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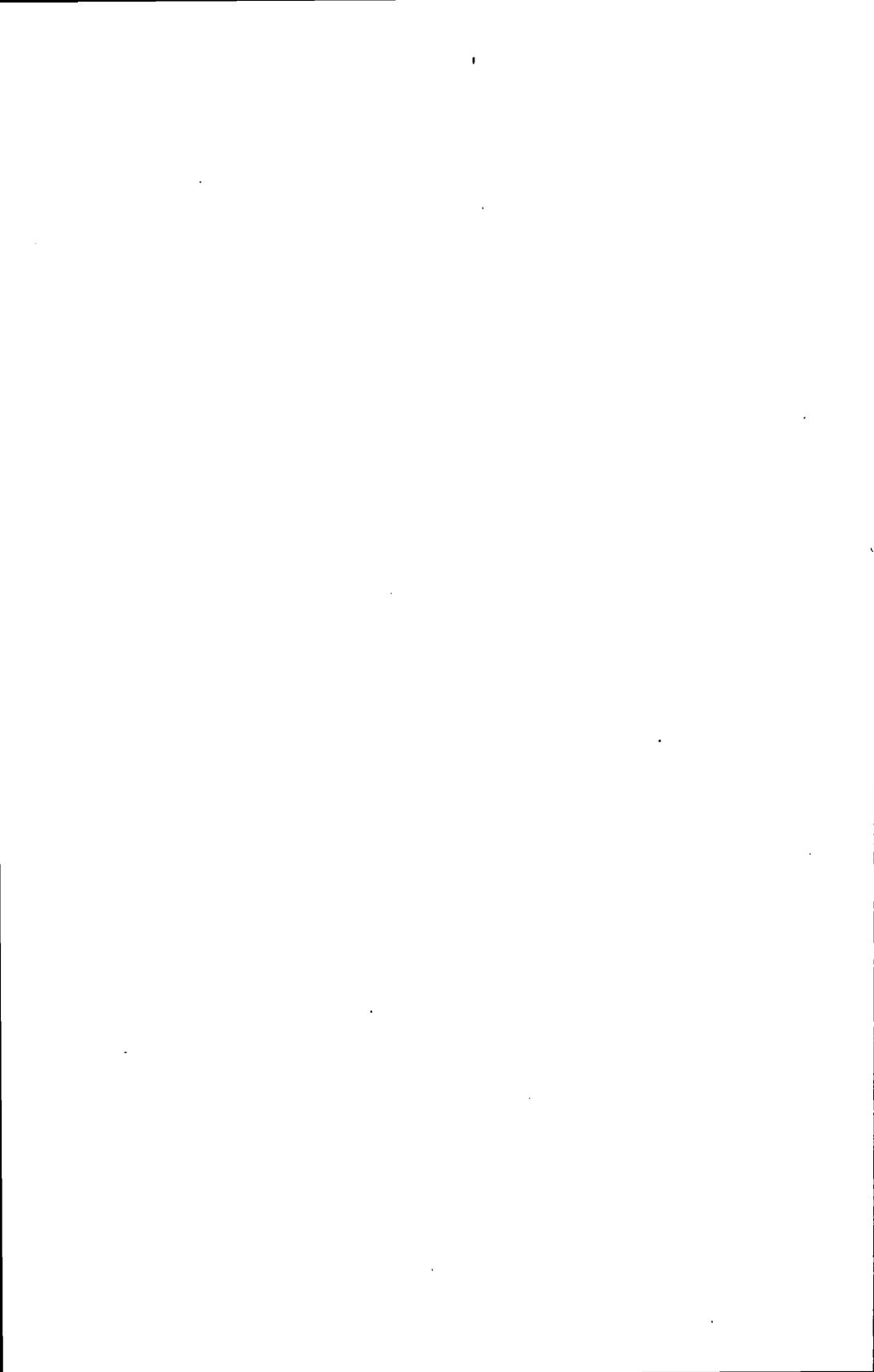
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PART I
POPULATION OF THE EARTH



CHAPTER I

INCREASE IN THE POPULATION OF THE EARTH AND OF THE CONTINENTS SINCE 1650

By

WALTER F. WILLCOX

When mankind was in its infancy, the number of persons could probably have been reckoned in no larger unit than thousands. From that remote day to the present the number has grown until now it is reckoned in millions or hundreds of millions. The increase has been irregular and sporadic, but never so great as during the last few centuries when it has depended closely upon the great discoveries and inventions by which wide areas of fertile and sparsely settled land have been opened to human stocks easily acclimated to their new homes and able to make them produce much more food or many more commodities with which to buy food. This modern multiplication of mankind has been closely related to the growing amount of human migration. It invites examination, therefore, as an introduction to a series of chapters dealing with modern migratory currents.

The examination makes it necessary to determine as accurately as may be the population of the earth at various dates and then the amount and rate of its increase. It involves a critical review of the series of past attempts to estimate the earth's population when each author wrote. The earliest was made by Riccioli in 1661; the next by Süssmilch in 1741, revised in 1762; the third by Dieterici in 1859. Before the middle of the nineteenth century others touched on the subject, but no one else really tried to probe it. Since then the estimates have become numerous, but most of them, including all in English, have been compends of official information or estimates by private citizens without critical appraisal of the results.¹

For Europe and its parts the growth of population during the nineteenth century was carefully measured near its close by Levasseur and Bodio, by Inama and Juraschek and by Sundbärg,² but none of these studies went back into the eighteenth or seventeenth centuries. For Europe also Beloch, who began in 1886 with an examination of its population during the Graeco-Roman period and

¹See Appendix I for a collection arranged chronologically of the attempts to estimate the contemporary population of the earth and the continents.

²For specific references to these and other authorities see *infra* and the Bibliography.

continued with that during the Middle Ages, had ended with that at the opening of the seventeenth century, or for Italy in the eighteenth century, dates so recent that his latest results can be linked with those of Riccioli and other students of the population in their day. Although the growth of population in the United States and in a few other European off-shoots has been measured well enough to furnish a basis for it, no other continent has been treated as those savants treated Europe.

Thus the field is open for surveying the growth of the earth's population as a whole in modern times, applying to other continents the methods developed in Europe and America and using the results of man's widening knowledge about non-European countries and stocks. In the nature of the case the conclusions must be provisional and temporary, to be superseded when better methods and fuller knowledge permit. The method adopted has been first to review and at one important point to modify the estimates of the earth's post-war population, then to determine its population in the middle of the seventeenth century on the basis of present knowledge, and finally to determine approximately also the earth's population in 1750, 1800, 1850 and 1900.

The population of the earth and of its primary divisions, the continents, in the period since the World War has been estimated by Bunle, Dore, Würzburger, Methorst, Loveday, and the French Bureau of Longitudes. The figures from which such an estimate can be constructed are given also in other annuals than those edited by Würzburger and Loveday, like the *Statesman's Year Book* and the *Almanach de Gotha*, but in none of these publications are the figures consolidated into totals for the several continents, so they are of little help. For present purposes the most valuable by far of the pre-war publications are the 13 issues of *Die Bevölkerung der Erde* (1872-1909) and its forerunner the three issues of the *Geographisches Jahrbuch* (1866-70) edited in masterly fashion by Behm, Wagner or Supan. Unfortunately the series has not been revived since the war.

In most of the post-war publications mentioned the totals agree so closely that they may be adopted without further investigation. Not that they are trustworthy, but they are as near the truth as present information allows. Africa, for example, is probably the continent about the population of which least is known, for in default of censuses nearly half of the total rests on estimates. Still, the largest post-war figure for Africa in any of these sources differs

from the smallest by only a few million and much of that difference is due to an actual growth of population within the period. In the case of Asia, however, the estimates differ more widely, and that because of divergent figures for China. Those differences result mainly from different opinions about the meaning and the weight to be attached to the Chinese return of 1910-11. If it is accepted, as was done by *Hübner's Tabellen* in 1921, the population ascribed to Asia is one hundred million less than if it is rejected, as was done by the same publication three years later. Indeed, if the present writer's first interpretation of that return should be accepted,¹ the population of China is less by 200 million than it is according to the more recent figure of Mr. Howard.² Consequently, in order to estimate the present population of the world, the Chinese return of 1910 must be evaluated.

Chinese population returns are made regularly by households and the total population estimated by multiplying the number of households by an assumed average number of members. In 1910 the method was different, two returns were demanded. The first gave the number of households, as before, but it was followed a year later by a second giving the number of persons. Unfortunately the second was left unfinished by the revolution which dethroned the Manchu dynasty and established the Chinese Republic. But fortunately, just before that overturn, the figures for four provinces and large parts of two others were made known. These two returns were translated into English by an attaché at Peking, and forwarded by the American Minister to Washington, where they were published.³ Whether they appeared also in any official Chinese source is doubtful; certainly the publication in Washington is cited in several Chinese works as authoritative. The latest edition of the *Chinese Year Book*, for example, at this point gives "Mr. Raymond Tenney's Report to the United States State Department" as its authority.

The second of the two returns embodied in Mr. Tenney's report gives the number of males, of females, of school children and of able-bodied males, but no totals. Because of that omission the question arises whether all four figures should be added to find the population, as was done by Tenney, or whether only the first three

¹Walter F. Willcox, "The Population of China in 1910" (1928). For fuller references to authorities consult the Bibliography.

²H. P. Howard, "The Present Population of China," in *The China Critic*, June 20, 1929, page 491.

³United States, *Daily Consular and Trade Reports*, July 13, 1911, pages 184-7.

should be added, as was done a year later by Rockhill, or whether only the first two should be added, as a recent examination concludes.¹

Mr. Tenney now admits that the able-bodied males should not have been added because they were included in the males. He also says, and on this point all the evidence except that of Rockhill agrees, that the word which Rockhill translated "men" and "adult males" does not imply any limitation to adults and thus does not exclude either school children or children of pre-school age. Among the four groups the one the meaning of which is most clear is the able-bodied males. All agree that it refers to men of age competent to render military service, "probably of from 16 to 45 years of age," Rockhill wrote. It seems doubtful whether all youth between 15 and 19 would be returned as able-bodied or fit for military service. Perhaps 18 is a better age to adopt as the lower limit. The reported number of Chinese males whom Rockhill called "adult males" was 2.7 times as great as the number of "able-bodied males." Both in Japan and in Asiatic Russia the number of males of all ages is about 2.6 times the number of males between 18 and 45 years of age. If the able-bodied males in China were enumerated completely or even approximately, the males in the other group must include children and youth as well as adults. If the return for males includes persons of all ages, that for females cannot be limited to adults, and the total population would be the sum of these two groups. This interpretation is made more likely by the words "additional investigation" prefacing the figures for school children and able-bodied males and by the instructions to reporting officers recently unearthed in Peking.² This interpretation led to the conclusions that the average size of a Chinese household is 4.3 persons, that the population of China Proper is about 278 million and of all China about 294 million.

Since this argument was published several objections to it have been raised, none of them challenging the interpretation, but all denying the accuracy of the return of 1910. They may be examined by considering three questions: Does the great excess of males in that return establish a presumption that many females were omitted? Does the evidence warrant a belief that many children under two years of age were omitted? Does the exceptional character of the

¹Walter F. Willcox, "The Population of China in 1910" (1928).

²Walter F. Willcox, "A Westerner's Effort to Estimate the Population of China and its Increase since 1650" (1930).

figures from Chekiang Province make it wiser to omit that return when attempting to estimate the average size of a Chinese household?

In the provinces from which returns of persons classified by sex were received, 9,230,000 more males than females were reported. Nearly 56 per cent of the reported population were male, about the same proportion as in Montana or Wyoming. In all countries for which the facts are known, almost as many girls are born as boys. Doubtless the same is true in China. If so, the only way in which to explain the disproportion between the sexes indicated by these Chinese figures is to suppose that the female death rate in that country is much higher than the male. The death rate, unlike the ratio of the sexes at birth, is largely under human control. A higher female death rate might be due to gross neglect of females, especially female children, or to female infanticide on a large scale, or more probably to a combination of two influences. That infanticide is one influence is suggested by a recent news item from Shanghai.¹ Since its publication I have conferred with officials of the Shanghai Burial Society and of the Chinese city of Shanghai and have received a full and illuminating letter from the Public Health Department of the Shanghai Municipal Council, which governs the International Settlement. A health official of the Chinese city informs me that as many bodies are buried by other societies as by the Public Benevolent Burial Society. The evidence laid before me by officials of this last society led me to believe that if it is correct the Society buries annually about 18,000 bodies of infants under one year of age. If these various statements and the estimates of the population of Greater Shanghai are anywhere near the truth the rate of infant mortality in that greatest of Oriental cities is so large as almost to force the conclusion that many of the deaths are due to infanticide.

The explanation is supported by a statement "that the male population is in excess of the female throughout the country as a whole, this being fundamentally due, apparently, to the wide-spread practice of female infanticide and to the neglect of girl children."² Another statement suggests "that there must be many omissions in enumerating the females."³

If many females were omitted at the enumeration of persons in 1910, and if they were in fact 99 per cent of the males, as they

¹*The New York Times*, March 8, 1930. Special Correspondence from Shanghai dated January 30.

²H. P. Howard, "China's Population and the Present Census" (1929), page 471.

³Warren Chen, "Recent Population Statistics" (1929), page 314.

are in Japan, then the average size of a Chinese household was probably 4.7 instead of 4.3 persons.

Regarding children under two years of age, a valued correspondent who has had experience with local population studies has written from Nanking that babies are usually not included when Chinese state the number of persons in their families. If one assumes that all children under two years of age were omitted, their number may be estimated from the ratio between the number of children under two years of age and that of older persons in Asiatic Russia (7.0 per cent) or in Japan (6.4 per cent). If the ratio in China be set at 6.7 per cent, the average size of a household was probably 4.6 instead of 4.3 persons; if both sources of error are taken into account it was 5.0 instead of 4.3 persons.

Chekiang Province has families which, if the returns may be trusted, average less than four-fifths as large as those in Kiangsi and only two-thirds as large as these in Chihli. The range between Chekiang and Chihli in this regard is greater than the range among the 48 American States. The exceptional character of these Chekiang returns arouses suspicion of their accuracy. Persons who have lived long in that part of China and studied the local population problem reject this return emphatically as incredible. For these reasons it may be safer to disregard the Chekiang figures and rely on those from the other three provinces.

If all three coöperating sources of error were at work up to the limit set by the figures, then the resultant size of a household derivable from the two 1910 returns would be 5.4 instead of 4.3 persons. If no other evidence were at hand it might be best to treat 4.3 and 5.4 as limits and assume 4.8 as the average size of a household. Other evidence, however, is found in three recent studies of the farm population in certain selected districts of China embracing about 14,000 families, or one-fifth of one per cent of the entire number, and showing 5.3 persons to a family. This evidence, the high quality and typical character of which make it far more weighty than its limited amount would suggest, perhaps warrants one in putting the average size of a Chinese household at 5.0 persons and as a result setting the population of China Proper in 1910 at 323 million and of all China at 342 million.

The return of 1910 to which attention thus far has been confined, is rejected by some scholars on the ground that it is inconsistent with other important sources of information. The return most highly regarded in China apparently is that published

in 1922 by the China Continuation Committee.¹ But the final conclusion of that committee seems to have been misapprehended. In their table showing the population by provinces, a total of 441 million for China Proper or 453 million for all China is indicated, and these are the figures usually quoted. In the discussion preceding the table, however, they say: "Undoubtedly the exact population of China is considerably lower than most estimates now lead one to believe. . . Perhaps the present population of the Chinese Republic lies somewhere between 350 and 400 millions." In view of that statement 375 million, the average of their two numbers, seems nearer the considered opinion of the committee than the 453 million in their table. In order to facilitate a comparison between their results and the present interpretation of the return of 1910, the estimate for each province in their table has been reduced in Table 1, page 41, so as to bring the whole down to 375 million.

Next to the Chinese return of 1910 and the report of the China Continuation Committee, probably the most important evidence about the population of modern China is contained in the 1901 issue of *Die Bevölkerung der Erde*,² the latest in a series of detailed critical discussions by Behm, Wagner and Supan which began in 1866 with the first issue of Behm's *Geographisches Jahrbuch* and steadily improved down to the World War. Supan started in 1901 with the most recent official returns of each province, twelve for 1894 and six for some earlier year, and amounting in all to 394 million. From a series of provincial returns in Sacharoff he computed that the rate of annual increase in 17 of the 18 provinces in each of four successive periods between 1749 and 1771 was between 0.06 and 9.07 per cent and averaged about 0.9 per cent, but that between 1771 and 1776 it was between 2 and 30 and averaged 5.0 per cent. Sacharoff has an explanation of this incredible bound forward. The Emperor had noted in 1774 that the reported population of China was about the same as in earlier years and directed that in future the returns should be made with more care. Those of 1775 showed an increase of about 44 million, due merely or mainly to an understanding that the Emperor would be pleased by a larger population.³ This fictitious increase, introduced more than a century before, Supan devised a method to eliminate. He assumed that the annual rate of growth in each province except Shantung and Kansu between

¹*The Christian Occupation of China*, page 12.

²A. Supan, *Die Bevölkerung der Erde*, Vol. XI (1901), 44-51.

³Sacharoff in *Arbeiten d. kais. Russ. Gesandtschaft zu Peking über China*, Vol. II, (1858) 186, 193, and translated as *Rise and Fall of the Chinese Population* (1864), 43.

1771 and 1776 was the same as the average rate in that province during the preceding 22 years and thus derived new figures for 16 provinces in 1776. For Kansu, where the annual rate 1771-6 was less than in the earlier years, and for Shantung where a decrease was reported, he retained the reported 1776 figures. This method gave China a population in 1776 of 219 instead of 267 million. To get its population in 1901, he estimated the increase for each province between 1776 and 1901 by subtracting the population reported for 1776 from that reported at the latest available date and added the remainder to his new 1776 estimate. In this way he reached a total of 346 million in place of Popov's 422 million, a reduction of 76 million, and further evidence led him to reduce the estimate for Shantung by 3.2 million. The figure for Szechwan in 1776 was only 3.2 million, but increases reported after that date, from 8 million in 1783 to 21 million in 1812, and from 22 million in 1842 to 68 million in 1882, he believed were incredible. This last increase of 46 million in 40 years would mean that the province had a rate of natural increase or excess of births over deaths equal to that of Russia between 1889 and 1893 and in addition an amount of immigration three times that which swarmed into the United States between 1850 and 1890. Wagner had accepted 45 million instead of 71 for Szechwan; Supan gave it 45.2 million instead of 75; Rockhill said¹ "all foreign writers agree that it is quite impossible to believe that any such population [as 71 million or 325 to a square mile] exists or can exist in it," and gave five estimates, four of them by western travelers in the province, which ranged from 30 to 55 and averaged less than 45 million. Supan's final result for all China was 330 million. In Table 1, page 41 the present interpretation of the return of 1910, the revised figures of the China Continuation Committee and Supan's results, which are probably the most important and trustworthy sources for estimating the present population of China, are brought together for comparison.

The return of 1910, it will be noticed, gives figures intermediate between those of Supan nine years earlier and those of the China Continuation Committee twelve years later, but nearer the former than the latter. The three thus serve in some degree to support one another when they are compared as a group with the later and much larger figures now current.

Supan's estimate of 1901 also throws light upon the value of those later figures. It seems likely that they have not resulted from

¹W. Rockhill, "Inquiry into the Population of China" (1905), page 674.

TABLE 1.
ESTIMATED POPULATION OF CHINA BY PROVINCES.
(In Millions)

Province	According to		Supan (1901)
	Return of 1910	China Continuation Committee (1922)	
<i>North China</i>	75.4	69.8	80.0
Chihli.....	26.0	22.6	18.6
Shantung.....	26.9	25.7	33.1
Shansi.....	10.0	9.0	9.9
Shensi.....	8.0	7.5	7.9
Kansu.....	4.5	5.0	10.5
<i>Central China</i>	129.4	145.9	130.4
Kiangsu.....	15.7	27.9	18.3
Anhui.....	15.7	16.6	18.5
Honan.....	23.3	26.9	20.1
Hupeh.....	22.7	23.7	28.3
Szechwan.....	52.0	50.8	45.2
<i>South China</i>	117.8	132.9	109.1
Chekiang.....	19.4	19.0	11.3
Fukien.....	11.9	14.2	19.6
Kiangsi.....	17.2	20.3	20.5
Hunan.....	21.4	24.4	15.2
Kweichow.....	8.8	9.5	3.4
Yunnan.....	7.9	7.3	11.7
Kwangasi.....	5.9	9.0	5.2
Kwangtung.....	25.3	29.2	22.2
<i>China Proper</i>	322.6	348.6	319.5
<i>Outlying Provinces</i>			
Sinkiang.....	2.3	1.5	1.0
<i>Manchuria</i>	12.9	16.7	5.5
Fengtien.....	8.0	10.4
Kirin.....	3.7	4.6
Heilung-kiang.....	1.2	1.7
<i>Mongolia</i>	1.8	6.4	1.9
<i>Tibet</i>	2.0	1.8	2.3
<i>All China</i>	342.0	375.0	330.0

entirely new inquiries, but are repeated or revised expressions of the generation-old Chinese tradition on the subject in which are embedded the exaggerations of 1775, and in some provinces swollen and untrustworthy figures for other dates. When the population of China in the seventeenth, eighteenth and nineteenth centuries is studied, other evidence tending to support the same conclusion will appear. The three returns reproduced in Table 1, while consistent on the whole with one another, are inconsistent with recent official returns, the smallest of which exceeds the largest of these by 65 million; either group of figures or neither may be accepted, but not both. The evidence seems to indicate that the return of 1910 is the best guide to the present population. The main purpose of the present study, it must be remembered, is to determine the rate of growth of the earth's population in modern times, and with that purpose in view it is desirable neither to overestimate the present population nor to underestimate the earlier population, since either error would exaggerate the true rate of increase.

A position has now been reached from which it is possible to revise previous estimates of the earth's population. The results appear in Table 2.

TABLE 2.
POST-WAR ESTIMATES OF THE POPULATION OF THE EARTH WITH FIGURES
FOR CHINA REVISED
(In Millions)

Date of Publication	Source	Earth	Asia	China		Asia Revised	Earth Revised
				Original	Revised		
1919	Ann. Bur. Long.	1,796	934	438	342	838	1,673
1920	Hübner	1,712	895	330	342	907	1,724
1921	Ann. Bur. Long.	1,696	829	330	342	841	1,708
1923	Ann. Bur. Long.	1,696	829	330	342	841	1,708
1923	Bunle	1,818	1,016	445	342	913	1,715
1923	Int. Inst. Agr.	1,824	1,016	444	342	914	1,722
1924	Hübner	1,790	1,007	440	342	909	1,692
1924	Int. Inst. Agr.	1,839	1,021	443	342	920	1,738
1925	Ann. Bur. Long.	1,818	953	440	342	855	1,720
1925	Int. Stat. Inst.	1,895	1,060	433	342	969	1,804
1925	Int. Inst. Agr.	1,853	1,033	445	342	930	1,750
1926	Int. Inst. Agr.	1,871	1,033	445	342	930	1,766
1927	Ann. Bur. Long.	1,818	953	440	342	855	1,820
1927	League of Nations	1,906	1,019	448	342	913	1,800
1927	Int. Inst. Agr.	1,895	1,038	448	342	932	1,789
1927	Int. Stat. Inst.	1,880	1,032	443	342	931	1,789
1927	Hübner	1,867	1,024	440	342	926	1,769
1928	League of Nations	1,927	1,025	448	342	919	1,821
1929	Ann. Bur. Long.	1,888	967	440	342	869	1,790
1929	Int. Stat. Inst.	1,937	1,070	458	342	954	1,820
1929	League of Nations	1,949	1,034	458	342	918	1,833
Average		1,840					1,760

The average of these twenty-one revised estimates is 1,760 million, which is less by 80 million than the average of the original estimates. The average of the eleven estimates published in 1919-25 as revised is 1,723 million, that of those published in 1926-29 is 1,800 million, the increase of 77 million being due partly to an increase of population and partly to more correct returns for areas in which the population had been underestimated. In view of this increase and of the fact that many of the recent figures refer to earlier dates, it is probably safe to conclude that the present population of the earth is not far from 1,800 million.

With this adjustment for China, Table 3 gives the population of the several continents according to the 1929 publications of the League of Nations and of the International Statistical Institute.

TABLE 3.

PRESENT POPULATION OF THE EARTH AND THE CONTINENTS
(In Millions)

Continent	According to	
	International Statistical Institute 1929	League of Nations 1929
Asia.....	954	918
Europe.....	478	520
North America.....	162	161
Africa.....	140	146
South America.....	77	79
Australasia.....	9	9
Total.....	1,820	1,833

The two authorities agree closely except for Europe and Asia. They both include in Asia the islands to the southeast of that continent as far as New Guinea. Their differences are due to the fact that the League has and the Institute has not abandoned the attempt to classify the population of Soviet Russia by residence in Europe or in Asia. For the figures in the last column, therefore, the words Asia and Europe are not quite accurate.

The next step is to estimate the population of the earth in the middle of the seventeenth century with the aid of modern additions to knowledge in this field. The desire for numerical accuracy about population is a modern growth. Ancient and medieval writers could

not have gratified even if they had felt it, for they had no trustworthy material; but if the critical spirit which it presupposes had been theirs, it would have prevented them from accepting and recording many statements now recognized as incredible, like that of Herodotus about the size of the army of Xerxes, 1.4 million men, or that of Tacitus about the population of Rome under Claudius, 6.9 million. Not one exact and authenticated figure for the population of a country or city has come down from the earlier world.¹ "To count," said Samuel Johnson, "is a modern practice; the ancient method was to guess; and when numbers are guessed they are always magnified."²

When the Greek and Latin classics were reopened after the period of darkness, their statements about population were accepted at face value. But if Rome at the Renaissance had only about one-seventieth as many people as in the first century of the Christian era and if other parts of the Mediterranean world had suffered to a similar degree, then the number of people on the earth must have dwindled greatly in the preceding fifteen hundred years. A sentence in Montesquieu: "After a computation as careful as can be made in matters of this kind, I have found that there are on the earth scarcely one-tenth as many persons as there were in ancient times"³ reveals what was probably a widely held and perhaps the prevalent opinion. Its correctness is not now an issue. But in weighing the seventeenth century estimates discussed below, the background of a belief in a dwindling population after the first or second century of the Christian era must be kept in mind.

About the population of the earth, before the seventeenth century saw the dawn of the modern scientific period, only a few guesses have been found based on the traditional Biblical chronology and assumed rates of increase in successive generations after Noah and one suggestion that in the fourteenth century it amounted to about 240 million people.⁴ This originated perhaps with Baas, who asserted that the Black Death had swept away one-fourth of mankind, 25 million in Europe, 23 million in the Orient and 13 million in China.⁵ As he gives neither authority nor evidence, the guess deserves only a mention.

¹Karl Bücher, *Zeitschrift für die Ges. Staatswissenschaft*, Vol. 37, (1881), page 535.

²As quoted by James R. Garfield in 41st Congress, 2d Session, *H. R. Report No. 3 (January 18, 1870)*, page 29. Garfield perhaps owed it to Edward Jarvis. The original passage has not been found.

³Montesquieu, *Lettres Persanes* (1721), Letter 112, end.

⁴F. H. Garrison, *History of Medicine* (1914), page 127.

⁵J. H. Baas, *Geschichte der Medizin* (1876), page 253.

Estimates of the earth's contemporary population made by various writers between 1650 and 1850 have been brought together in Appendix I, Table I, so that they might be reviewed in the light of present knowledge. The only forerunner of such a review is Wagner's historical sketch and chronological list of previous estimates,¹ made more than half a century ago and not including a revision of the estimates which he recorded. Such a revision is the heart of the present study. Wagner's compilation of past estimates, however, is more to the present purpose than the earlier ones by Balbi² and Wappäus³ or the later ones by Levasseur⁴ and Knibbs.⁵ In Appendix I, Table I, the lists of Balbi and Wappäus which were originally arranged according to size have been rearranged according to date, the five lists consolidated, figures from other sources introduced and those for the continents added.

The table shows that attempts to estimate the earth's population were made in the seventeenth century by five writers. Their results ranged from 320 million to 1,000 million:

<i>Data</i>	<i>Source</i>	<i>Earth</i>	<i>Europe</i>	<i>Asia</i>	<i>Africa</i>	<i>America</i>	<i>Oceania</i>
1661	Riccioli	1,000	100	500	100	200	100
1682	Petty	320	—	—	—	—	—
1685	Vossius	500	30	300	—	—	—
1696	King	700	100	340	95	65	100
1696	Nicholls	960	—	—	—	—	—

The evidence on which these writers relied needs a brief examination. Riccioli was the most important because he summarized the knowledge of his day. He was a learned Jesuit priest who had been chosen by the authorities of the Roman Catholic Church to explain and defend its attitude towards the heretical doctrines of Copernicus and Galileo. Later he compiled "various conjectures and essays concerning the true number of mankind." He gleaned from many sources statements about the population of European countries, but relied mainly upon Botero, more competent than any previous or contemporary writer on population. For Europe he gave the figures in Table 4, page 46. With the other islands the total would be, perhaps, 100 million.

For Asia his only evidence was about China. In one passage

¹Hermann Wagner, "Historische Entwicklung der Versuche die Gesamt-Bevölkerung der Erde zu schätzen," page 5.

²Adrian Balbi, *Abrégé de Géographie*, page 46.

³Stein und Horschelmann, *Handbuch der Geogr. u. Stat.*, 7th ed. (1855) Vol. 1, pp. 171 f.

⁴E. Levasseur, "Statistique de la superficie et de la population des contrées de la terre," page 238; and "La Population Française," Vol. 1, page 461, note.

⁵G. H. Knibbs, "Mathematical Theory of Population," page 30.

TABLE 4.
 RICCIOLI'S ESTIMATE OF THE POPULATION OF EUROPE IN
 THE SEVENTEENTH CENTURY
 (In Millions)

Country	Population
Italy (with Sicily and adjacent islands).....	10-11
Spain (with Portugal and Sardinia).....	10
France.....	19-20
Great Britain and Ireland.....	4
Lower Germany, Holland and Zeeland.....	4
Upper Germany.....	20
Illyria, Dalmatia, Greece and the Islands.....	10
Macedonia, Thrace and Moesia.....	6
Poland, Lithuania, Pomerania.....	6
Denmark, Gotland, Sweden, Norway, Livonia, and other northern lands.....	8
Total	97-99

he said: "At the beginning of this century there were [in China] 59 million souls, counting neither soldiers nor officials." A later passage runs: "Father Martini believes that, if those were counted who are not customarily, there would be found about 200 million inhabitants in China." About Africa he wrote: "Although Africa is twice the size of Europe and more, yet the interior is full of great deserts and I cannot believe that it exceeds Europe in multitude of persons nor that it can much exceed 100 million if indeed it reaches that figure." He concluded that the population of the earth was not more than 1,000 million.

Before considering the value of his evidence and the significance of his results, it will be well to note the opinions and arguments of the others.

Petty wrote in 1681 to Southwell: "Supposing the people in England, Scotland and Ireland to be about 9 million, those in Holland and Zeeland about 1 million and in France 16, I say that by comparing the rest of the world therewith there are but between 300 and 400 millions of souls now living." In a work published two years after this was written he said: "The present 320 millions computed by some learned men (from the measures of all the nations of the world, their degrees of being peopled and good

accounts of the people in several of them) to be now upon the face of the earth''; and in a third passage published later still but written probably before either of the preceding, he said: "Some have estimated that there are not above 300 millions of people in the whole world." Hull tells us that "Petty's learned men have not been identified"; I suspect that they were Petty himself.

Vossius suggested four years later that a city's population might be estimated by counting the houses and stated that Paris not having more than 25,000 houses probably contained about 300,000 inhabitants and could not have 2 million as some persons believed. London at that time, he said, had nearly 50,000 houses, but he did not for that reason claim that it had 600,000 or even more than 300,000 people.

He gave the following figures of population in millions for the leading countries of Europe (Table 5), but cited no authority and offered no evidence.

He added that if Muscovy was assigned to Europe, although most of it belonged to Asia, and if Iceland also were included, one

TABLE 5.

VOSSIUS' ESTIMATE OF THE POPULATION OF EUROPE IN THE SEVENTEENTH CENTURY.

Country	Population In Millions
Spain and Portugal	2
France	5
Italy, Sicily, Corsica, Sardinia	3
England, Scotland, Ireland	2
Netherlands	2
Germany, Bohemia, Hungary	5
Denmark, Holstein, Jutland	0.04
Norway, Sweden, Finland, Lapland	0.6
Poland, Livonia, Lithuania	1.5
Lands between Hungary and the Black Sea including Thrace	2.5
Dalmatia, Illyria, Macedonia, Greece, Crete and the Islands	3
Total	26.64

¹C. H. Hull, *Economic Writings of Sir William Petty* (1899), pp. 295, 463, 467.

would get about 30 million souls. He ended that in his opinion the earth's population did not exceed 500 million.

King, a decade later, wrote a pamphlet on the condition of England which was not published for more than a century but which in the interim was known imperfectly to scholars through the use of the manuscript made by King's friend Charles Davenant. King estimated the population of England from the number of houses "as charged in the books of the hearth office" at 5.5 million and assumed various densities of population for certain other countries. He gave Great Britain and Ireland about 7 million; France 14; Italy 8.5; Holland 2. To the different continents he ascribed densities of population and so populations as given in Table 6. His assumed densities of population combined with correct areas, and rejecting the 100 million assigned to his hypothetical southern continent, would have yielded as shown below a population of about 875 million.

Nicholls in the same year estimated the population of London at thirty times the annual 24,000 deaths, and "London being by common computation the eleventh part of the nation," England had nearly 8 million inhabitants. To Scotland and Ireland together he gave an equal number, or to Great Britain and Ireland 16 million, and to the whole world about 60 times as many, or 960 million.

These are all the seventeenth century writers known to have ventured an estimate of the population of the earth. The guesses of Petty, Vossius and Nicholls may be rejected as unimportant and

TABLE 6.
KING'S ESTIMATE OF THE POPULATION OF THE EARTH IN THE
SEVENTEENTH CENTURY.

Continent	Acres per head	Population in Millions	
		According to King	With present measurement of area
Europe.....	17	100	141
Asia.....	20	340	544
Africa.....	64	95	115
America.....	129	65	74
Total,		600	874

attention concentrated on those of Riccioli and King. The former gathered a large body of testimony regarding the population of the different countries in Europe, but his evidence and that of the writers whom he quoted was meager and inadequate. He was merely a compiler and his comments display little critical ability.

King made no reference to any other estimates, but in starting with an assumed density of population he used a wiser method. The fact that his figures and those of Riccioli agree for Europe and Africa tends slightly to confirm their results. Regarding Asia, King's estimate that it had 20 acres per head or was five-sixths as crowded as Europe, is more weighty than Riccioli's based on accepting the larger of Martini's two figures for China unsupported by any evidence for the rest of the continent. On the basis of seventeenth century opinion then, Europe and Africa might be assigned each 100 million, Asia 500 million and America 75 million, or if no account be taken of the unknown parts of the world to which both Riccioli and King assigned 100 million, rather less than 800 million in all.

Modern knowledge points to a different result. For Europe the best source is an article by Beloch,¹ who had carefully studied the population of the Mediterranean world, ancient, medieval and modern, and had used much information unavailable in the seventeenth century. His results for the opening of that century, published in 1900 and including nearly two-fifths of the area of Europe, are summarized in Table 7, page 50.

Beloch adds that eastern Europe was sparsely settled, and the whole continent probably contained about 100 million people. Because of the great losses of life between 1600 and 1650, due on the continent to the decimation during the Thirty Years War and in England to the check to increase resulting from the struggle between King and Parliament and the heavy emigration which preceded it, due also in both areas to the recurrent visitations of the plague, the population of Europe was not much greater in 1661 than in 1600 and therefore the difference in date between the estimates of Beloch and of Riccioli is unimportant.

A comparison of Table 7 with Table 4 shows that the two writers are in substantial agreement. Beloch has much weightier evidence than Riccioli for the same conclusion. The result may be accepted as approximately true and the population of Europe in the middle of the seventeenth century estimated at about 100

¹Julius Beloch, "Die Bevölkerung Europas zur Zeit der Renaissance" (1900), pp. 765ff.

TABLE 7.
BELOCH'S ESTIMATE OF THE POPULATION OF EUROPE IN THE
SEVENTEENTH CENTURY.

Country	Area in thousand square miles	Population in Millions	Density per square mile
Italy	114	13	114
Spain and Portugal	226	10	44
France	182	16	88
England and Wales	58	4.5	78
Scotland and Ireland	62	2	32
Netherlands	29	3	104
Denmark	16	0.6	39
Sweden, Norway, Finland	417	1.4	3.4
Poland with Prussia	81	3	36
Germany	278	20	73
Total,	1,463	73.5	50

million, or 27 persons to a square mile, a density not far from that of the earth as a whole today or that of the United States in 1900.

The more difficult question of the population of Asia in the seventeenth century may be opened by examining the population of China. A western scholar, Farther Martini, a contemporary and perhaps an acquaintance of Riccioli, studied the subject in China with the aid of Chinese sources and Chinese scholars. Most of Martini's figures indicate a population of 59 million, but there is also a statement about 200 million people in China with which it is difficult to harmonize his figures. The puzzling passage runs:

"The most authoritative books about China if we credit them noting with care and accuracy the number of men who were in each province, city or place (omitting those of the royal line, magistrates, eunuchs, clergy or priests of their superstitions, women and children) yield a total of 58,914,284. Hence it is not surprising that China is said to have 200 million men."¹

¹M. Martini, *Novus Atlas Sinensis*, page 5. The passage is important and the book not easily found, so the sentence in its Latin form is here reproduced. Although it appeared also in Dutch, Spanish and French editions, it was probably first written in Latin:

"quod si libris Sinicis maximeque authenticis credimus, qui diligentissime adnotatum habent singularum provinciarum, urbium aliorumque locorum hominum numerum (seclusis regni sanguinis familia, magistratibus, Eunuchis, militibus, sacrificulis, mulieribus, pueris) sunt ad quinquaginta octo millones, nongenta et quatuordecim millia, ducenta, octoginta et quatuor, 58,914,284. hinc non adeo mirandum, si quis eam dixerit ducentos hominum millones continere."

How Martini reached, if he did reach rather than merely report, the figure of 200 million is a problem. Could he have told some friend versed in Chinese lore that Europe was thought to contain about one hundred million people and been gravely assured that China contained fully two hundred million? The households by his figures for each province total 10,128,787 and the men 58,916,783. If the last figure is interpreted as the total population, there would be 5.8 persons to a household. On the other hand, if the figures of 200 million persons and about 10 million households are accepted, there would be about twenty persons to a household. One other passage in Martini uses *homines* meaning adult males, but in more than a dozen cases it means apparently population. He seems to have been regarded until the nineteenth century as the most authoritative western writer upon Chinese questions, and his impressive round figure of 200,000,000 was repeated again and again. Other students of the past population of China have reached results widely different from the larger of his two figures. Rockhill inferred from certain Chinese statistics "that the total population of China Proper in 1651 . . . was about 55 million—just about the number we should have assumed it to be had we to deduce it from the data supplied by history alone."¹ The discussion in Williams leaves the impression that he would estimate China's population in the middle of the seventeenth century at about 60 million.² Sacharoff estimated the population of China in 1661 as 21 million.³ Gowen wrote, "According to the accounts given by the Jesuit fathers, China at this time [A.D. 1644] contained a population of eleven and a half million families. At the end of the reign [A.D. 1661] another estimate was made of nearly fifteen million families or eighty-nine million individuals."⁴ Parker compiled from the annual volumes of the official *Tung-hwa-Luh* the numbers of taxed families for each year in the last half of the seventeenth century.⁵ The average number of such families, 1652-4, was 14,153,000, pointing to a population of about 77 million. Chang-Heng Chen, relying apparently on the same Chinese sources, has stated that during the 60 years of Kang Hsi's reign (1662-1722) the census population "limited to males between 16 and 60 for taxation purposes" stood

¹W. W. Rockhill, "Inquiry into the Population of China," page 663.

²S. Wells Williams, *The Middle Kingdom* (ed. 1907), Vol. I, page 265.

³T. Sacharoff, *The Rise and Fall of the Chinese Population*, page 42.

⁴H. H. Gowen, *Outline History of China* (1913), Vol. 2, page 15.

⁵E. H. Parker, "Note on Some Statistics regarding China" (1899), pp. 150-156.

uniformly at about 27,350,000.¹ If this figure is correct and if at that time in China, as today in Japan, the males 16-59 years of age were 27.6 per cent of the population, China had a population of about 100,000,000. But if the improbable idea that the population was stationary during those 60 years of prosperity is abandoned and Chang-Heng Chen's figure of 27,350,000 males between 16 and 60 years of age be accepted for the middle of the reign and the rate of increase between the population in that year 1692 and the 177 million reported in 1749 be carried back to the year 1650, then the population at that date was about 66 million.

From these sources the following estimates of the population of China about 1650 have been derived:

<i>Source</i>	<i>Millions</i>
Sacharoff	21
Rockhill	55
Martini	59
Williams	60
Chang-Heng Chen (adjusted)	66
Gowen	69
Parker	77
Chang-Heng Chen	100
Martini	200

Reasons have been given for rejecting Martini's larger figure. It seems likely that Sacharoff's figure was erroneous because he accepted a return of adult males as one of the whole population. If these two extreme estimates are discarded the average of the other seven, about 70 million, may be adopted as the best approximation to the population of China in 1650.

For estimating the population of Japan in the middle of the seventeenth century, two authorities, Droppers² and Yanagisawa,³ are helpful. Evidence offered by the latter leads me to increase his figure for 1732 by one million for the families and servants of the military caste who were omitted, and by 1.6 million for females who were probably omitted. The second omission is indicated by the fact that in 1732 the females reported were only 87 per cent but in 1910 they were 98 per cent of the males, the cause of the difference

¹Chang-Heng Chen, "Changes in the Growth of China's Population in the last 182 years," page 2.

²Garrett Droppers, "The Population of Japan in the Tokigawa Period."

³Yasutoshi, Count Yanagisawa, "Histoire critique des travaux statistiques au Japon," especially page 297.

being probably the omission of many females at the earlier date. After making these corrections Yanagisawa's figure for 1732 becomes 29.5 million. Droppers thinks the omissions were more numerous still and raises the figure to 30.6 million. One will not go far astray if he adopts 30 million. From the returns of population at various earlier dates as given by Droppers for four daimyos, including between 5 and 6 per cent of the population, it appears that their increase and perhaps that of all Japan between 1650 and 1732 amounted to about 30 per cent. Droppers believed for other reasons that the population "increased very rapidly" between 1603 and 1721. So the population of Japan in the middle of the seventeenth century was probably about 23 million, a conclusion supported by Yanagisawa's 24 million as an approximation to the total half a century later.

The population of India at the beginning of the seventeenth century has recently been estimated upon evidence drawn mainly from the reported size of armies and the extent and character of agriculture, with the result: "We shall run no risk of serious error if we take 100 millions as indicating a total . . . rendered probable by a consideration of all the relevant facts."¹ A valued correspondent in India writes about these estimates, "All things considered they seem too high." Still it is probable that, even if for 1600 A.D. they are too high, for half a century later they are not excessive. Thus the following estimates in millions have been reached:

China	70
Japan	23
India	100
	<hr/>
Total	193

If these estimates are near the truth and if the three countries included in 1650 as they do now about three-fourths (76 per cent) of the population of Asia, then in the middle of the seventeenth century it supported about 250 million people.

About the population of Africa less is known than about that of any other continent, and the estimates present or past have unstable foundations. In recent years the estimates have been falling,² but still may be too high. No careful study of African conditions is yet possible, so the main current of authority should be

¹W. H. Moreland, *India at the Death of Akbar* (1920), pp. 9-22.

²See Appendix I, Tables I and II, and Diagram 3 on page 81.

followed. A population of 100 million assumed by Riccioli without any evidence to support it would mean 8.6 persons to a square mile, about the density of population in South Dakota or Oregon in 1920. That is more than one would be disposed to ascribe to a continent with extensive areas of desert and primitive agriculture in its cultivated districts. But a comparison with the present population tends to corroborate the estimate. The present area and population of the coastal states, Egypt, Tunis, Northern Algeria, Sierra Leone, Liberia, Gambia, South Africa, and Zanzibar, which are known to have increased rapidly since the seventeenth century, have been subtracted from the area and population of all Africa. This procedure shows that, if current estimates of the total population are correct, the rest of the continent today has about 8.5 persons to a square mile. So Riccioli's and King's guess of 100 million remains unchanged.

The population of the Western Hemisphere in the seventeenth century furnishes a difficult problem. Riccioli's guess of 200 million unsupported by evidence should be discarded at once. Modern scholars have begun to attack the question. Critical analysis of sixteenth and seventeenth century writings has not yielded and probably never will yield definite results. The archaeological study of ruins, mounds, etc., is faced by the difficulty that these remains can hardly be dated and shown to be contemporary rather than successive and to indicate seventeenth century conditions. The method preferred by Americanists in the United States is to study the various Indian tribes when the whites first met them, or when disturbance in consequence of the arrival of the whites began, attempt to estimate the number in each tribe at or near that time, and so arrive at the Indian population for larger areas. The leading exponent of this method died in 1921, leaving his work unfinished. His monograph has recently been published and the editor says that its "figures though conservative as compared with most earlier undertakings of the kind are still somewhat high."¹ Students of this subject, or at least those using Mooney's method, tend, as this comment implies, to lower their earlier estimates. This is illustrated by Mooney, whose second estimate of the aboriginal population of New England was four fifths of his first, and by Kroeber² whose estimate of the number of Indians in California in 1770 was little more than one-half as large as that of Hart Merriam³ made twenty

¹James Mooney, "The Aboriginal Population of America North of Mexico," page 2. See also Mooney's article "Population" in *Handbook of American Indians* (1910).

²A. L. Kroeber, *Handbook of the Indians of California*, pages 880-891.

³C. Hart Merriam, "Indian Population of California," (1905).

years before. It is illustrated also by Kidder,¹ who lowered Mooney's estimate of the original pueblo population of Arizona and New Mexico more than two-fifths. From these sources Table 8 has been drawn.

TABLE 8.

ESTIMATED INDIAN POPULATION NORTH OF MEXICO BEFORE THE WHITES ARRIVED.

District	Authority	Date of Estimate	Area in 1000 square miles	Population in thousands	Population per 100 square miles
California	Kroeber	1925	156	133	85
Arizona and New Mexico	Kidder & Mooney	1924, 1928	236	58	25
Rest of United States	Mooney	1928	2,582	517	20
Canada and Alaska	Mooney	1928	4,133	294	7
Total			7,107	1,002	14

The Indian population north of the Rio Grande in the middle of the seventeenth century was about one million.

This conclusion is opposed to that of MacLeod, who says: "One may safely estimate for the whole of North America, north of Mexico, a pre-European Indian population of roughly three million."² But apparently MacLeod did not use Mooney's fuller posthumous pamphlet. He is inaccurate in saying that Mooney's earlier study indicated "that there were about 800,000 Indians in North America north of Mexico in the pre-white period," when Mooney's words were "nearly 1,150,000 Indians." MacLeod objects to Mooney's results as "far too small," and yet accepts Kroeber's much smaller figure for California. His new evidence, which is very slight, relates only to Virginia in A.D. 1600. To that region he assigns about two persons to a square mile, while Mooney with fuller evidence make the Virginia Indians less than one-fifth as numerous. For these reasons Mooney is probably the safer guide.

No studies comparable to those of Mooney, Kroeber and Kidder have been made for regions south of the Rio Grande. In default of them, such opinions as have been published will be reviewed, the results of correspondence presented and the writer's tentative conclusions outlined.

¹A. V. Kidder, *Southwestern Archaeology* (1924), page 39.

²W. C. MacLeod, *The American Indian Frontier* (1928), page 16.

Lopez de Velasco, cosmographer and historian to the Council of the Indies, wrote in the latter part of the sixteenth century a description of what is now known as Latin America, "which far surpasses in detail and completeness any official report on the English colonies till the time of Chalmers"¹ more than two centuries later. The Spanish scholar wrote: "In all the discovered and inhabited parts up to the year 1574, when this summary was finished, there are . . . eight or nine thousand towns, nations or tribes of Indians . . . in which there are a million and a half tax-paying or tributary Indians not counting their children and wives nor the aged nor the ones about to be married nor the many who have hidden and did not allow themselves to be counted in the appraisement in order not to pay any tax nor those who are not peaceful."² This 1,500,000 adult males implies about 6,000,000 of both sexes and all ages, for the peaceful or subjugated Indians of Latin America.

Humboldt wrote: "Cuba must have seemed very populous to Columbus and Velasquez if it was as well populated as when the English landed in 1762 . . . but we know that Cuba . . . did not contain over 200,000 inhabitants in 1762." From this one may infer that Humboldt would probably have put the pre-Columbian population of Cuba at less than 200,000, although in a previous passage he had said "no means now exist to arrive at a knowledge of the population of Cuba in the time of Columbus."³ Since Cuba contains nearly half of the area of the West Indies and nearly one-third of their present population, the pre-Columbian population of the archipelago may be estimated at less than six hundred thousand. For Mexico, Humboldt said that the population of New Spain in 1793 as reported to the viceroy by the intendants and governors of provinces was 4,483,000, and "it was supposed that a sixth or a seventh part at least ought to be added to the sum total, and the population of all New Spain was accordingly estimated as 5,400,000 souls." Elsewhere he wrote that New Spain extended from the tenth to the thirty-eighth parallel and so included most of what are now Central America and California. In another passage he declared that "New Spain is much better inhabited at present [1803] than it was before the arrival of the Europeans."⁴ These statements show he estimated the population of Mexico and Central America in A.D. 1500 to be not more than 5 million and perhaps much less.

¹E. B. Bourne, *Spain in America* (1904), pages 195-7.

²Lopez de Velasco, *Geographia y Descripcion Universal de las Indias*, page 2.

³Alexander von Humboldt, *The Island of Cuba*, pp. 233, 236.

⁴Alexander von Humboldt, *Political Essay on the Kingdom of New Spain*, Vol. I,

In an address before the International Congress of Americanists at The Hague four years ago, Professor Sapper said:¹ "If I were to attempt a rough estimate of the number of Indians in America and its parts at the end of the fifteenth century it would stand as follows:

<i>District</i>	<i>Estimated Population in millions</i>
North of the Great Lakes.....	0.5
Between the Great Lakes and the Rio Grande.....	2-3
Mexico.....	12-15
Central America.....	5-6
West Indies.....	3-4
Tropical Andes Region.....	12-15
Tropical eastern South America.....	2-3
Temperate South America.....	1-2
Total.....	40-50

For this total he presented no evidence. His estimate about the regions north of the Rio Grande, it will be noticed, is three times as large as that reached in the present discussion.

In attempting to estimate the seventeenth century population of the West Indies and of the mainland south of the Rio Grande, certain areas may be distinguished in which the density of population was probably greater than in any large region to the north. These well settled areas include the West Indies, Central America, that part of Mexico in which the present density of population is above the average for the whole republic, and the plateau districts of South America as defined by Grubb.² In this way the whole area has been divided as follows:

	<i>Area in thousand square miles of:</i>	
	<i>dense settlement</i>	<i>sparse settlement</i>
Mexico	219	548
Central America	206	
West Indies	91	
South America	460	6817

To make a guess at the population of those densely settled districts it was first assumed that the average density of population

¹Karl Sapper, "Die Zahl und die Volksdichte der indianischen Bevölkerung in Amerika," Part I, pp. 95-104.

²K. G. Grubb, *The Lowland Indians of Amazonia* (1927), p. 15.

south of the Rio Grande, including the West Indies, was equal to the average density in California, the most densely settled area north of the Rio Grande, and so was somewhat less than one person to a square mile. This would give about 7 million Indians south of the Rio Grande compared with one million north of that river. Next it was assumed that outside of the densely settled districts south of the Rio Grande, the average density of population was the same as it was in what is now the United States outside of California, Arizona and New Mexico, namely, one person to 5 square miles. These two assumptions would leave for the densely settled districts of the West Indies, Mexico, Central America and the Andes plateau including nearly one million square miles, about 6.6 million people, nearly 7 persons to a square mile, or a density of population between that of Idaho and of Oregon in 1920.

So far as the densely settled districts are concerned, the foregoing assumptions and density have been retained.¹ But for the sparsely settled districts, subsequent correspondence has indicated that the estimate was too low. Professor Sauer, who has carefully examined the evidence for the distribution of population in Lower California and Sonora,² writes that from an inspection of the baptismal records and chronicles of the missions he estimates that the population of Lower California in the seventeenth century was about one to a square mile. That of Sonora he believes was at least two to a square mile. This would make the average density for the two provinces about 1.6 to a square mile. If a like density should be assumed for the other sparsely settled districts in Mexico, a population of 855,000 instead of 110,000 would be reached. But perhaps it is better to apply the changes in density of population in these two provinces between then and now to the whole region. On the basis of Professor Sauer's estimate, they had a density of population 300 years ago equal to about three-fifths of what it is now. If the same ratio held for the entire sparsely settled area in Mexico, its population then would have been 2,180,000 as compared with 3,480,000 today, a result which seems too large, but which will be adopted nevertheless and partly because of the need not to under-estimate.

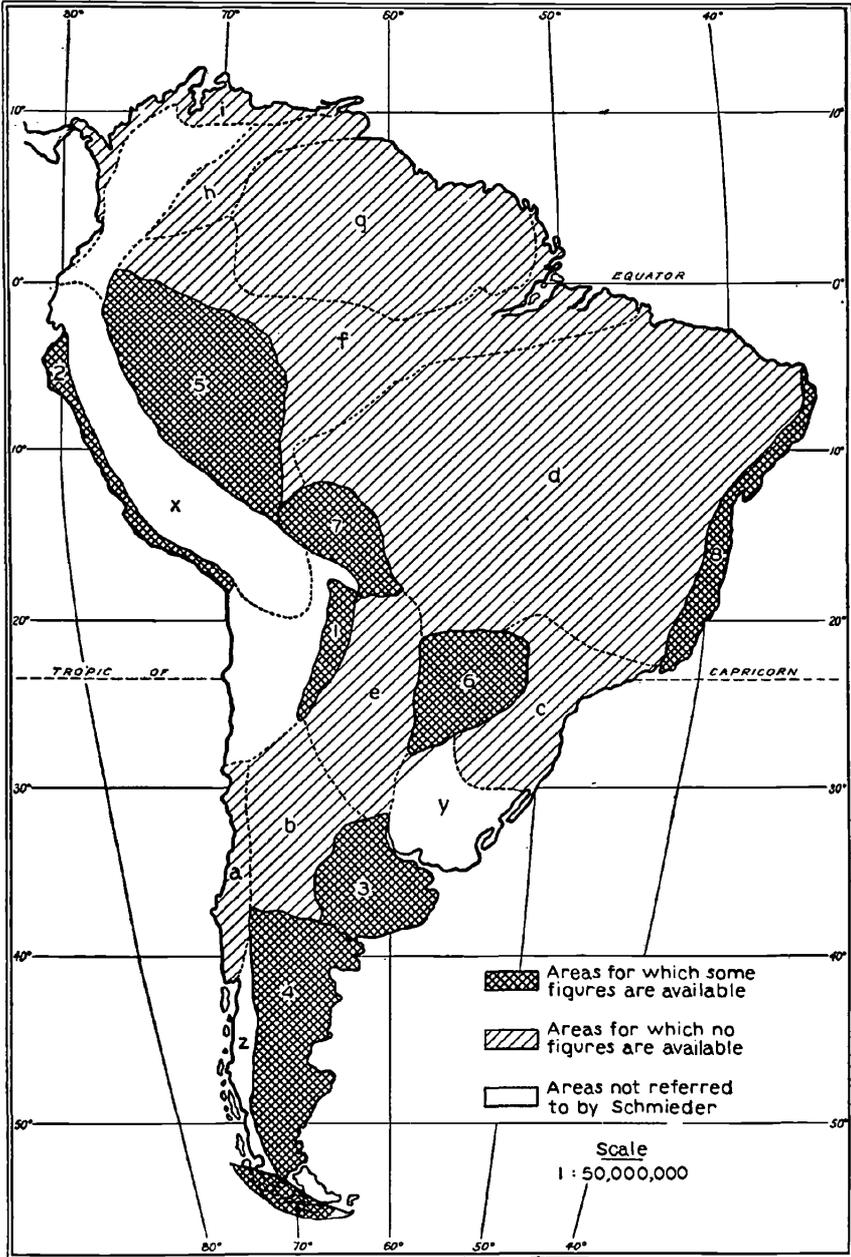
In studying the sparsely settled districts of South America aid has come from Professor Schmieder, who is well acquainted with many parts of that continent,³ He has estimated roughly the

¹See Table 10, page 62.

²Carl Sauer and Peveril Meigs, "Lower California Studies: Site and Culture at San Fernando de Velicata."

³See Oscar Schmieder's four contributions to *Univ. Calif. Publ. in Geography*, Vol. 2 (1926-28).

Diagram 1. Population Areas of South America in the Seventeenth Century, by Schmieder
(For explanation of estimated populations of the areas see pp. 60ff).



seventeenth century population of eight areas with which he is acquainted and which are shaded on the accompanying sketch map, Diagram 1, page 59.

Three classes of districts are distinguished on that map: the cross-hatched are those for which Professor Schmieder gave some clue to the population, those marked with parallel lines are the ones about the population of which he gave little or no information, and those left white are the ones which he did not mention.

The memorandum elucidating Professor Schmieder's map on page 59 runs thus:

I. Areas for which some figures are at hand (cross-hatched on map):

1. *East Bolivian Front Ranges:*
Chiriguano Indians.....200,000
Probably a somewhat high estimate, town of Santa Cruz is not included.
2. *Peruvian coast oasis:*
Aboriginal population at arrival of whites, about 200,000. By 1650 reduced to approximately..... 20,000
Lima, 1650:
Spaniards..... 25,000
Negroes..... 30,000
Indians..... 5,000
Minor Spanish settlements.....Not estimated
3. *Argentine Pampa:*
Inhabitants of urban settlements..... 5,000
Free Indians..... 100,000
4. *Patagonia:*
East Patagonia, very sparsely populated. First estimate by Mustas should be valid for 1650 also..... 2,000
In the Southwest Islands:
Alacaluf, first estimate 1880, acceptable for 1650 since there was no previous white influence..... 3,000
Yaghan, ditto..... 1,300
5. *Upper Amazon:*
No data of any kind available for that time. In the "Missions of Maynas," however, there lived in 1727 Indians amounting to..... 160,000
This figure does no justice at all to the number of free Indians from which the neophytes were permanently drawn. Total therefore probably a multiple of the figure given.
6. *Paraguay Mission District:*
The mission movement of the Jesuits started about 1610. There were 50,000 Christian Indians in 1682 and 100,000 in 1768. Even if the latter figure is accepted it will still be a most conservative estimate for the area, since it includes no free Indians..... 100,000
Inhabitants of Spanish towns, particularly of Asuncion, exceeded those of contemporaneous Santa Fe and Buenos Aires, and this is certainly too low a figure..... 5,000
7. *Llanos de Mojos:*
The Missions of the Mojo and Baure alone embraced, at the end of the 18th century, Christians amounting to..... 31,000
Even if this figure should be doubled it would hardly do justice to the entire population, only a small part of which has ever gotten under the missionaries' influence. Archaeological finds indicate that the native population once reached the stage of overpopulation (E. Nordenskjold).

S. *East Brazilian coast plain between Cape San Roque and Cape Frio:*

One figure for Islands of Maranhão, Tupinamba Indians settling in Maranhão in 1712	12,000
Under Dutch occupation (1640-49) the town of Recife had 2000 houses..	10,000
At the same time, there were negro slaves working on the sugar plantations of Eastern Brazil to the number of.....	40,000
The town of Bahia had, as early as 1589, 800 families, and in the surrounding rural districts 2000 families of colonists lived. A period of steady development followed. For 1650 there must have been in this minor district at least	20,000
The Jesuits had numerous mission settlements on the coast plain, about which there are no exact figures for 1650. This year however marked the climax of their success; in 1663 epidemics began to reduce the number of Christian Indians. Not too high an estimate of Christian Indians for 1650 would be.....	40,000
No data about the number of free Indians and Indian slaves are available, nor is anything known about the number of colonists and negro slaves and Indians in the southern capitánias such as Espiritu Santo and Rio de Janeiro.	

Total, 809,000

II. Areas for which no figures are at hand (parallel shading on map):

a. *Central and Southern Chile:*

The number of Araucarian Indians must have been several hundred thousands. To this one would have to add Spanish colonists in Central Chile.

b. *Ancient Tucuman area:*

1657, town of Córdoba, about.....	12,000
1657, town of Salta, about.....	2,000
Tucuman, Rioja, and other Spanish settlements.....	Not estimated
Number of Indians.....	Not estimated

c. *Mesothermal part of Brazil:*

A numerous half-breed population.

d. *Central Brazil, Malto Grosso* in the wider sense.

Population sparse, yet important, due to extent of area.

e. *El Gran Chaco.* Population at present estimated at 50,000, but without any reliable basis. There has been no direct European influence on this part of the aboriginal population of South America. The guess might be accepted as valid for 1650 also.

f. <i>Central and Lower Amazon basins</i>	Not estimated
g. <i>Coast and Mountains of Guiana</i>	Not estimated
h. <i>Llanos of the Orinoco</i>	Not estimated
i. <i>Northern and Northwestern Coast</i>	Not estimated

On measuring the areas of the 20 sections of South America the results in Table 9, column 2, page 62, are reached. For the two groups of sections marked with letters rather than numbers, whatever densities seemed from the meager evidence to be most probable have been adopted, except that Professor Schmieder's central plateau district has been divided into two sections based on Grubb's map and widely different densities have been assigned them.

MIGRATION INTERPRETATIONS

TABLE 9.
ESTIMATED POPULATION OF SOUTH AMERICA IN THE SEVENTEENTH CENTURY.

District Symbols	Area of districts, thousand square miles	Population per 100 square miles	Population (in thousands)
1	57	351	200
2	73	124	90
3	176	60	105
4	340	2	6.3
5	476	126	600
6	183	57	105
7	139	45	62
8	116	106	122
a	90	660	594
b	258	60	155
c	268	60	161
d	1,968	13	256
e	311	16	50
f	654	13	85
g	726	31	226
h	148	50	74
i	130	50	65
x	920	660 460 460	3,036 276
y	183	60	110
z	83	2	1.7
Totals,	7,304	87	6,380

On combining these results for the Western Hemisphere its estimated population in the middle of the seventeenth century stands as in Table 10.

TABLE 10.
ESTIMATED POPULATION OF THE WESTERN HEMISPHERE IN THE SEVENTEENTH CENTURY. (In Thousands)

Regions as now bounded	Area in thousand square miles	Density of population per 100 square miles	Population
Canada and Alaska.....	4,128	7	294
United States.....	2,974	24	708
Mexico.....	767	470	3,630
Densely settled.....	219	660	1,450
Sparsely settled.....	548	400	2,180
Central America.....	225	660	1,485
West Indies.....	93	660	614
<i>North America</i>	8,171	82	6,731
<i>South America</i> :			
Plateau districts.....	460	660	3,036
Rest of continent.....	6,844	49	3,344
<i>South America</i>	7,304	87	6,380
Western Hemisphere.....	15,475	85	13,111

The net result of the analysis is given in Table 11.

TABLE 11.

ESTIMATED POPULATION OF THE EARTH IN THE SEVENTEENTH CENTURY
(In Millions)

Continent	Contemporary Estimates	Present Revision
Europe	100	100
Asia	500	250
Africa	100	100
North America	75	7
South America		6
Australasia		2
Earth	875	465

The population of the earth in the middle of the seventeenth century was about 465 million, less than one-half of the most widely accepted contemporary estimate, that of Riccioli.

As in the seventeenth century there were two scholars, Riccioli and King, so in the eighteenth century there were two, Struyck and Süssmilch, whose work in estimating the population of the earth deserves attention. Before examining their contributions, however, it will be profitable to review the position of their immediate predecessors and contemporaries, a list of whose estimates will be found in Appendix I, Table I.

At the opening of the century Whiston, a distinguished theologian and mathematician, stated: "'Tis now generally owned that the number of souls upon the face of the whole earth at present does not exceed four thousand millions, though I imagine it may come nearer to that sum than many suppose.'" Starting with eight persons who "doubled themselves in 60 years at a mean from the Flood till David. . . and thence forward to our own times in 400 years. . . we shall pretty nearly obtain the sum total of mankind in every corresponding year after the Flood.'" Apparently Whiston believed, although he gave no evidence for it, that the earth's population was not far from 4,000 million and harmonized that belief with his Biblical history and chronology by assuming certain periods of doubling.

A generation after Whiston another theologian, Canz, assigned Europe 10 million, Asia 20, and the rest of the world 30, a total of 60 million. His guess is the smallest as Whiston's is the largest in the entire series, and no evidence was offered in support of either. Because they were unsupported guesses they are not included in the estimates represented in Diagram 2, page 79.

Three years after Canz one passes with Struyck from a theological to a geographical and statistical point of view. Struyck collated the work of several predecessors, but rested mainly on Riccioli, although he said that the latter's figures for Asia and America were too large. He was the first to reject the current estimate of 200 million for the population of China and to argue that the 59 million reported by Martini and others as adult men were probably the entire population. He displayed more acuteness and sound judgment than Süssmilch, but less patient toil and less range of information. He accepted Riccioli's figure of 100 million for Europe, but reduced his estimate for Asia by half. He said nothing about the other continents, except that one could hardly guess the population of Africa, and suggested 500 million as an alternative to Riccioli's 1,000 million for the population of the earth.

His contemporary Süssmilch, the best known if not the greatest statistician of the eighteenth century, was a theologian like Riccioli, Whiston and Canz. He was a chaplain in the army of Frederick the Great and saw his country's military need for a large and growing population. He wrote to prove that it was the duty and privilege of a ruler to encourage the increase of his subjects and thus collaborate with the Almighty who had commanded mankind to multiply and inherit the earth. The objection that the earth was already well peopled he met by arguing, from the number of persons for whom food could be grown on a square mile, that the earth might easily maintain 14,000 million people and was maintaining not more than 1,000 million, leaving ample room for increase.

Süssmilch found more evidence than Riccioli could and he gathered it with care and patience. But he seems to have been swayed by Riccioli's attractive round figure of 1,000 million. After he had rejected the latter's 100 million for the mythical southern continent and had reduced the figure for America from 200 to 150 million, he added to Riccioli's estimates 50 million for Africa and 50 million for Europe, perhaps to retain his predecessor's total. Süssmilch continued for twenty years to study population and in 1761-2, when he brought out a much enlarged edition of his main

work, he reduced his final estimate for Europe from 150 to 130 million, but added 150 million to his earlier estimate for Asia and that without making any explanation of the change.

During the second half of the eighteenth century, and even into the nineteenth, Süssmilch's arguments and conclusions dominated European thought. Whether Malthus was acquainted with him as early as 1798 is doubtful, but in later editions of the *Principles of Population* he drew largely from his German predecessor.

Voltaire and Morse were the only other eighteenth century writers who made any contribution to the question.

Voltaire reverted, but perhaps without knowing it, to a method outlined by Petty and King and, estimating the inhabited land at 9 million square leagues, assumed for that area the average density of population in five European countries, 100 persons to a square league, thus making the earth's population 900 million. The statements of Balbi, Wappäus, and Wagner that Voltaire set its population at 1,600 million have not been verified. None of them noticed Voltaire's estimate of 900 million; perhaps the mention of a larger figure may have been a mistake of Balbi, repeated by his successors.

Morse, "the Father of American geography",¹ reproduced with little comment the estimates made by European students about the population of countries in the Eastern Hemisphere, but was the first to criticize with acumen current estimates about the population of the western world. In 1789 he had expressed the opinion that an estimated population of 160 million was "exaggerated at least one-half." Four years later, after discussing the suggestions of Riccioli and Süssmilch, he reached an independent conclusion by supposing that the Western Hemisphere, being about fifteen times the size of the United States as then bounded, had about fifteen times as many inhabitants. This indicated a population of about 60 million, and Morse added "The exact number, I presume, is considerably less than this." In the fifth edition of his *Geography Made Easy* (1796). Morse reproduced an estimate from William Carey, "a gentleman in England" who has not been identified. Carey's total of 731 million was distributed only by religions. Morse comments: "This estimate, I apprehend, considerably exceeds the truth. He reckons upwards of 90 millions in America. Dr. Stiles, than whom no man was better informed on this subject, reckoned that the whole number

¹This title was applied to Jedidiah Morse in 1874 by W. B. Sprague in his *Life of Jedidiah Morse*, p. 192, and has been accorded him ever since.

of Indians in all North America did not exceed two millions and a half. Admitting this to be true fifteen or, including the Islands, twenty millions would be the extent of the population of all America.' Elsewhere Morse says that this opinion from the president of Yale College was expressed in a personal letter to him.

Subsequent study has added to our knowledge of population in the middle of the eighteenth century. Regarding Europe, the following results deserve attention. Süssmilch, using many contemporary sources of information, finally reached a total of 130 million. The writer has tried twice to revise that conclusion. At first he inferred from evidence most of which was not available until long after Süssmilch's day, that 126 million was a more probable figure.¹ Nearly ten years later he went over the ground again and estimated the population of Europe in 1750 at 137 million.²

The population of Europe and of its several political divisions has been determined by Sundbärg for each decade in the nineteenth century.³ Accepting his figures of 187 million for 1800 and 266 million for 1850, Europe increased in the first half of the nineteenth century by 42.2 per cent. If it increased during the preceding fifty years at the same rate, its population in 1750 was about 131.5 million; if it increased at a lower rate, as it probably did, its population in 1750 was above that.

Another method starts with estimates or so-called "censuses" for various parts of Europe before 1800.⁴ Where such a return has been found, the population of that country in 1750 has been estimated by assuming a rate of annual increase between 1750 and 1800 equal to that derived from the two censuses embracing part of that half-century. Seven countries in different parts of Europe including between one-fifth and one-fourth of its population increased as a whole between 1800 and 1850 by nearly 50 per cent, but in the preceding half century, if the figures reproduced by Bertillon may be accepted, by only 28 per cent or less than three-fifths as fast. If it be supposed that the rates for all Europe in the two periods differed similarly, that continent in the second half of the eighteenth century increased not by 42.2 per cent but only by 24.1 per cent.

¹Walter F. Willcox, "The Expansion of Europe in its Influence upon Population" (1906).

²Walter F. Willcox, "The Expansion of Europe in Population" (1915).

³G. Sundbärg, *Aperçus Statistiques Internationaux, Dixième Année* (1906), p. 28. For our purposes these results are better than the earlier ones of Inama in *Statistische Monatschrift* (1901).

⁴Jacques Bertillon, *Statistique Internationale* (1899), pages 8-34.

On that basis its population in 1750 was a little over 150 million.

The rate of increase in Europe, 1750-1800, may be supposed to have been to the rate 1800-1850 as the latter was to the rate 1850-1900. This assumption points to an increase of 35 per cent in the population of Europe, 1750 to 1800, and so a population in 1750 of about 140 million. This intermediate result should be preferred, perhaps, to the others and so 140 million accepted as the most probable population of Europe in the middle of the eighteenth century.

The probable population of China at that date next calls for consideration. Parker's figure for 1750, as we have seen, is 179 million and Chang-Heng Chen's for 1748 is 177 million. The official returns no doubt showed these totals. If the estimate of 70 million already reached for the population of China in 1650 is accepted, this increase of 156 per cent in a century, or nearly one (0.94) per cent a year, although high, is not incredibly high. Parker gave also the number of families for nearly every year between 1651 and 1734. The number of families in 1653 has been assumed to equal the average for the years 1652-4, and that in 1733 to equal the average for the years 1732-4. The increase in the 80 years is about 80 per cent or three-fourths (0.75) of one per cent annually. If one holds to the figure of 70 million for 1650, and applies this rate of increase derived from the increase of families to the whole century, a population of 148 million in 1750 is reached. If the official figure of 179 million is preferred, one must assume apparently either that after 1734, when the figures available for families end, both families and population increased more rapidly than before, or that through the century population increased faster than families because the families were gaining in size. Since 1712 the population returns are said to have been of no administrative use but to have been maintained for religious or traditional reasons. The figures show that throughout the two centuries since 1712 the reported increase of population in China and in the several provinces has been incredibly regular and almost incredibly rapid. In view of these facts, it may be permissible to adopt the theory that the official figures after 1712 exceeded the truth more and more, and to estimate the population of China in 1750 at 148 million instead of the official 179 million.

Another method is to assume that, after the disorders which began with the Taiping Rebellion in the middle of the nineteenth century or even earlier with the first war between China and Great Britain, there was no steady and regular growth in the population

of China but rather an ebb and flow, the excess of births over deaths in ordinary or normal years being balanced by the excess of deaths over births in the numerous years of civil war, flood, famine, or pestilence.

For the period of two centuries, 1650-1850, the annual Chinese figures of population are given by Parker,¹ those between 1651 and 1734 by families or households and those between 1741 and 1851 by heads. To make of this long record a brief and consistent series, the number of households before 1734 has been multiplied by 6, Parker's figure for the average size of a household, and 5-year averages computed. The results show that between 1660 and 1710 the rate of growth was moderate, but that after 1710 it was much more rapid. The average rate between 1710 and 1850, five-sixths of one per cent, was five times as great as the average during the preceding half-century. The few books upon Chinese history during the Manchu dynasty which have been examined do not reveal any political or economic reason for the change. It does not appear that the production of food in China increased notably or that the consumption of food per head declined. One is brought back to the statement of Sacharoff that the emperor's edict removing fiscal motives for a careful enumeration was an important factor. This left the local officers free to follow the local tradition modified by a local desire, reinforced perhaps occasionally by what was understood to be the desire of the emperor, for a large and growing population. The annual returns of households between 1651 and 1710, also, carry on their face evidences of untrustworthiness. There are 58 returns, purporting to show in thousands the number of households in China. Each contains five integers. Thirteen are exact repetitions of those of the preceding year, in nine only one figure and in eleven only two figures of the five were different. Three-fifths indicate that they were carried over with little change from the preceding year. If the original returns were by provinces and could be found, a similar analysis might be applied to them.

As the case now stands it seems best to adopt the Chinese returns before 1712 not as trustworthy but as better than nothing, to reject those between 1712 when the more rapid increase began and 1910 and those after 1910, to assume that between 1850 and 1930 the population of China has been stationary, and to distribute the increase between 1712 and 1910 over the years between 1712 and 1850 at a uniform annual rate. This method yields 158 million as

¹E. H. Parker, "Note on Some Statistics regarding China" (1899), pages 150-156.

the population of China in 1750. Not only does the method seem preferable to either of the preceding, but the result falls between the 148 million resulting from projecting the rate of increase between 1654 and 1734 and the official figure of 179 million.

If the population of Japan in 1650 was 23 million and if in 1732 it was 30 million, then, assuming a uniform rate of growth, the population in 1750 was about 31.8 million.

The population of India in A.D. 1650, as we have seen, was probably about 100 million, that in A.D. 1850, as will appear later, was about 205 million. Assuming a uniform rate of increase, the population in A.D. 1750 was about 144 million.

If the rest of Asia included in 1650 about 57 million (page 53) and in 1850, according to the revision of Dieterici's figures (page 74), about 91 million then in 1750 it had probably about 72 million and the population of the whole continent would stand as follows:

<i>Population in Millions</i>	
China	158
Japan	31.8
India	144
Rest of Asia	72
	406
Total	406

For Africa and for Australia and Polynesia no evidence has been found warranting a change in the figures already adopted for 1650.

About the Western Hemisphere, also, the evidence is meager. For what was later to be the United States, current estimates are supported by assuming that during each decade between 1750 and 1790, the population increased as it did between 1790 and 1800 by 35 per cent. For Mexico, Humboldt gave figures relating to 1793 and 1803 and believed that the population was doubling in from 30 to 40 years. For Cuba also he gave much evidence, and the writer analyzed the early returns from that island in connection with the Cuban census of 1899.¹ The population of Porto Rico may be estimated from returns for 1775 and 1800. Returns from Jamaica for before and after 1750 exist, and it has been assumed that in 1750 as in 1823 that island contained about 52 per cent of the population in the English West Indies. Similar methods have been used for the

¹U. S. War Department, *Census of Cuba, 1899: Appendix XVII*, "Previous Censuses of Cuba," pp. 702-713.

other West Indian islands. Central America, or Guatemala as it then was named, had early in the last century about one-fourth (26 per cent) as many people as Mexico. Thus the estimates of the population of North America in 1750 set forth in Table 12 have been constructed.

TABLE 12.
ESTIMATED POPULATION OF NORTH AMERICA, 1750
(In Thousands)

Canada.....		60
English continental colonies.....		1,200
Jamaica.....	127	
English West Indies.....		244
Cuba.....	150	
Porto Rico.....	32	
Santo Domingo.....	95	
Spanish West Indies.....		277
Guadeloupe.....	82	
Haiti.....	285	
Dutch, West Indies.....		435
French Danish & Swedish West Indies.....		58
Mexico.....		2,500
Central America.....		650
Independent Indians.....		900
Total for North America,		6,324

If the preceding results are accepted and if South America had in 1750, as apparently it had a century earlier, about 95 per cent of the population of North America, then it had some 6.1 million inhabitants, and the results for the Western Hemisphere in 1750 are:

<i>Population in Millions</i>	
North America	6.3
South America	6.1
	—
Total	12.4

By combining the foregoing, the approximate population of the

earth and the continents in 1750 is found to be somewhat as follows:

<i>Continent</i>	<i>Estimated Population of the Earth in Millions about 1750</i>
Europe	140
Asia	406
Africa	100
North America	6.3
South America	6.1
Australasia and Polynesia	2
Total	660

When the question of the population of the earth and the continents at the beginning of the nineteenth century is opened, it is found that the writers were more numerous but the evidence, at least for the population of Europe, was no better. Volney in 1803 gave it 140-142 million, a gross understatement, and Pinkerton in the following year, perhaps adopting the earlier Süssmilch result, said "150 million may be assigned to Europe." The earliest of Hassel's statements is dated 1809, when he allotted to Europe 179 million inhabitants. Malte-Brun probably published in 1810 that part of his voluminous *Précis* which contains his estimate of the earth's population. In the English translation, dated 1824, his statement reads: "Europe... may contain 170 millions of inhabitants." Graberg de Hemsö in 1813 gave Europe 180 million. Balbi's estimate of 704 million for the earth seems to have included no figures for any divisions of Europe or even for that continent as a whole. His total for the earth was raised later and at that time his figures for Europe were 228 and 229 million. It is probable, therefore, that his earlier figure for Europe, if he had one in mind, was somewhat above 200 million. His reputation as a geographer stood very high and his endorsement of Hassel's *Umriss der Statistik*, published in 1823-4 as containing "the best work that has yet been done in this field," may be used to preface the quotation from Hassel's *Lehrbuch der Statistik* published in 1822, the only work of his I have seen, that "Europe has about 200 million inhabitants," a statement from which Balbi may have taken his earlier idea. No one of these writers presented as much evidence or studied the question with as much care and thought as their American contemporary Morse or their predecessors Riccioli and Süssmilch.

But the survey does show that, early in the nineteenth century, the leading geographers of Europe gave that continent not less than 140 million and not much more than 200 million inhabitants.

Several writers at the end of the nineteenth century sought to estimate the population of Europe at its beginning, in order to determine how much it had increased during the hundred years. Levasseur and Bodio in 1902 gave Europe 175 million inhabitants in 1800; Inama and Juraschek in 1901 gave it 185 million and Sundbärg in 1906 gave it 187 million at the same date.¹ The figures of Levasseur and Bodio cannot easily be compared with the others, because they gave the population of the several countries within the boundaries of 1800 and the others within the boundaries of 1900.

Before consulting these sources an estimate was made by combining figures of Bertillon² and Juraschek,³ and a total of 188 million reached. But it is best to adopt Sundbärg's figure, 187 million, which was made more carefully and by a better authority.

This survey about opinions at the beginning and the end of the century points to two conclusions. First, the problem is one of mixed geography and statistics, and during the first part of the last century no scholars gave it serious attention. Secondly, the evidence towards the end of the nineteenth century was much greater in amount and better in quality than that at the beginning.

Asia has previously been given about 406 million people in 1750. To estimate its population in 1800 the next step should be to ascertain its population in 1850, and that because the earliest careful and significant effort to determine the contemporary population of Asia was made in 1859 by Dieterici.⁴ In his paper he divided that continent into twelve sections; his results for eight may be accepted, but for four they should be changed. About China he had only the evidence of a few western scholars, notably Humboldt, Gützlaff and S. Wells Williams. The last accepted the Chinese return of 1812 and gave China Proper 362 million inhabitants. For reasons already explained, the estimate of the population of all China in 1910 has been reduced to 342 million, and the annual returns of the popula-

¹Levasseur and Bodio, "Statistique de la superficie et de la population des contrées de la terre," p. 106; Inama and Juraschek, "Bericht über die Thätigkeit des statistischen Seminars," p. 596; Sundbärg, *Aperçus Statistiques* (1906), p. 28.

²*Statistique Internationale*.

³In Hübner, *Geographisch-statistische Tabellen*, 1901.

⁴Dieterici, "Die Bevölkerung der Erde." The author had been for twenty-five years professor of political science at the University of Berlin and for fifteen director of the Prussian Statistical Bureau. He was the first man in the nineteenth century to take up seriously the problem of estimating the earth's population, carrying on the work of Riccioli in the seventeenth century and of Süssmilch in the eighteenth.

tion between 1712 and 1910 have been rejected as not furnishing a clue to the changes in the population in those two centuries. It has also been argued mainly from external evidence that the population of China has not increased significantly since 1850. Rockhill, writing in 1904, said: "The present population of China Proper cannot greatly exceed that of 1842."¹ Two years later, and with no knowledge of Rockhill's statement, I expressed a preference for "the earlier conclusion of Dr. Behm that the best basis for an estimate of the present population of China is the census of 1812, namely, 350 million, supplemented by the assumption that the population since that date has been stationary, the calamities of civil war, famine and flood having eaten up the natural increase."² In the intervening years new and better evidence has led to the conclusion that a sounder basis for an estimate of the present population of China is the return of 1910, namely, 342 million, supplemented by the assumption that the population both between 1850 and 1910 and between 1910 and 1930 has been stationary, the calamities of civil war, famine, flood and pestilence in many of the years after the middle of the nineteenth century having neutralized the excess of births over deaths in normal years. So China in 1850 may be assigned a population of 342 million, in place of Dieterici's 367 million.

For Japan also Dieterici's estimate should be reduced, and that from 35 to 32.5 million, because of evidence not available to him. For the Dutch East Indies he had figures of 16 million, and for the Philippines 3.8 million, or 19.8 million for the two. These archipelagoes include less than one-fourth of the entire area of the East Indies. Dieterici assumed that the other three-fourths had a density of population about five-eighths of the average in the Dutch and Spanish East Indies, and so assigned them 57.6 million people. At the present time those three-fourths, namely, Australia, Polynesia and the other East Indies have only about one-sixth as many people as the Philippines and the Dutch East Indies combined, instead of about three times that number, as Dieterici supposed. There is no reason to believe that the ratio in 1850 was greater, but it may well have been less. So they have been given 3.2 million in 1850 instead of 57.6 million, and the whole of Australia and the insular world 23 million, one of which goes to Australia and Polynesia and 22 to the East Indies. For India Dieterici rested upon a careful study two

¹W. W. Rockhill, "Inquiry into the Population of China" (1905), p. 674.

²Walter F. Willcox, "The Expansion of Europe in its Influence upon Population" (1906), p. 56.

years before by Behm, and he upon recent and authoritative publications by Edward Thornton, head of the statistical bureau in the East India House. It seems probable now that both of these writers underestimated the 1850 population of India, the first census of which was not taken until about 1871. Instead of accepting their conclusions it seems better to estimate the population of India in 1850 by assuming that the rate of its increase 1851-71 was equal to the average of the rates of increase 1871-91 and 1881-1901. This method indicates that the population of India in 1850 was 205 instead of 171 million.¹ As a result of these changes, Dieterici's estimate of the population of Asia about 1850 may now be revised thus:

<i>Country</i>	<i>Dieterici</i>	<i>Revision</i>
China	400	342
Japan	35	32.5
East Indies	80	22
India	171	205
Rest of Asia	69	69
	—	—
Total for Asia	755	671

If the population of Asia in 1750 was about 406 million and in 1850 about 671 million, in 1800 it was probably not far from 522 million, the mean of the other two.

For Africa in 1800 the earlier estimate of 100 million for 1650 and 1750 cannot now be improved.

For North America there are the following estimates:

Canada	350
United States	5,300
Louisiana	40
Florida	20
Mexico	5,300
Central America	1,600
Cuba	400
Porto Rico	150
British West Indies	610
French West Indies	200
Dutch, Danish and Swedish West Indies	80

¹Probably even this figure is not large enough because the first census of India, that of 1871, is thought to have suffered from serious omissions. If so, the 1871 base is too small and the 20-year increase 1871-91 is too large, each error tending to make the resulting 1850 estimate too small.

Haiti	350
Santo Domingo	150
Independent Indians	800
	<hr/>
Total for North America	15,350

South America has been assigned in 1650 and 1750 about 95 per cent as many people as North America. In 1823 according to Humboldt it had about 55 per cent as many as the northern continent. In 1800, then, it had perhaps about 60 per cent as many or 9.2 million and the Western Hemisphere about 25 million.

To sum up the results for 1800:

<i>Continent</i>	<i>Estimated Population of the Earth, in Millions</i>
Europe	187
Asia	522
Africa	100
North America	15.4
South America	9.2
Australia and Polynesia	2
	<hr/>
Total	836

The next question is about the probable population of the earth in 1850. For Europe, Dieterici reached a total of 272 million. But his article was published in 1859 and many of his figures spoke for 1857 or later. This is probably the main reason that his total exceeded those of Inama-Juraschek, 265.3, and Sundbärg, 265.9, for 1850. It is difficult to compare his figures with theirs because his speak for countries bounded as in 1857 and theirs for countries bounded as in 1900. Sundbärg's figure of 266 million has been accepted.

For Asia, as already explained, Dieterici's figure has been reduced from 755 to 671 million.

Africa puzzled him greatly; about it he had little more evidence than Riccioli had two centuries earlier. He wrote, "Europe has about 70 to a square mile and Asia 44. Africa is not nearly so densely settled as Europe nor even as Asia... Twenty-five to a square mile might be too many. The returns for single countries

such as Egypt, Algeria and Liberia indicate between 14 and 19 to a square mile; these densities applied to the whole continent would give in the one case 163 million, in the other 217 million." So he assumed as a mean 200 million. This evidence furnishes no reason for departing from Riccioli's guess of 100 million, supported as it is by evidence which has since become known.

For the population of the Western Hemisphere in 1850 much more information is now accessible than Dieterici possessed. He had returns for only three West Indian islands: Haiti, Cuba and Jamaica. He knew the area of the rest and assumed that on them there were about 1,000 persons to a German square mile, which was far above the truth. In revising his estimates use has been made of Humboldt, Stein-Wappäus, Behm and Wagner. The results are given in Table 13, page 77.

For several countries the changes are important, but the net change is negligible. The population of the earth and of these several continents in 1850 may now be estimated as follows:

<i>Continent</i>	<i>Estimated Population of the Earth in 1850</i>
	Millions
Europe	266
Asia	671
Africa	100
North America	39
South America	20
Australia and Polynesia	2
Total	1,098

The population of the earth in 1900 has been carefully studied by many scholars, and only a collation of their results is needed. For Europe there are the following estimates in millions:

Inama-Juraschek (1901)	392
Levasseur and Bodio	401
Sundbärg (1906)	401

More than two-thirds of the difference between the first and third scholars lies in the figures for European Russia. Inama reproduced those of the census of 1897, the only careful enumeration taken in Russia before the World War, while Sundbärg estimated

TABLE 13.

ESTIMATED POPULATION OF THE WESTERN HEMISPHERE ABOUT 1850
(In Thousands)

Country	Dieterici (1859)	Revision of Dieterici's figures
British America.....	2,571	2,400
United States.....	23,192	23,200
Mexico.....	7,662	7,300
Central America.....	2,150	2,100
Haiti.....	1,133	1,133
Dominican Republic... }		
Cuba.....		
Jamaica.....		
Other Antilles.....		
North America....	38,981	38,873
New Granada.....	2,250	2,250
Venezuela.....	1,356	1,490
Ecuador.....	900	816
Peru.....	1,700	1,888
Chile.....	1,300	1,287
Bolivia.....	2,326	1,800
Brazil.....	7,678	7,678
Argentina.....	1,235	1,100
Uruguay.....	150	150
Paraguay.....	600	500
Guiana.....	171	100
Wild Tribes.....	320	1,000
Polar regions (South America).....	10
South America....	19,996	20,059
Total,	58,977	58,932

the increase between 1897 and 1900 probably by adding the excess of births over deaths during that interval. Sundbärg's figures are the more suitable. Levasseur and Bodio reached the same total as Sundbärg, 401 million, although they differed from him not a little in the details.

For Asia there is Supan's report of 1901 which reached a total of 814 million. His results have been adopted in the main, but he

gave the Chinese Empire 330 million while the foregoing analysis points to 342 million. If Supan's results for Asia in 1900, Sundbärg's for Europe, Juraschek's for the rest of the world at the same date, and those of the International Statistical Institute for 1929 are accepted, with the change for China already indicated, the figures in Table 14 are reached.

TABLE 14.

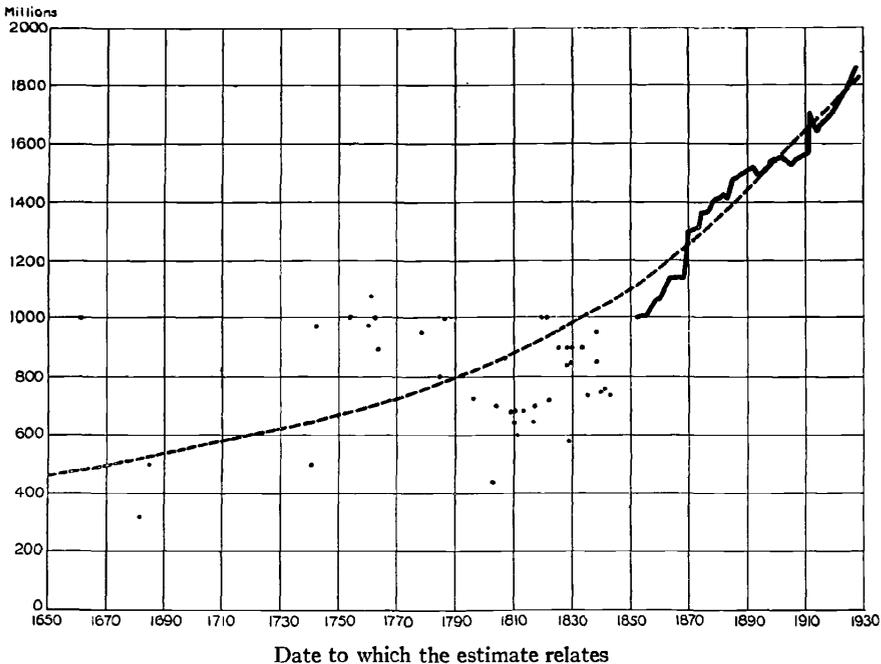
ESTIMATED POPULATION OF THE EARTH AND THE CONTINENTS, 1650-1929.
(In Millions)

Continent	Year						Area ¹ in Million Square Miles
	1650	1750	1800	1850	1900	1929	
Asia.....	250	406	522	671	859	954	16.7
Europe.....	100	140	187	266	401	478	3.8
North America.....	7	6.3	15.4	39	106	162	9.4
Africa.....	100	100	100	100	141	140	10.8
South America.....	6	6.1	9.2	20	38	77	7.3
Australasia and Polynesia..	2	2	2	2	6	9	3.3
Total.....	465	660	836	1,098	1,551	1,820	51.3
Annual Increase per 100,000.....	...	351	474	549	693	553	...
<i>Per Cent Distribution</i>							
Asia.....	53.8	61.5	62.5	61.1	55.4	52.4	32.6
Europe.....	21.5	21.2	22.4	24.2	25.9	26.3	7.4
North America.....	1.5	1.0	1.8	3.6	6.8	8.9	18.4
Africa.....	21.5	15.1	12.0	9.1	9.1	7.7	21.0
South America.....	1.3	0.9	1.1	1.8	2.4	4.2	14.2
Australasia and Polynesia..	0.4	0.3	0.2	0.2	0.4	0.5	6.4
Total.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0

¹Excluding the uninhabited Polar lands; based on International Statistical Institute *Aperçu de la démographie . . . du monde, 1929*, pp. iv, 25-40.

The main results of this Chapter are depicted in Diagram 2. The ascending line represents the population of the earth at various dates since 1650 according to Table 14. The scattered dots represent the contemporary estimates of that population, a record of which will be found in Appendix I, Table I. The annual estimates of the contemporary population of each continent since 1850, according to *Hübner's Tabellen*, are shown in Diagram 3, the figures underlying it being given in Appendix I, Table II. The Hübner figures for Asia have not been revised to bring them into harmony with the present estimates for China.

Diagram 2. Contemporary Estimates (dots and solid line) and Present Estimates (dash line) of the Population of the Earth at various dates between 1650 and 1929. (See Appendix I, Tables I and II, and page 78, Table 14).



This evidence indicates that in less than three centuries the population of the earth has nearly quadrupled and that the rate of its increase accelerated until about 1900 but slackened after that date. Asia seems to have gained at first more rapidly than any other continent; between 1650 and 1800 its proportion of the world's population increased by 10 per cent. Since 1800 the proportion has fallen and it now holds about the same relative position that it did in 1650. Europe and the Americas lost ground relatively between 1650 and 1750, but in the following two centuries North America gained 8.0 per cent, Europe 6.1 per cent, and South America 3.7 per cent, or together 17.8 per cent, these shifts having been offset by a relative loss during the same period of 11.2 per cent in Asia and 6.8 in Africa. Africa has lost in relative population almost without a break, its present proportion being little more than one-third of what it was in 1650. In view of that change and of the diminished importance of tropical America in comparison with its populousness before the whites arrived, it might be held that in modern times man

has become less tropical in his habitat and more a denizen of the temperate, perhaps even of the cold temperate zones.

When this study began the writer believed that a main cause of the unprecedented growth of population in modern times had been the widening influence of Europe.¹ Perhaps for the period since 1750 that contention is correct. But if the foregoing results are accepted, the century before 1750 was characterized by a growth in the relative size of Asia's population at the expense of every other continent. In that century the population of the Americas dwindled, that of Africa and Oceania was stationary, and while the population of Europe increased, it did so at a rate not much more than half that of Asia. Since 1750, on the contrary, Europe's rate of growth has been more than twice that of Asia. May the new evidence be reconciled with the old in the statement that when and where the production of food or of food and other economic goods has rapidly increased, population also has increased and often the standard of economic life has risen? Whether there was a great increase in the production of food in Asia between 1650 and 1750 or 1850, as there almost certainly has been since 1850 both there and in Europe and America, does not appear; but if there was not, it will be found difficult or impossible to accept the present and provisional figures for that part of the world.

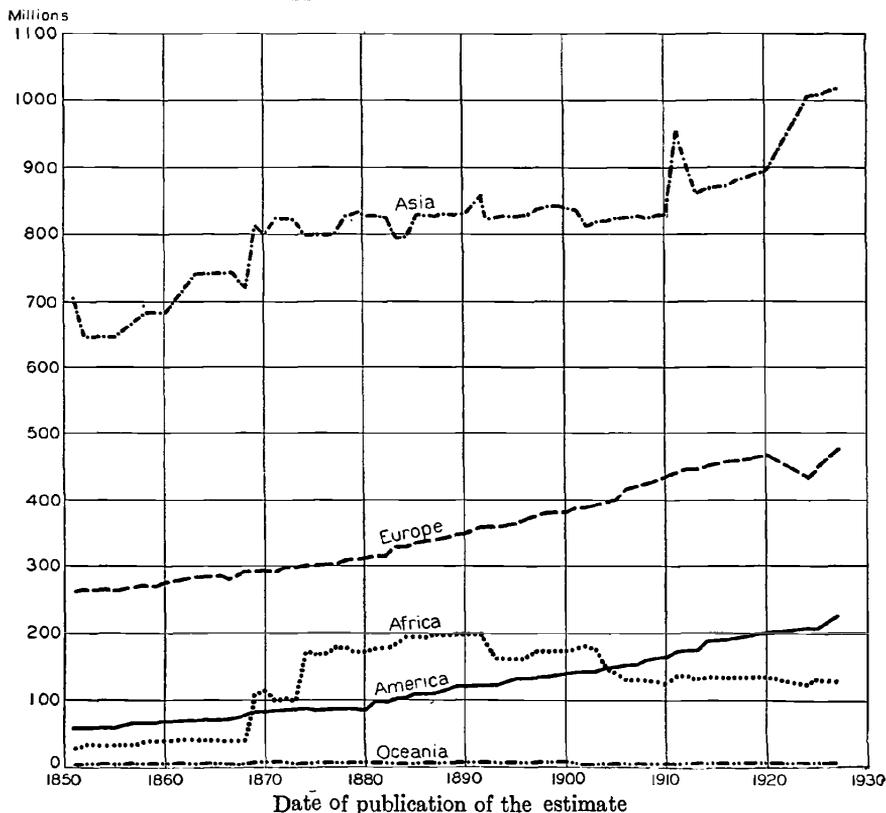
Human races have not yet been defined in a way to receive general acceptance. Until that is done, an effort to determine their number and their rate of growth would be premature. But the present study has some bearing upon the increase of whites and of American Indians or Amerinds.

Whether the number of Amerinds in the Western Hemisphere 500 or 1000 or 2000 years ago was much greater than it was when Columbus crossed the Atlantic, is a question which need not now be considered. Americanists apparently believe that the aboriginal population of America decreased rapidly between 1500 and 1650, and at the later date was near its minimum. If the present estimate of 13 million people, practically all Amerinds, in America in 1650 be accepted, the question whether there are more or less today apparently finds the authorities agreed upon the answer. Spinden estimates the present number at 26 million, two-fifths in Mexico and about half in each of the two continents.² Because persons of mixed bloods were counted in this estimate according to the propor-

¹Walter F. Willcox, "The Expansion of Europe" (1906 and 1915).

²H. J. Spinden, "The Population of Ancient America" (1928), page 643.

Diagram 3. Contemporary Estimates of the Populations of the Continents, after Hübner 1851-1927. (See Appendix I, Table II.)



tion of their Indian blood, it cannot easily be compared with those in which the pure bloods and mestizos are distinguished. Other estimates point to similar results:

Writer	Date	Pure Bloods	Mestizos
Keane ¹	1902	9.9	12.3
Bryce ²	1914	16-17	19
Willcox	1930	14.4	18

Any one of the preceding estimates would indicate that there is more Indian blood now in the Western Hemisphere than there was in 1650 unless the number of Amerinds then was much above 13 million.

¹A. H. Keane, in Mill's *International Geography* (1902), page 106.

²James Bryce, *South America* (1914), pages 458 ff.

The increase of the white or Caucasian races since 1650 can be shown more exactly. In such a rough survey it is unnecessary to take into account the minor Mongoloid or other non-Caucasian stocks in Europe. The general results are brought together below.

*Population of unmixed European Stock
(in millions)*

	1650	1929
Europe	100	478
United States		95.8
Canada and Newfoundland..		8.9
Mexico		2.7
Cuba		2.1
Rest of North America		0.3
North America		109.8
South America		30.2
Africa		3.4
Asia		13.3
Oceania		6.9
 Total		 642

There are now about 164 million persons of European stock living outside of Europe, nearly one and two-thirds as many as there were in Europe in 1650, or one-third as many as there are now in Europe. Of these 164 million, nearly three-fifths are in the United States. The non-European stocks in the world have increased since 1650 about 3.2 times; the European stocks about 6.4 times, or twice as fast.

The figures in this chapter may be left with the comment of an eighteenth century predecessor upon his own results. "They are not to be viewed with much confidence but they are a first step towards the truth. The proper way to criticize them is to displace them by more accurate figures. They are like old maps of unexplored parts of the world, useful or even necessary until rectified by new discoveries."¹

¹Moheau, *Recherches et considérations sur la population de la France* (1778), p. 62.