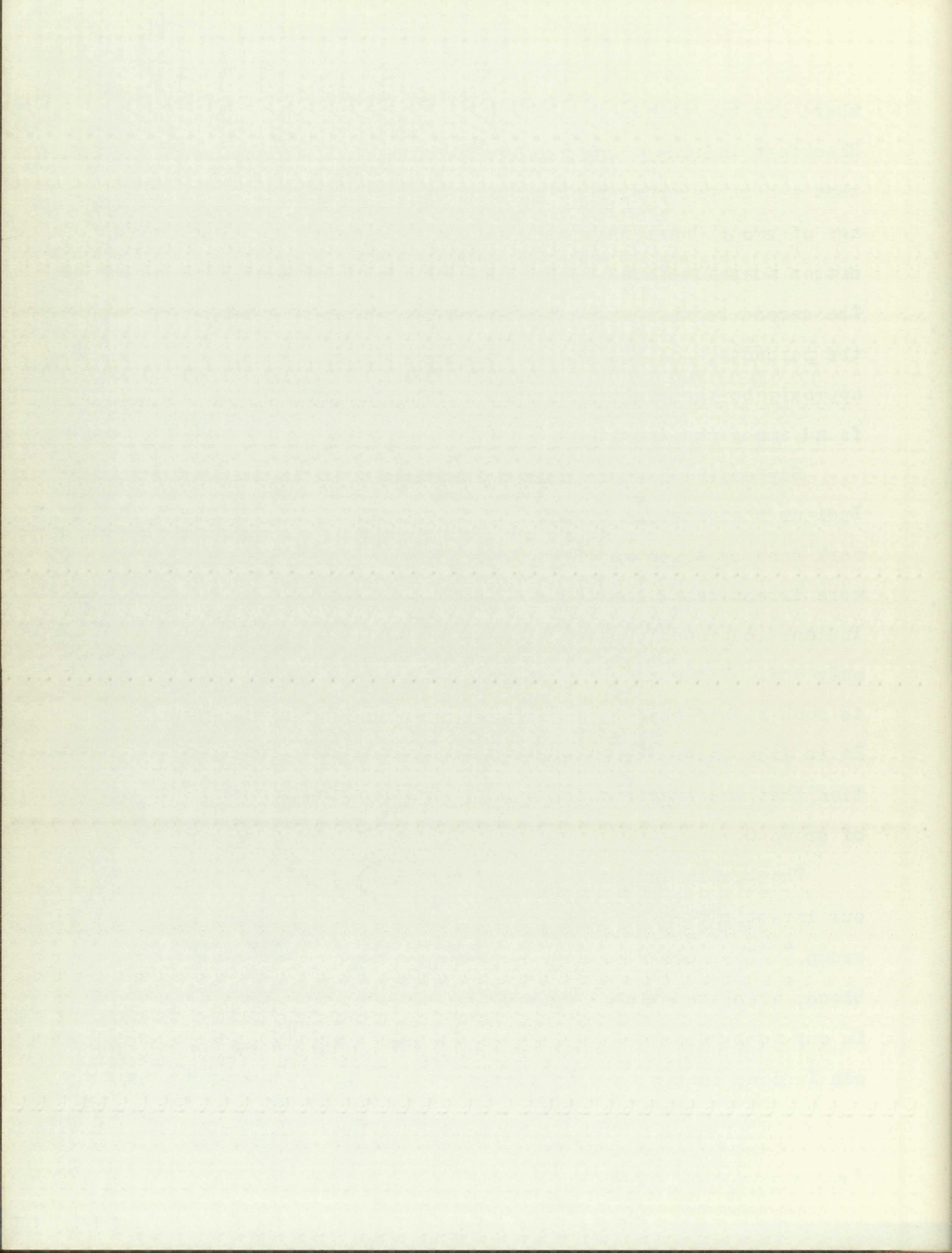


there are two things in their results obtained on the Blackfeet Indians which are worth noting. The first is that a high percentage of group A and a low percentage of group O exists, which is the reverse of the condition normally found among the North American Indians. The second is that among the mixed Indians investigated, the percentage of the various blood groups tends to approximate the distribution of the blood groups as found among the Americans (White).

Snyder (9) has probably investigated more American Indians than any one else, with the exception of the work done by Allen and Schaefer. However, many tribes were investigated instead of one homogeneous group. The Indians (supposedly pure) whom he investigated number only 453. The percentage of group O in this investigation is much higher than that found by any other investigator. It is from these results that Snyder bases his assumption that the American Indians of pure blood were all of group O.

The Pueblo Indians of New Mexico were selected for our investigation because they constitute a homogeneous group.* The number of Indians, supposed to be of pure blood, which were investigated far exceeds the number in any work which has been done previously on the American Indian, in that our investigation covered 1175 Pueblo

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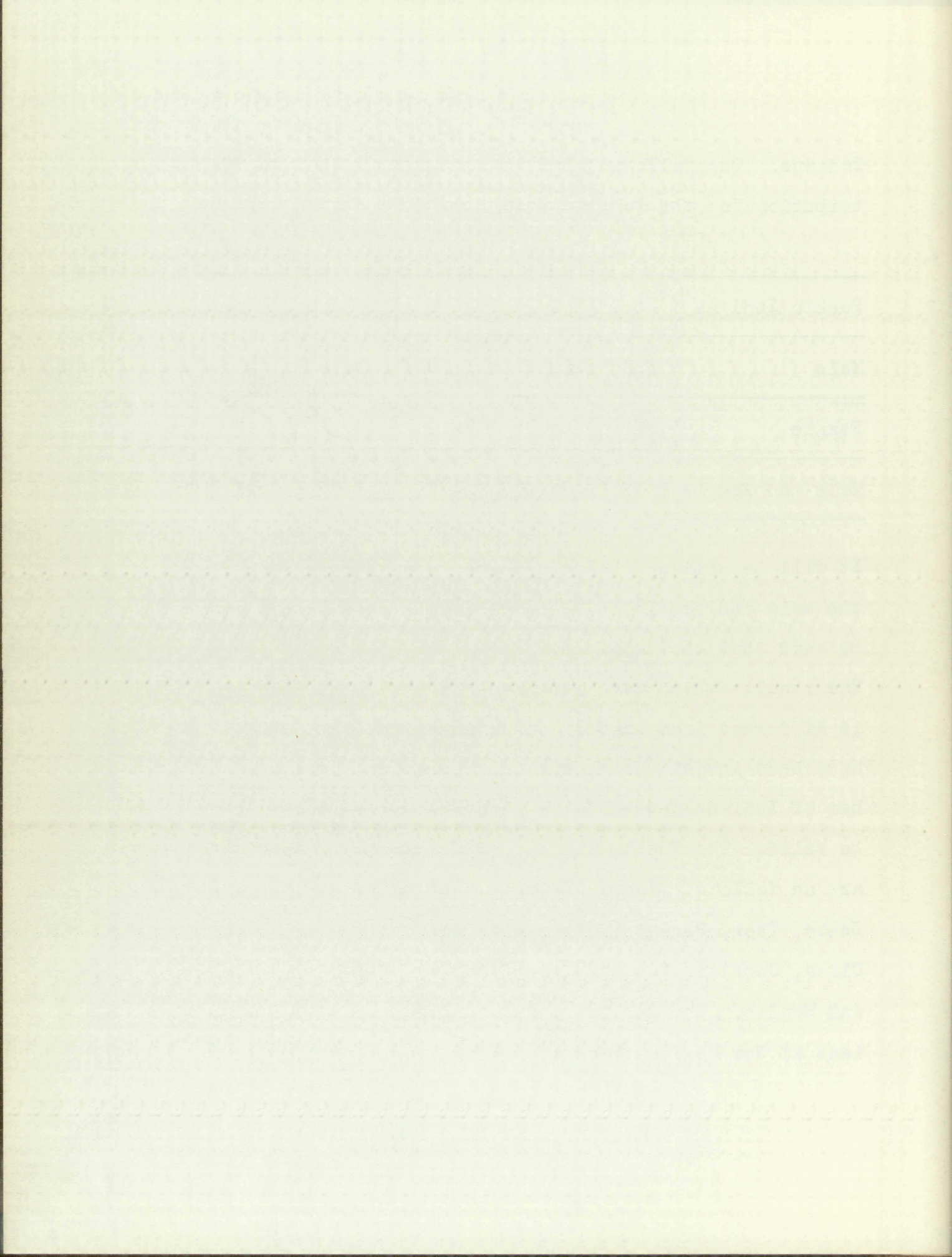


Indians. The following table shows our percentage distribution for the Pueblo Indians of New Mexico studied.

Table #5

Pueblo Indians	No.	Group O	Group A	Group B	Group AB
Male	588	82.82	15.98	1.19	0
Female	587	84.38	12.6	2.21	.51
Male and Female	1175	83.6	14.3	1.7	.25

It will be noticed that the percentage distribution for the male and female is so nearly alike that it cannot be said that they would differ for the different sexes. The results which were obtained for the Pueblo Indians is different from that of other American Indians which have been investigated, but in view of the large number of Indians investigated the results would seem to be valid. The Pueblo Indians of New Mexico investigated are as follows: Acoma, Laguna, San Ildefonso, Picuris, Nambe, Taos, Paquate, Zuni, Zia, Santa Ana, Jemez, Santa Clara, Cochiti, San Domingo, San Juan, San Felipe, Isleta, and Sandia. The results obtained from the Pueblo Indians of New Mexico concern only the same.

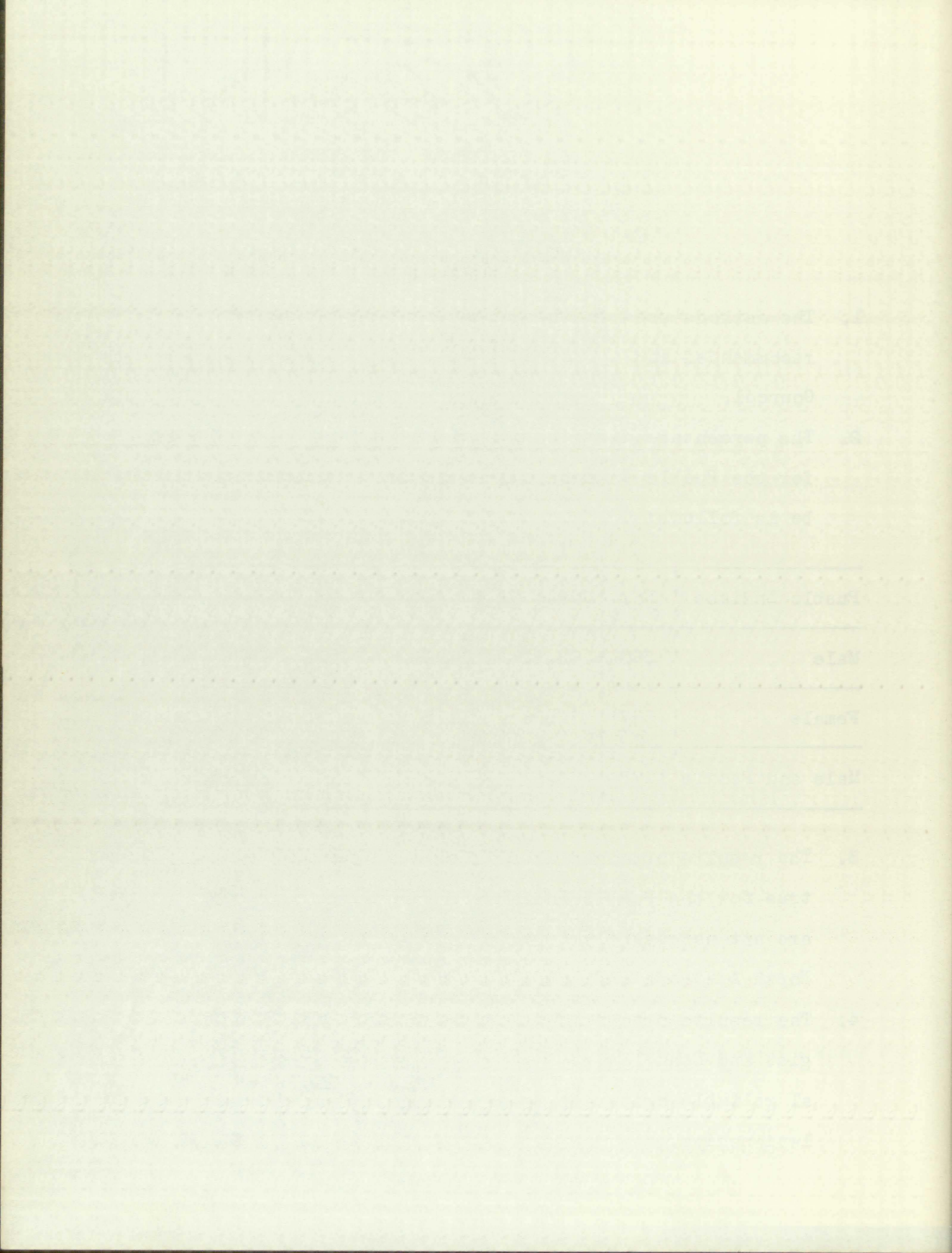


SUMMARY

1. The methods used in this investigation are those recommended and approved by the National Research Council.
2. The percentage distribution of the human blood groups for the Pueblo Indians of New Mexico was found to be as follows:

Pueblo Indians	No.	Group O	Group A	Group B	Group AB
Male	588	82.82	15.98	1.19	0
Female	587	84.38	12.6	2.31	.51
Male and Female	1175	83.6	14.3	1.7	.25

3. The results obtained from this investigation hold true for the Pueblo Indians of New Mexico only and are not necessarily true for any other group of North American Indians.
4. The results obtained are of value to the Anthropologist and Ethnologist in that they provide an additional reliable criterion for ascertaining racial relationships.

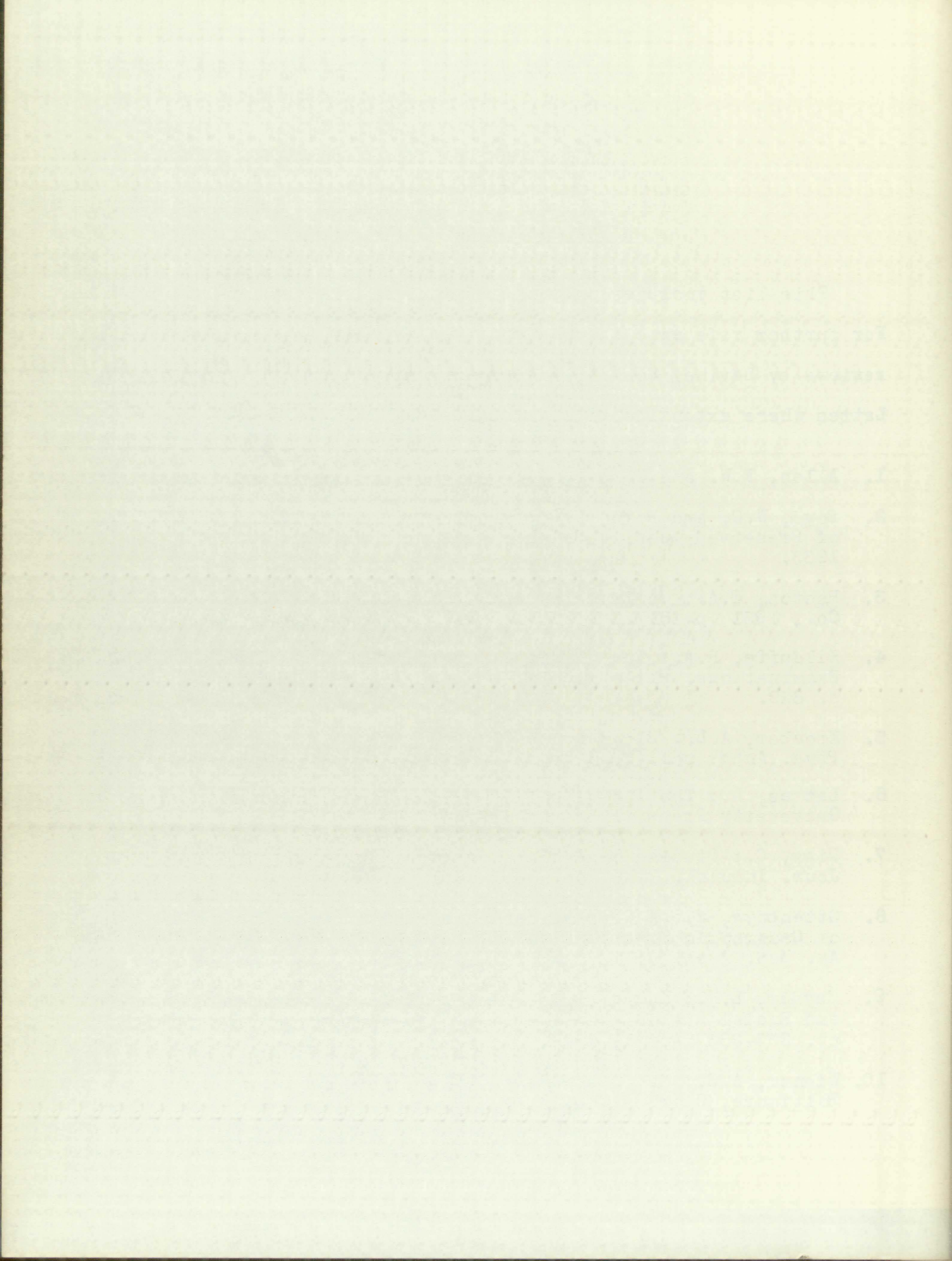


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