The Trends in Western Civilization Project, No. 3

SOME LONGITUDINAL TENDENCIES

by

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Introduction

One of the first tasks in this project was to try to get some
ideas about the more "objective" variables and their variation.
In the first effort in that direction the focus is on population
(including marriage age as one of the conditioning factors),
urbanization and the climate. Later, the focus will be on ecology
and the division of the population on sectors of economic activity.

1. Development of population.

In the following pages we shall give some estimates for
population in European and Mediterranean countries back to Roman
times. The works og J.C.Russell, C.Clark and K.J.Beloch have
provided most of the material.
Number is given in million of inhabitants, except table 4.

(1) The British Isles

Table 1   THE BRITISH ISLES

Year:	England:	Wales:	Scotland:	Ireland:
0	0,3			
200	0,3			
400	0,2			
600	0,5	0,1		
800	0,7			
1000	1,0			
1086:	1,1			
1200	2,5			
1348	3,757			
1400:	2,0	0,125 (1377)	0,35	0,5
1500	3,220 (1545)	0,25 (1545)	0,69	0,75
1600	4,6		0,85	1,2
1650	5,2		0,95	1,6
1700	5,8		1,04	2,5
1750	6,1		1,25	3,1
1800	9,1		1,6	5,2

Sources: The estimate for ancient and medieval times are Russell's.
While he - for lack of other evidence - assumes an even develop-
ment 1086 - 1348, Hollingsworth thinks the middle of the 1100's
to be the most violent period of growth. The 1200

estimate is increased according to this. For modern times Clark
is the source. Oxford English History, Economic Survey of
Ancient Rome (ed. Frank) is also used.

Comments: The earliest estimate commonly accepted is a 1348
estimate near four million. There is reason to believe that
1086-population recorded was nearer two million.

Other ancient estimates: 1.5 million (Wheeler), 1 million
(Collingwood), 0.5 million (Collingwood). The Roman Army was
comprised of nearly 70.000 and was supported by Britain (Colling-
wood). It seems that Russell's estimate might be raised.
Population was definitely higher in medieval times. Regarded
in this light even one million might be high.

Ancient trend: It is in general assumed that population
rose - contrary to Russell. Russell based his evidence mainly
on the rise and fall of Roman towns. It has been shown (Colling-
wood) that the disappearing of Roman towns in no way can be
regarded as an economic collapse - rather as progress. As
mainly import centers their role waned with growing self-supply.
In the meantime trade moved to the countryside where new
cloth exporting industry was developed. Up to 350 economic
progress dominated Britain.

Other medieval estimates: The 1086 figures is often believed
to be 2 million - thereby assuming larger households.(Atsatt
and others). The 1348 figures is more commonly accepted. Postan
regards 4 million as "limit". Up to 1.0 claimed for 800's
(Vinogradoff),0.8 (Collingwood).

Early medieval trend (500-1050): Population moved from
Roman (mainly chalk soil) villages to tilling new (clay soil)
areas after Anglo-Saxon invasion. More widespread use of
heavier plough and oxen power was connected with it. The period
is regarded as one of extensive clearance. Postan regards the
latter part of this period as the biggest growth period. Anyway,
population rose.

High medieval trend: (1086-1350). The growth rate has
been interpreted as even (Russell), falling (Atsatt), peaked
1140-70 (Hollingsworth). The rising prices of food have been
taken as a sign of pressure from population around 1200 (Postan).
Prices fell slightly after 1315 - with widespread evidence
of population stabilizing.

Wales, Scotland, Ireland: 0.1, 0.12, 0.4 in 1086 (Russell).

Late medieval estimates: The Black Death repeatedly struck
at Europe over a century. Atsatt has 2.5 million for 1485.
Some prefer a stable population until 1520. In the latter
part of the 1400's settlement contracted.

Late medieval estimates: The Black Death repeatedly struck
at Europe throughout the century after 1348. Downfall might
have continued until 1450 - reaching under 2.0 (Hollingsworth)
2.5 million for 1485 (Atsatt).

Late medieval trend: There is broad agreement that population
fell until early 1400's and might have continued to do so till
1450. Population remained stable from the time it stopped
falling and at least to the late 1400's; some see no rise
until the 1520's. In the latter part of 1400's settlement
contracted.

Later estimates are not seriously disputed. There was a
downfall in population around the 1550's, growth to 1600. The
Black Death left England in the 1660's. After a downfall in
the mid-1700's acceleration started (Dean, Cole).

Recent: England, Wales and Scotland numbered 10.5 million
in 1800. In 1870 there were 26.1, when growth slowed down.
1900: 37 million, 1950: 51 million.

Ireland dropped from 7.8 million to 5.4 between 1830 and
1870, 1900: 4.5 million, 1950: 3 million.

Table 2 F R A N C E

Year:

Year	France
0	6,0
200	6,5
400	4,5
600	2,7
800	4,5
1000	5,4
1200	9,2
1300:	15,7
1348	17,5
1500	14,4
1600	15,4
1650	20
1700	20
1750	21
1800	28,3

Table 3 SPAIN and PORTUGAL

Year:	Peninsula:	Spain:	Portugal:
0	6,0	6,0	
200	9,0	9,0	
400	4,0	4,0	
600	3,6	3,6	
800	4,0	4,0	
1000	7,0	7,0	
1200	8,0	8,0	
1285:	8,3	8,3	
1348		8,25	1,25
			1,0 (1417)
1500		6,902	1,129
			1,5 (1527)
1600		6,0	1,3
1650		5,0	1,3
1700		6,4	1,6
1750		8,2	2,3
1800		10,5	2,9

(2)   <u>France</u>

<u>Sources</u>: Russell, Clark.

<u>Comments</u>: There seems to be agreement about 20 million inhabitants in the late 1600's. It is hard to accept that the medieval population was larger or the ancient not less.

<u>Other ancient estimates</u>: Russell made various estimates ranging from 5 to 8 million. Beloch has about the same magnitude. 8 million (Levasseur for 200 A.C.). Estimates vary up to 30 million.

<u>Ancient trend</u>: Population might have risen under Roman rule (Clark).

<u>Other medieval estimates</u>: 6-8 million in the 700's (Levasseur), 8 million at 1050 (Levasseur). Before the Black Death: 30 million (Krause, accepted by Clark), 23-24 (Lot).

<u>Medieval trend</u>: It has been shown that clearance and settlement occurred in France after 400.(Smith). However, Levasseur lets the population fall to the 700's, Russell to 600. There is common agreement that after 1000 expansion had started. Some think that growth accelerated after 1260 (D'Avenel) due to serfs becoming free-holders. At 1500 there had been considerable repopulating of the country after the Black Death.

<u>Recent</u>: From 28.3 million in 1800 it reached 37.7 in 1870. Including Alsace and Lorraine there were 40.7 in 1900 and 42 million in 1950.

(3)   Iberian Peninsula

Sources: Russell, Clark. The estimate for year 0 is
Beloch's. Russell gives various estimates. We allow a rise
in 200 A.D.

Other estimates: 8 million in 100 A.D. (Vandellos). It
is in general believed that population rose under the Romans
and fell in early medieval times (Clark).

At 1500: 10 million (Vandellos), 7-9 million (Cortes).
Reinhardt supports Russell at 7 million.

At 1600: Falling from 8 to 7.3 million in 1600-s, repopulation
before 1660 (Cambridge).

Regional distribution: Baetica (Andalusia) densest populated,
1½ million (Beloch). About 1400 the Kingdom of Aragon had 0.7
million (Reinhardt), in 1500 0.85 million (Cambridge) against
6 million in Castilla.

Population trend: after depopulation in early medieval times
Roman level was regained in 1300 (Vandellos). After participating
in late medieval decline population rose in 1500 (Cambridge)
and fell markedly in 1600's.

Recent: Spain from 10.6 million (1800), 18.6 (1900), 33.3
(1970). Portugal from 2.9 million (1800), 5.4 (1900), 9.6 (1970).

(4)   The Scandinavian Countries
Source: Clark

Censuses: However imperfect they were, they were taken
from the 1600's. From there on estimates ought to be reliable.
The 1100 estimates are by Thorarinson, the 1300 for Norway from
Lunden.

Other medieval estimates: Norway: about 0.25 million (Steinnes

Population trend: Migration in 800's and 900's might have
been considerable (100.000 Schreiner). Scandinavia participated

Table 4.

	Millions			Thousands				
	Nederland	Belgium	Switzerland	Denmark	Sweden	Finland	Norway	Iceland
0	0.15	0.2	0.3					
200	0.16	0.22						
400	0.1	0.15						
540								
600								
800	0.1	0.15						
1000	0.26	0.34					77	
1100					500		250	
1200			0.6(1300)					
1340							450	
1400			0.625					
1500	0.7	0.9			500		180 (1520)	
1600	0.7	0.9			900 (1635)			
1650	0.9	1.2		450			430 (1660)	
1700	1.2	1.6			1460 (1721)		600	50 (1703)
1750	1.6	2.2					769 (1769)	50
1800	2.1	3.1	2.19 (1837)	930	2350	830	880	50

in the common medieval increase. In Norway repopulation
was notable from 1520's. The Icelandic trend is strange, due
to limited natural resources.

Denmark: is reported to have had - including some possessions
now lost - three times the Norwegian population in late medieval
times. 1900: Norway 2.24, Sweden 5.14, Denmark 2.45, Finland 2.71

(5)   Belgium, Netherlands, Switzerland.

Source: Clark

Population 1650 is extrapolated backwards according to
French trend in all three countries.

Other estimates: A 35 / square km. estimate for Brabant in 1374
would give 1.1 million to Belgium, 1.2 million to Netherlands, 55 /
sq.km. 1.7 and 1.9 million respectively in 1437. These figures are
near French average. Russell's estimate for Brabant 1500
indicates falling population. The trend reversed, however,
during the 1500's and lasted in Netherlands until 1700 (Clark).
1900: Belgium 6.75, Netherlands 5.10, Switzerland 3.31.

Table 5   I T A L Y

Year:			
0	7,1	1600	11,5
200	8,o	1700	13,4
400	5,o	1750	15,5
600	4,o	1800	18,1
800	4,o		
1000	5,o		
1200	7,8		
1348	9,3		
1500	10,o		
1550	11,5		

(6) <u>Italy</u>

<u>Sources</u>: Beloch (0 and from 1500), Russell.

<u>Other estimates</u>: 14 million (Frank), 6 million (Russell), 6-7.1 (Beloch) in ancient times.

<u>Population trend</u>: At 0 population was in decline, except in the north. The country was depopulated in the 500's. Growth was often checked by warfare.

<u>Population of Rome</u>: 350.000 in the year 0, 240.000 at 200, 175.000 at 250 (Russell).

<u>Regional distribution</u>: Sicily 0.6 at year 0 (dropping from 0.8 at 400 B.C.) in ancient times (Beloch), what it nearly had in early modern times. Sardinia: 0.5 million in ancient times, 0.6 in the 1200's. Southern Italy: 2.5 in ancient times, 2.0 in the 1200's, North Italy from 1.6 to 2.4, Central Italy at 2.7.

<u>Recent</u>: 17.2 million (1800), 32.5 (1900), 1.6 million added 1919.

(7) <u>Germany and Austria</u>

<u>Source</u>: Clark, from Russell and Abel. Clark's figures are split according to 1816-division. War losses in the Thirty Years War are attributed to Germany. Clark's figures represent present Germany, in ancient times. They represent non-Roman Germany.

<u>Eastern territories</u>: Comprised perhaps 3/4 million (see Poland) in 1340's. About 2.5 million in 1816 (25 sq.km., Clark) or about 3 million in what was then German territory east of Oder. It might have been half in 1750 (Reinhardt).

<u>Other estimates</u>: 5-6 million in the first century, 20 million in 1618, dropped to 13 million in 1648 (Cambridge). Other scholars prefer heavier drop in population in 1650 than is in the table.

Table 6   GERMANY and AUSTRIA

Year:	Germany:	Austria:
0	3,1	0,4
200	3,1	0,4
400	3,1	0,4
600	2,1	0,3
800	3,5	0,5
1000	3,5	0,5
1200	6,5	1,5
1348	11,4	2,6
1500	8,9	2,1
1600	12,2	2,8
1650	9,7	.2,8
1700	12,6	2,9
1750	14,6	3,4
1800	19,o	4,3

Table 7 Year:	Poland:	Czechoslovakia:	Hungary:
1000	0,8	0,3	o,3
1200	1,1	0,5	0,5
1348	1,4	0,6	0,7
1500	2,7	1.1	1,3
1600	3,9	1,6	1,o
1650	3,9	1,6	0,8
1700	3,1	1,3	0,8
1750	4,1	1,8	1,2
1800	6,3	2,6	1,7

(8)   Poland

Sources: Clark, Poland split up according to area. The estimates apply to bigger areas which are split up.

Other estimates: Polish scholars (Fryde m.m.) 1.0-1.3 million in 1340's on densest populated 2/3 of Polish territory. Perhaps 1.5 all together, 0.6-0.7 in German territories. This supports our figure. 9.0 in 1800 (p. 106, Clark); the estimate of 1800 is based on 20 persons per sq. km. Recent: 25.6 million in 1900, 25 million in 1950 (35 million in 1940).

(9)   Czechoslovakia

Sources: Clark. Bohemia, Moravia, Slovakia are separated out from Poland and Hungary. 1800-estimate is based on 20/sq.km. Reinhard supports this figure. 11.1 million counted in 1880, 12.7 (1900), 12 million (1950).

(10)   Hungary

Sources: Clark. Hungary separated out. Other estimates might be based on other territorial units.

Other estimates: About 1.9 (1787), 2.0 (1804) - Reinhardt (20 and 21/sq.km.). Earlier estimates: Maccartney (1400's, 1700) supports our figures, Reinhardt (1700) estimates 20% lower.

Population trend: It seems agreed that population was halved or near so from 1400 to 1700. Recent: 6.9 million in 1900, 9 million in 1950.

Table 8	Greece	Bulgaria	Romania	Yugoslavia
0	3.0	0.6	0.5	1.3
400	2.0	0.8	1.1	1.4
600	1.2	0.5	0.6	0.8
800	2.0	0.8	1.1	1.4
1000	2.0	0.8	1.15	1.4
1200	2.0	0.5	1.0	1.3
1340	2.0	0.5	1.1	1.5
1500	2.0	0.6	1.8	2.5
1600	2.0	0.9	1.85	2.5
1650	2.0	1.0	1.8	2.3
1700	2.0	1.3	2.1	2.7
1750	2.0	1.5	2.7	3.5
1800	2.0	1.7	3.25	4.3

Table 9   R U S S I A

Year:	European Part:	Asian Part:
1000	7,5	5,o
1200	6,o	6,o
1348	8,o	6,o
1500	6,o	6,o
1600	11,o	6,o
1650	14,5	6,o
1700	19,5	6,o
1750	28,o	6,o
1800	40,o	6,o

(11)   Greece

Sources: Beloch, Russell, Clark

Other ancient estimates: About 330 B.C.: 2.5 million
in Greece, 3-4 million in Macedonia (Glotz). It fell until
0 when Beloch put it at 3 million together. From here it
was stationary (Clark).

Population of Athens: 200.000 in 431 and 300 B.C. Beloch
thinks it fell from its peak level in 431 B.C.

Recent: The country had 5.5 million in 1920.

(12)   Balkan

Sources: Russell, Clark.

Clark's figures are separated according to countries,
assuming an even distribution on sq.km. Ancient sources
indicate a sparse population. 5 million 950-1350 indicated
by Cambridge Economic History.

Recent: Romania: 3.9 million counted in 1879, 6.0 in 1900,
16.3 in 1920. Bulgaria: 2.0 million counted in 1880, 3.74 million
in 1900, gained 0.5 in the Balkan war, 4.85 (1920). Yugoslavia:
12.0 in 1920.

(13)   Russia

Sources: Medieval estimates are Russell's. The modern are
taken from various scholars, references will be found in Clark.

Comments: The European part of the Russian Empire is
estimated to have had 14 million inhabitants in 1722.

(14)   The Near East

Sources: Russell, Clark. We have left Turkey out and
grouped Syria, Libanon, Palestine and Jordan. Consistent with
Beloch 70% of the total population is attributed to Turkey.

                              Turkey

Other ancient estimates: 13.5 million (Beloch, around 0).
Regional distribution: Densest in southwest - 6 million out of
13.5 in province of Asia (Beloch).

Population of Byzants: 160.000 in the 500's (Russell) -
it might have been 200.000. At 1500 perhaps 300.000 (Cambridge),
the biggest in Europe.

Other medieval estimates: 8 million 950-1350, risen
from perhaps $6\frac{1}{2}$ in the 500's (Cambridge Economic).

Population trend: Some has favored more pronounced
progress than our tables: falling until the 600's, strong
growth in 700's and at least into the 900's. (Ostrogorsky).

Recent: 5.5 estimated for 1800 (Bonné). It reached
11 million in 1900, 21 in 1950.

Table 10   The Byzantine Empire

Year	Area in 1000 sq. km. (Andreades, Ostrogorsky)
422	745
560	1010
770	405
959	420
1024	545
1180	390

Table 11 Population of the Byzantine Empire

	400	600	800	1000	1200
Asia Minor, Greece	11.3	7.3	8.0	6.7	6.7
Balkan	3	1.8	3	3	2
Syria	5.7	3.7		3.3 *	
Egypt	4	2.7			
North Africa		1.8			
Spain		1.0*			
Italy		3 *	3 *	3 *	
	26	22.5	16	18	8.7

*marks territory partly held in the most populated parts of Syria, Spain and Italy.

Cyprus

Turkey includes Cyprus. Ancient estimate 0.5 million. 170.000 is estimated in the 1500's, about the same as counted in 1881.

Syria

Other ancient estimate: 6 million (Beloch). Population increased in the 300's and 400's (Jones), unusual in that period. Devastated by war in the 600's.

Recent: 1.1 million in 1800 (Bonné), 3.0 in 1900.

Iraq, Persia, Arabia

Sources: Beloch, Russell, Usher.

It is reported that arable territory is far less today than in ancient time in Iraq. Downfall in irrigation may be responsible.

Table 12

	Turkey	Syria, m. Libanon, Palestine, Jordan	Iraq	Iran	Arabia	Total
0	9.3	4.7				20
400	11.3	5.7				24
600	7.3	3.7	9.1	4.6	1.0	15
800	8.0	4.0				15
1000	6.7	3.3				12
1200	6.7	3.3				11
1340	7.3	3.7				11
1500	5.3	2.7				7
1600	4.7	2.3				6
1650	4.7	2.3				6
1700	4.7	2.3				6
1750	4.7	2.3				6
1800	5.3	2.3	1.0	4.0	1.0	6

Table 13	Egypt	North Africa
0	7.0	4.2
200		
400	4.0	2.0
600	2.7	1.8
800	3.0	1.0
1000	3.0	1.0
1200	2.0	1.5
1340	3.0	2.0
1500	2.5	3.5
1600	2.5	3.0
1650	2.5	3.0
1700	2.5	3.0
1750	2.5	2.5
1800	2.5	2.5

(15)   North Africa

Sources: Russell, Clark, Economic Survey of Roman
Empire (Johnson) in year 0.

Comments: Egypt is said to have had 3-5 million
inhabitants about 2600 B.C.

Other ancient: Contemporary sources report 7 million,
7½ later in the first century. Beloch and Russell accept
only 5. There is evidence of falling population after 200 A.D.
Beloch estimates the population of Kyrene (now in Libya) at
½ million.

Medieval: Some reject Russell's figure - putting it to
6-7 million in the 700's (Issawi).

Recent: 2.5 million was registered during Napoleon's
occupation. It rose to 9.7 in 1900, passed 30 million in
the 1960's.

The Cartaginian Empire is believed to have had 3 million
inhabitants.

Other ancient: Beloch gives 6.5 million in the year 0. A
land survey taken in 420, before the invasions, reports former

cultivated areas, up to half, lying waste in the provinces.
The densest populated part was Tunisia.

(16)   Table 14   Ancient Empires

Egypt in 600 B.C.:	7
Assyria in 600 B.C.:	17.3
Persia in 400 B.C.:	40
Alexander's Empire, 320 BC	43
Selenkide Syria, 200 BC	33
China around 0:	73/60 (Clark)
Sassanide Persia, 200 AD	19
Arab Empire at 750	27

Sources: Beloch, Russell, Usher. This is only a rough view.

Egypt

Old-Egypt (2600 BC) might have had 4 million. Greek
sources attribute 7 million for 500 BC, as in the first
century AD. For 300 BC the estimate was 3 million, so it
might have dropped. Glotz puts it at 7 and it is accepted
here.

Syria and Asia Minor

Beloch: 19.5, Russell: 14. Russell's estimate for the
year 0 is used.

Iraq

Taxes were bigger from Babylonia than from Egypt under
Persian rule - relation indicates nearly 12 million if Egypt
had 7 - although Beloch admits 5 (counting 3 in Egypt). The
cultivated area was bigger in Iraq. It is not possible to
indicate any trend except that Russell puts it at 9.1 in 600 AD.
We admit 12 million down to 200 AD. Usher's estimate of year 0:
19 million used.

Arab and Ottoman Empire:

Table 15.	About 650	About 750	About 1540
Arabia	1.0	1.0	1.0
Syria	3.7	4.0	2.7
Iraq	9.1	9.1	1.0
Persia	4.6	4.6	-
Egypt	2.7	3.0	2.5
Turkey			5.3
North Africa		1.0	3.5
Greece			2.0
Balkan			5.0
Hungary			1.3
	21.1	22.7	24.3

2.   Pattern of Marriage Age in Western Europe

This is a summary of an article by the demographer I. Hajnal, published in "Population in History" and edited by Glass & Eversley.

Hajnal points to the fact that censuses made in various countries in the world around 1900 show some Western European peculiarities. These are: high age at marriage, greater proportion of not-married compared to countries outside Western Europe.

Hajnal proves with the article that Western Europe in ancient and medieval times had the "normal" pattern and that things changed during the 1500's or 1600's. Only some data from Hajnal are given; "unmarried" includes both never married and people who have been married.

Table 16.   Percentage unmarried of all women, about 1900.

	25-29 years	45-49 years
Sweden	52	19
Bulgaria	3	1
Serbia	2	1

Eastern Europe about 1900 still shows the "normal" pattern. The percentage of unmarried women 25-29 years varied from 56-59% (Iceland, Ireland) down to 30% (Italy, France) in Western Europe. From there there is a leap down to Hungary (15%).

The border countries - Finland, Italy, Austria - follow Western Europe, as do Spain and Portugal. Minor parts of Italy and Spain, however, differ.

Table 17.   Percentage unmarried of all women

	20-24 years	25-29 years	45-49 years
Iceland	81	56	29
Ireland	86	59	17
Norway	77	48	18
--------	60	30	11
Hungary	36	15	4
Serbia	16	2	1
Thailand (1947)	30	11	3
Korea (1930)	2	1	0

Countries in Asia show the same pattern as Eastern Europe
and so does Africa. In these countries people marry young,
they are not used to people who never marry, and widows/widowers
nearly always remarry.

14 years was considered a fitting age for marrying in
Roman times. A collection of tombstones gave the following
result:

Table 18

Woman's age at wedding	Roman	Norway 1841-50
10-14 years	39	-
15-19	35	8
20-24	15	33
25-30	4	30
31-34	5	14
more than 35	2	15
	100	100

From Hollingsworth's investigation in noble families in England
we find that:

Table 19

Period	% unmarried women		Mean age at first marriage	
	at 20	at 50	Men	Women
1330-1479	42	7	22.4	17.1
1480-1679	45	6	24.3	19.5
1680-1729	75	17	28.6	22.2
1730-1779	76	14	28.6	24.0

These data give a hint that a change occurred in the marriage
pattern before 1700.

Table 20

	Geneva. "Ruling families"			
Period	% unmarried at death over 50	Mean age at first marr.		
	Women		Men	Women
1550-99	2		27.2	21.4
1600-49	7		29.1	24.6
1650-99	25		32.6	25.7
1700-49	29		31.6	26.3
1750-99	31		31.5	24.0

From an unusually well recorded family of Würternberg Hajnal
presents the following:

Table 21

| Period | Mean age at first marriage | |
	Men	Women
1500's	25.3	21.4
1600's	26.3	20.8
1700's	28.9	24.0

Hajnal concludes that a new pattern of marriage penetrated
into the upper classes in the 1500's and spread to the common
people during the 1600's.

3.   Development of cities

What shall be considered as a town? In "An Historical
Geography of Europe 450 B.C.-A.D. 1330" Poundschooses the
unit at 2000 inhabitants and considers less to be primarily
agricultural.

If we accept this unit we will still not always have
complete information about all cities with more than 2000
inhabitants. In a survey of cities in Northern Europe about
1330 Pound tells that 47 cities with more than 10.000 inhabitants
had 0.9 million all together, 220 cities with from 2-10.000
had 1.1 million. We have tried to use an assumption of cities
with more than 10.000 inhabitants having ½ the total city
population.(that is, cities with more than 2000 inhabitants).
Cities with more than 10.000 we usually know about. Tried on
surveys of Roman cities the estimate proves valid. Where only
area is given we have used 100 persons per hectar. This is a
cautious estimate, probably below the average density. J.C.
Russell does, however, reject as high population as this for
all Roman cities. His and Collingwood's (Oxford English
History) estimates for English Roman cities part - 4000 and
15.000 in the case of London.

Sources: J.C. Russell: Medieval Cities
         J.C. Russell: Late Ancient and Medieval Population

Table 22.
          Percentage of population in cities estimated

	1.Century	200-s, 300-s	1086	about 1400
England	4%		4%	8% (1377)
Ireland				9%
Netherlands, Belgium				25%
France	8%	0.5%		6%
Spain	5%		10%	11%
Portugal				6%
Germany	3%	3%		5.5%
Poland				2%
Czechoslovakia				15%

We have a full list for all Irish cities over 2000
inhabitants. Either Irish population estimate is too low or

we have in general been too careful in estimating city popu-
lation. Our estimate for the low countries seems well adapted.
(Pounds). While Spain had 5% city population under the
Romans, Andalusia is estimated to 11%. As the center of the
German Empire in late 1300-s Czechoslovakia might have had
a considerable urbanization.

(1)   Table 23.   Spain and Portugal. City-population in '000.

Until 400 A.D.		Under the Arabs		1300-1400s		ca. 1375	
Cadiz	65	Cordoba	90	Cordoba	90	Lisboa	20
Tarragona	27	Sevilla	52	Barcelona	48	Evora	12
Cordoba	20	Almeria	31	Toledo	40		
Merida	15	Cartagena	29	Sevilla	40		32
Cartagena	10	Toledo	28	Valencia	31.1		
Pamplona	10	Jerez d.l.		Granada	30	City population
	147	Frontera	24	Valladolid	25	6% of 1417
		Palma	23	Zaragoza	19.2	population
		Badajoz	21	Almeria	18	
		Granada	20	Palma	17	
		Murcia	17	Jaen	16	
		Zaragoza	12	Murcia	15	
		Valencia	11	Salamanca	15	
		Malaga	10	Baeza	12.5	
			368	Jerez d.l.		
				Frontera	12	
				Merida	12	
				Burgos	10	

Until 400 A.D.

City population:
5% in cities
over 2000 inhab.

Province of
Baetica: 110000

City population:
11% in cities
over 2000 inhab.

Under the Arabs

City population:
10%

In Andalucia:
244 000

1300-1400s

450.8

City population:
11% in cities
over 2000 inhab.
of 1348 population

(2)   Table 24.   England City-population in '000.

Until 400 A.D.		1086		1377	
London	13	London	18	London	60
Verulam	5	Winchester	6	York	18.1
Others	20	Norwich	4.4	Bristol	16
	38	York	4.1	Norwich	13
		Lincoln	2.6	Plymouth	12.1
		Thetford	2.6	Coventry	12
		Bristol	2.3		
		Gloucester	2.1		131.2
			42.9		

4% of Collingwood's
population estimate

in towns over
2000 inhabitants

City population:
4%

City population:
7% of 1348 population es
8% of 1377 population es

(3)   Table 25 .   France. City-population in '000.

1. Century		200-300s		1300-1400s	
Narbonne	24	Lyon	11.3	Paris	80
Nimes	22	Toulouse	10	Montpellier	40
Autun	20			Toulouse	35
Vienne	22.5		21.3	Rouen	34
Orange	20			Tours	26.3
Lyon	16.5			Strasbourg	25
Avenches	15			Narbonne	25
total	268.5			Orleans	22.5
				Amiens	21
				Bordeaux	20
				Tournai	20
				Reims	19
				Avignon	18
				Dijon	17
				Bourges	16.3
				Beauvais	15.5
				Poitiers	15
				Troyes	14.8
				Beziers	14.5
				Perpignan	12.3
				Marseilles	12
				Albi	10.7
				Chalons	10
				Lyon	10.5
					534.4

200-300s

City population:
½% of Gaul population

1. Century

City population:
8% of entire
Gaul population

(4)   Table 26 .   Ireland

Dublin 11 000

total, all towns:
 45.900

City population: 9%

1300-1400s

1300-1400s

City population: 6%
of 1348 population

(5)   Table 27 .   Netherlands / Belgium. City-population in '000.

1300-1400s

Gent	56
Brugge	30
Brussel	18
Louvain	18
Antwerp	17
Namur	14.4
Ypres	14
Bois l.d.	13
Liege	11
Mechlin	10
Haag	10
Mons	10
	221.4

443 in towns over
2000 inhabitants

City population:
ca. 25%

(6) Table 28. <u>Germany / Eastern Europe, City-population in '000.</u>

1. Century		200-300s		1300-1400s			
Trier	28.5	Trier	28.5	Køln	40	Austria	
Køln	10	Mainz	12	Lübeck	28	Vienna	20
Mainz	8-9	Køln	10	Augsburg	25		
				Magdeburg	20		
City population:		City population:		Aachen	18	Switzerland	
3%		3%		Münster	16	Zürich	13
				Worms	16	Basel	11
				Brunswick	15		
				Rostock	14		
				Nürnberg	14	Hungary	
				Frankfurt	12	Budapest	
				Erfurt	12		
				Regensburg	11		
				Bremen	12	Poland	
				Trier	10.5		
				Mainz	10	Breslau	12
				Nördlingen	10		
				München	10	City population	
					293,5	2%	

City population:
5.5%

Czechoslovakia

Prague   30
Pilsen   10
Olomovic 10

City population:
15%

4. Development of climate

Figure 1. Milankovitsj curve - variation in solar radiation received at 65°N in summer.
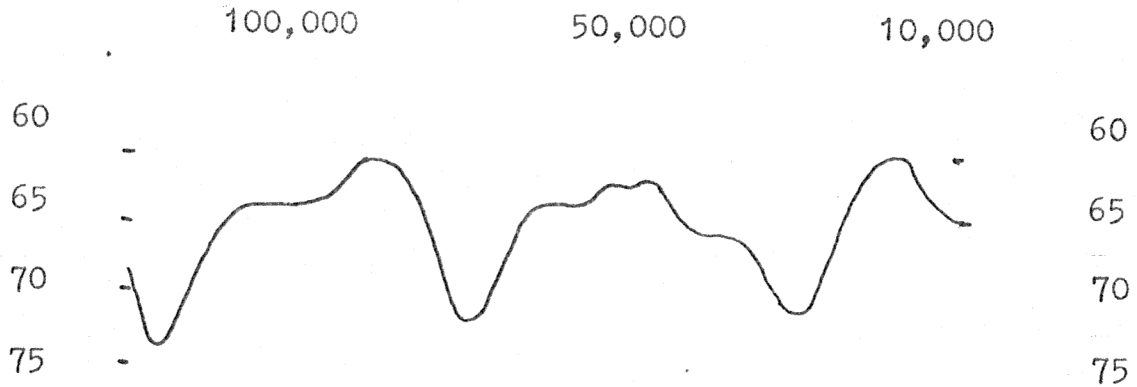
The Figure shows Milankovitsj's curve for variation in radiation received at 65°N in summer. It might be read that 10,000 years ago 65°N received what 60°N gets today. The tops are warm periods. The total is also influenced by winter radiation. The figure does not take into account all factors influencing radiation but explains occurrence of glacial periods in a satisfying way.

Radiation received has dropped from 8000 B.C. The mean temperature on earth has probably sunken. There can be distinguished two warm periods, 5500-3000 B.C. (humid), 3000-500 B.C. (dry) and one cold after 500 B.C. Within the periods climate has changed. Roman, high medieval, the 1500's and 1900's appear as climatical favourable periods within the last 2500 years, at least in Europe. Unfavourable was especially the "little ice-age" which culminated in 1750. Climatical development appears to be similar in various parts of the world. (Jones)

We have concentrated upon mean rainfall and mean temperature. These are but two of the climatical factors having impact on life.

(1) Europe

Figure 2. Temperature and rainfall in Europe

Temperature in Europe
acc. to Brooks

Rainfall in :England

Rainfall in Central Europe

Rainfall in Sweden
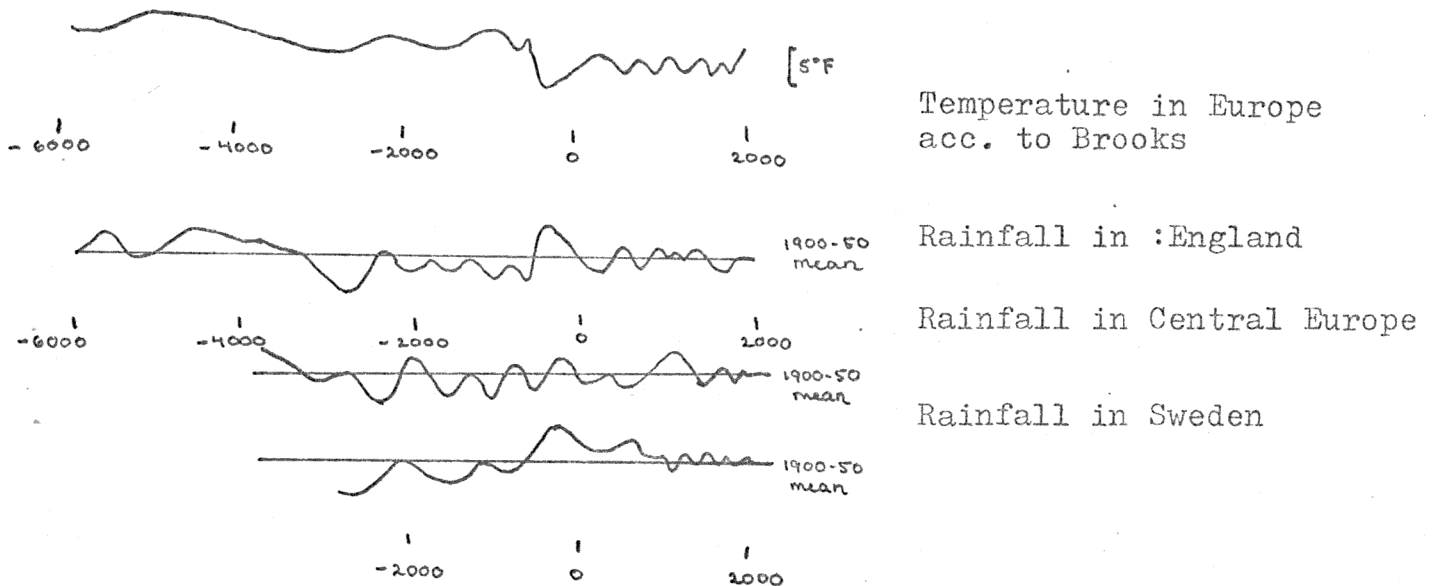
The figures are from Brooks. Everywhere we find a violent
increase in rainfall about 500 BC. Investigations in a
Swedish peat bog point to five marked periods of drought:
about 2300 BC, 1200 BC, 600 BC - which distinguish themselves
as droughtperiods nearly everywhere - and the 300-s and
1100-s AC. In England the drought-periods follow the same
pattern.

As will be seen - the period 2500-500 BC was a warm
period - warmer than to-day. That period was for the greater
part dry too - especialy about 2300 BC and after 1200BC.
A very dry 700-500 BC at the same time marks the end of the
warm and dry period - rainfall eas heavy from 5oo BC. Swiss
lakes are reported to have risen 10 meters within decades.
As will be seen later, increased rainfall was familiar to
Mediterranean countries too in those days - although in
Egypt the rise in rainfall seems to have antècipated the
European rain somewhat.

It was probably in this period (after 500 BC) that the
glaciers in Southern Norway were formed. While the tempera-
ture was lower and the rainfall higher during early Roman
times (than it is to-day) both seem to have been near the
present around 0.

The next period, approximately 350 - 800, was dry in many places, and it seems as if that were the case in Europe too. It isn't before far into medieval times - after 1000 AD - that greater amounts of rainfall reached Europe.

The period 1000 - 1300 might have experienced the best climate A.D - possibly apart from the 1900-s. The mean temperature might have been at least as high as present - probably with heavier rainfall.

Opinions differ concerning late-medieval times. This was the period of falling population in Europe and scholars have predic ted deteriorating climate as one responsible factor. Nothing in our data suggests a deterioration of that magnitude - the 1400-s experienced a continental climate, dry and with severe winters; the temperature dropped compared with the 1200-s but was favourable compared with later periods.

The climate became more oceanic and wet towards 1500. Wet conditions prevailed after 1550 and European climate then turned cold. The period from 1550 and almost to 1900 was to become the severest period of climate since the Ice Age.

It is a widespread opinion that the 1900-s represents a break with the "Little Ice Age" and more favourable climate in our part of the world.

(2) Asia.

Figure 2   Caspian Waterlevel and rainfall in Asia

Waterlevel in the Caspian

Rainfall in Western Asia
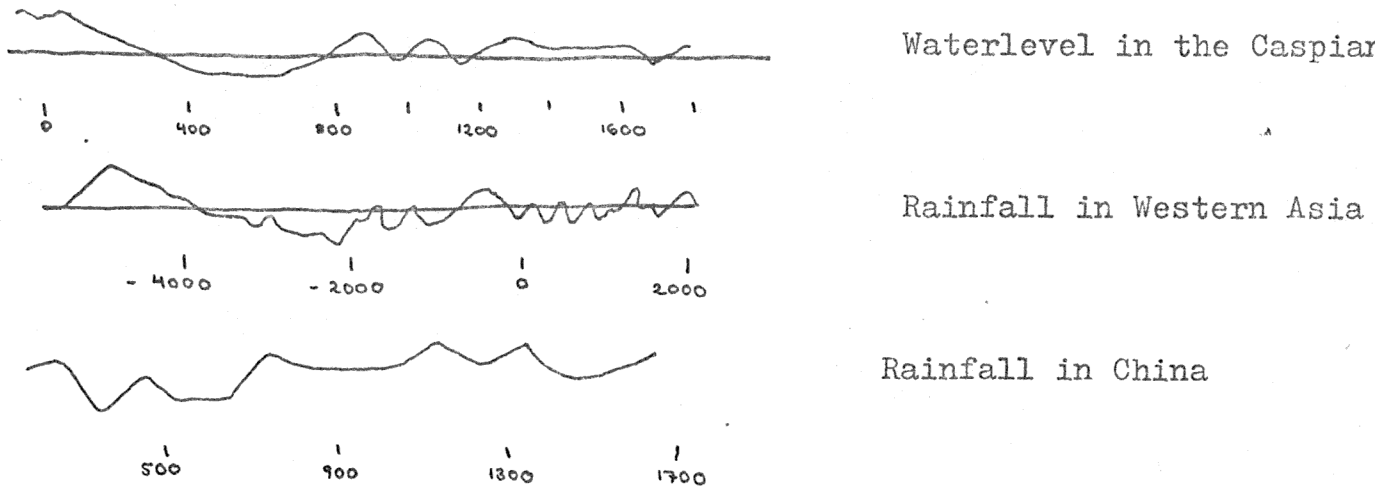
Rainfall in China

The figure for rainfall in China is compiled by Brooks on written evidence. The fluctuations of the Caspian have been known for a long time - the climate of an enormous territory is by supply and evaporation responsible for these changes.

Old records confirm that the waterlevel was higher in early Roman time and in medieval times than today while fortifications from the 400's are under the sea. This does not fit too badly into North African and European evidence.

Basing his conclusions on evidence from studies of lakes and of written records Brooks concludes that the time around 300 A.D., 500's, 1100's and 1400's were dry periods. Around 500 B.C. there seems to start a more humid period also in Western Asia - marked by transport along desert routes not usable today.

(3) Africa.

We will concentrate upon Northern Africa.
Figure 3   Rainfall in Egypt
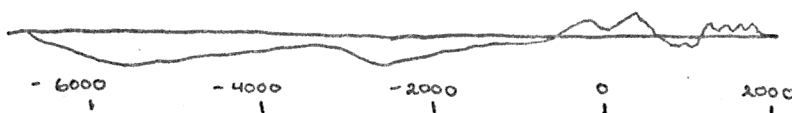
The figure shows how Brooks estimates the development of

rainfall in Egypt. The centuries around the year 0 are marked as a period with particularly heavy rainfall, a conclusion supported by newer investigations (World Climate). Recent investigations in the Sahara give a slightly altered picture: the period 7000-3000 B.C. was a humid period. Rainfall was average until 2350 - the doorstep to a dry era - ending 870 B.C. - followed by an unusually humid period 870 B.C. - 100 A.C. - probably the period allowing Sahara to be crossed on horseback as Herodotus reports. Brooks imagines the period 600-1300 as dry, more recent time more humid. In general the picture is very like the European trend. Some observations survive from Roman times. They support a theory of a more humid climate - telling about rainfall in summer - which seldom occurs nowadays.

Figure 4. <u>Floodwater in the Nile</u>
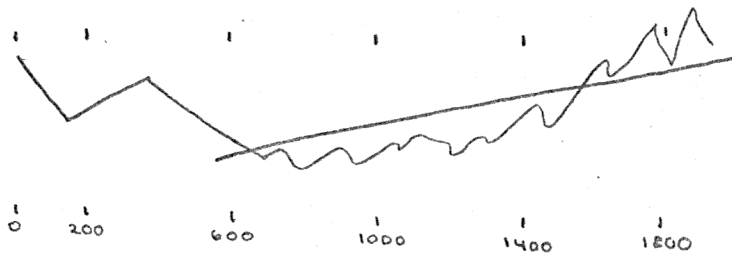
The straight line indicates what height the floodwater has to reach to give the same effect every year. The normal, low level of Nile water, which is also of importance to economy, moves roughly in accordance with floodwater, and therefore is not pictured. Conditions seem to deteriorate before 600 - the noted shift of Byzantine corn supply from Egypt to Asia Minor (Camb. Econ. History) might have been based on lack of ability to produce corn. From late medieval times conditions improve.

If there have been changes in temperature, World Climate concludes that Romans experienced a cooler climate. This might have been advantageous in these latitudes. As for the rest of Northern Africa no certain change of climate has been proved.

As for the discussions about the fall of the Roman Empire of which North Africa and near-by Syria formed an important part, there is no evidence that the climate in the 300-400's should have been particularly notable.

(4) History and Climate.

The following lines is a summary from Le Roy Ladurie.

Climate is reflected in tree rings - favorable years making wider rings. Yet both temperature and humidity influence - but in certain areas only one factor will be marginal - temperature in Scandinavia, humidity in Arizona. The main conclusion on humidity (Douglass, Schulman) is that although climate never was entirely different from now there are fluctuations. The most marked are the dry 1200's and humid 1300's in the USA. The second biggest fluctuation is the last quarter of the 1500's. It can be compared to the droughts of 1900 ("To a God unknown") and 1934 ("Grapes of Wrath"). The droughts of the late 1500's were much harder - nevertheless even the former had serious impact.

Also temperature oscillates around a mean - we are now on a favorable level (Giddings: Arctic Canada). The most striking is the absence of impact from the little ice age in the tree rings. The cold period and glacier advance seem hardly to have influenced tree rings.

In parts of Europe grape harvest starts with an act of proclamation - often recorded. This date depends on maturity and consequently on spring and summer climate. Early riping is a token of a hot sunny summer. Completed with other knowledge the method has yielded results. 1639-43 and 1646-50 were especially cold in ripening season, as historical evidence confirms. A drop in population occurs around 1650 (Cambridge). Louis XIV continued to experience bad weather. 1673-75, 1687-1704, 1710-17 accompanied by the severe winters of 1693 and 1709. Further, cold summers occurred in 1740-52, 1767-73, 1785-89. These climatic cycles correspond to economic high prices and insufficienty of grain in cold years.

Perhaps the confusion about the little ice age can be explained (Schove). It might be that the period was a continentalization of climate - with cold winter allowing glaciers to expand and warm summers to allow tree rings to grow. In this matter the

1540's and the 1890's turn out to be the turning points in modern history of climate (Ladurie) - the 1890's marking the end of the little ice age and return to more maritime climate. Thus cold winters and hot summers often occur together in a continental climate.

The 1500's were maritime (cool summers and mild winters, humid) up to the 1540's - so humid that foresighted contemporaries built an ark. Then continental weather prevailed to the 1890's. The bad years of the late 1600's and early 1700's were maritime, 1651-80 very continental. If this continentalization is the little ice-age of glacier advance it can not be shown to have depressed European agriculture.

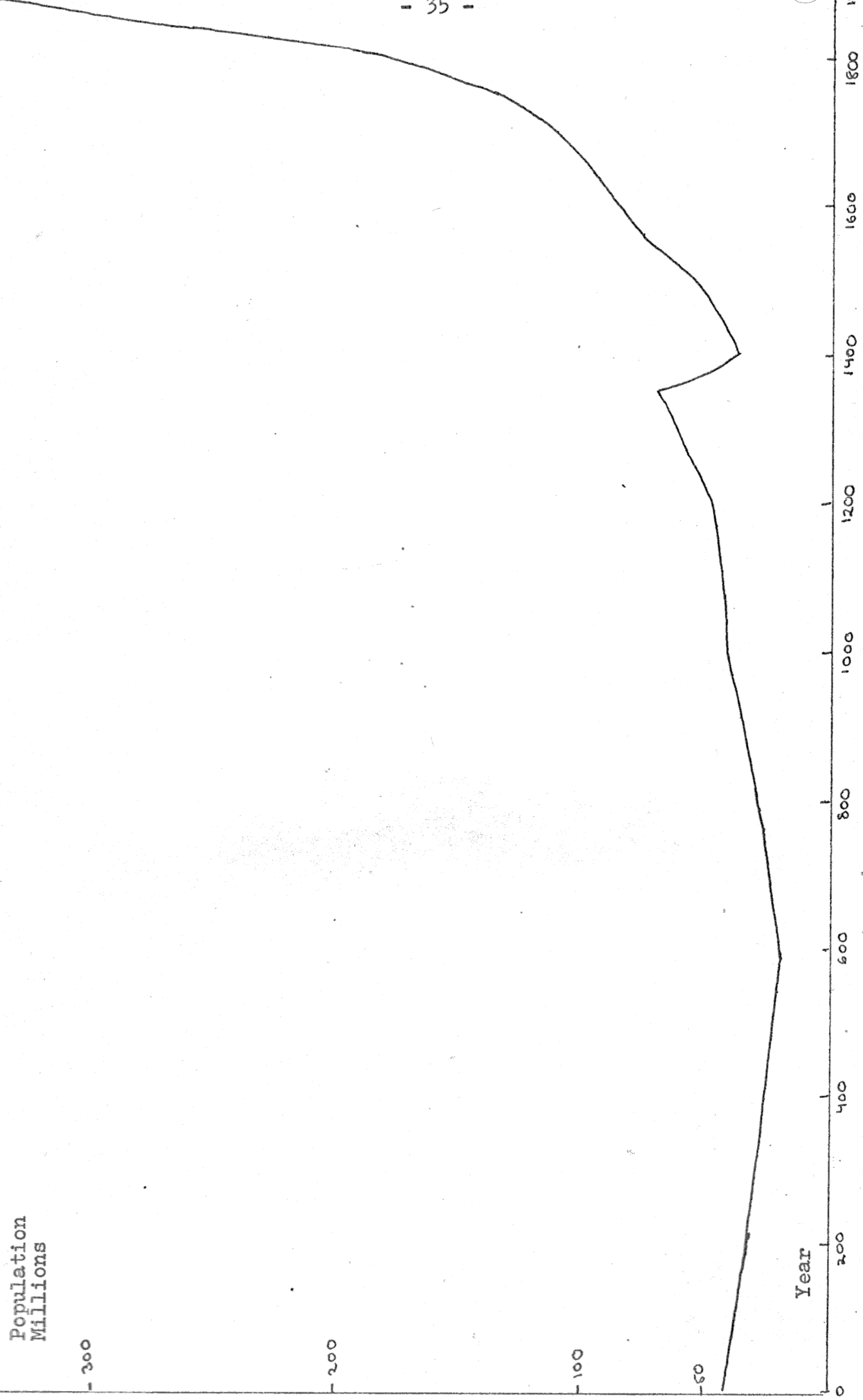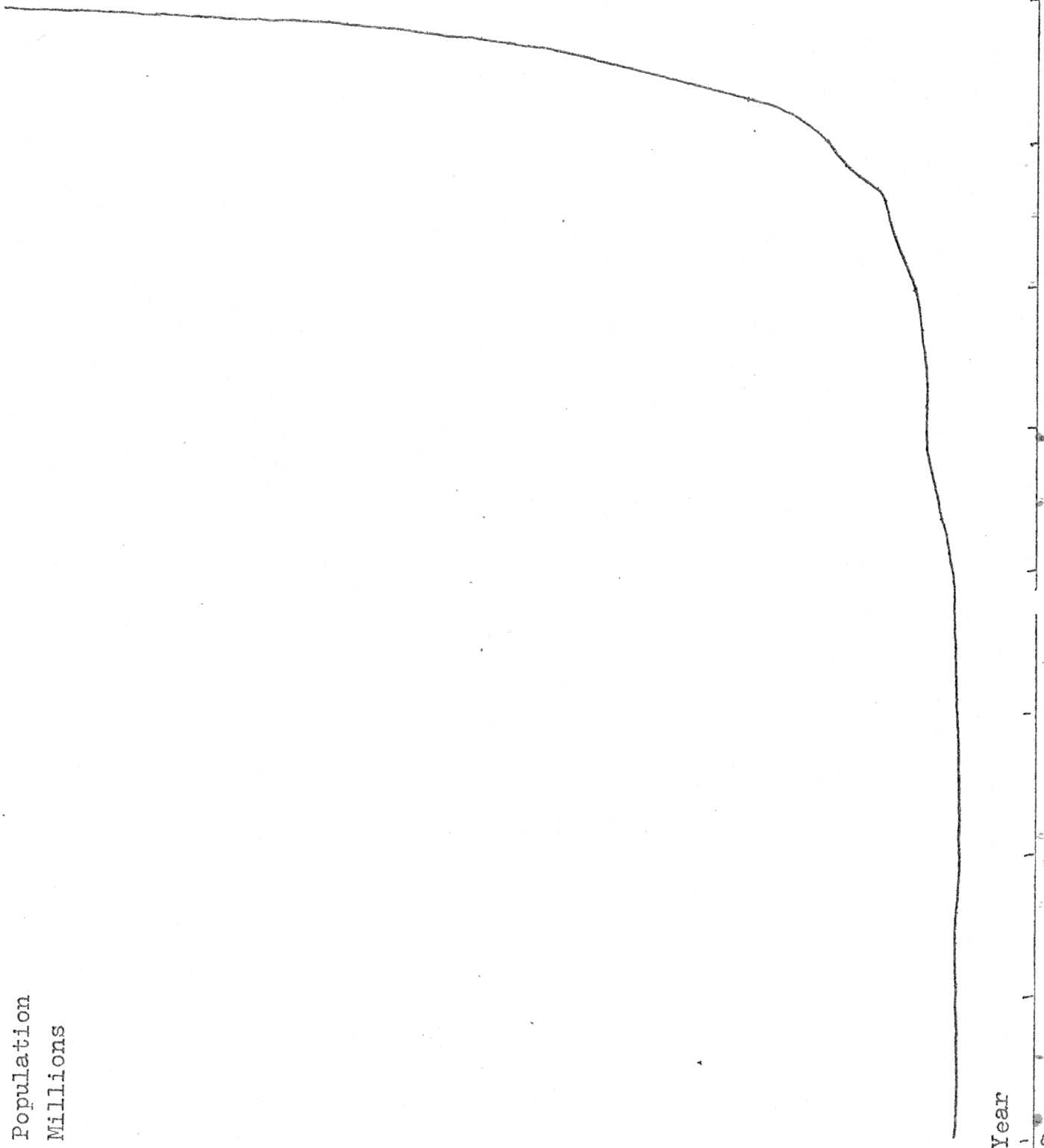Figure 5. Population of Europe according to Russell.

Figure 6. Population of the World.

Population
Millions

4000

3000

2000

1000

Year

6. Bibliography.

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