[] Dendrochronology Program Library Run 145BR Program COF 13:44 Tue 22 Mar 2011 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 27841

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: 145\_BRI\_corr1-30

File of DATED series: 145\_BRI\_corr1

CONTENTS:

Part 1: Title page, options selected, summary, absent rings by series

Part 2: Histogram of time spans

Part 3: Master series with sample depth and absent rings by year

Part 4: Bar plot of Master Dating Series

Part 5: Correlation by segment of each series with Master

Part 6: Potential problems: low correlation, divergent year-to-year changes, absent rings, outliers

Part 7: Descriptive statistics

RUN CONTROL OPTIONS SELECTED VALUE

1 Cubic smoothing spline 50% wavelength cutoff for filtering

32 years

2 Segments examined are 30 years lagged successively by 15 years

3 Autoregressive model applied A Residuals are used in master dating series and testing

4 Series transformed to logarithms Y Each series log-transformed for master dating series and testing

5 CORRELATION is Pearson (parametric, quantitative)

Critical correlation, 99% confidence level .4226

6 Master dating series saved N

7 Ring measurements listed Y

8 Parts printed 1234567

9 Absent rings are omitted from master series and segment correlations (Y)

Time span of Master dating series is 1713 to 2010 298 years

Continuous time span is 1713 to 2010 298 years

Portion with two or more series is 1772 to 2010 239 years

>> 591-a 2009 absent in 6 of 20 series, but is not usually narrow: master index is -.028

>> 591-a 2010 absent in 6 of 20 series, but is not usually narrow: master index is 1.629

>> 591-b 2009 absent in 6 of 20 series, but is not usually narrow: master index is -.028

>> 591-b 2010 absent in 6 of 20 series, but is not usually narrow: master index is 1.629

>> 593-a 2009 absent in 6 of 20 series, but is not usually narrow: master index is -.028

>> 593-a 2010 absent in 6 of 20 series, but is not usually narrow: master index is 1.629

>> 593-b 2009 absent in 6 of 20 series, but is not usually narrow: master index is -.028

>> 593-b 2010 absent in 6 of 20 series, but is not usually narrow: master index is 1.629

>> 595-a 2006 absent in 1 of 20 series, but is not usually narrow: master index is .390

>> 595-a 2007 absent in 1 of 20 series, but is not usually narrow: master index is 1.148

>> 595-a 2009 absent in 6 of 20 series, but is not usually narrow: master index is -.028

>> 595-b 2009 absent in 6 of 20 series, but is not usually narrow: master index is -.028

>> 595-b 2010 absent in 6 of 20 series, but is not usually narrow: master index is 1.629

>> 596-b 2001 absent in 1 of 20 series, but is not usually narrow: master index is -.189

>> 597-b 2010 absent in 6 of 20 series, but is not usually narrow: master index is 1.629

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*C\* Number of dated series 20 \*C\*

\*O\* Master series 1713 2010 298 yrs \*O\*

\*F\* Total rings in all series 2206 \*F\*

\*E\* Total dated rings checked 2147 \*E\*

\*C\* Series intercorrelation .510 \*C\*

\*H\* Average mean sensitivity .263 \*H\*

\*A\* Segments, possible problems 33 \*A\*

\*\*\* Mean length of series 110.3 \*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

ABSENT RINGS listed by SERIES: (See Master Dating Series for absent rings listed by year)

591-a 3 absent rings: 2008 2009 2010

591-b 3 absent rings: 2008 2009 2010

593-a 3 absent rings: 2008 2009 2010

593-b 3 absent rings: 2008 2009 2010

595-a 4 absent rings: 2006 2007 2008 2009

595-b 3 absent rings: 2008 2009 2010

596-b 2 absent rings: 2000 2001

597-b 1 absent rings: 2010

22 absent rings .997%

PART 2: TIME PLOT OF TREE-RING SERIES: 145\_BRI\_corr1-30 13:44 Tue 22 Mar 2011 Page 2

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1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050 Ident Seq Time-span Yrs

: : : : : : : : : : : : : : : : : : : : : -------- --- ---- ---- ----

. . . . . . . . . . . . . . . . . . .<====> . 590-a 1 1962 2010 49

. . . . . . . . . . . . . . . . . . <=====> . 590-b 2 1954 2010 57

. . . . . . . . . . . . . . . . . . <=====> . 591-a 3 1952 2010 59

. . . . . . . . . . . . . . . . . . <=====> . 591-b 4 1957 2010 54

. . . . . . . . . . . . . . . . . . <=======> . 592-a 5 1932 2010 79

. . . . . . . . . . . . . . . . . <==========> . 592-b 6 1908 2010 103

. . . . . . . . . . . . . . . <=======================> . 593-a 7 1772 2010 239

. . . . . . . . . . . . . .<=============================> . 593-b 8 1713 2010 298

. . . . . . . . . . . . . . . . . <=============> . 594-a 9 1875 2010 136

. . . . . . . . . . . . . . . . .<==============> . 594-b 10 1868 2010 143

. . . . . . . . . . . . . . . . . . .<====> . 595-a 11 1968 2010 43

. . . . . . . . . . . . . . . . . . .<====> . 595-b 12 1967 2010 44

. . . . . . . . . . . . . . . . . <=============> . 596-a 13 1876 2010 135

. . . . . . . . . . . . . . . . . <=============> . 596-b 14 1875 2010 136

. . . . . . . . . . . . . . . . .<==============> . 597-a 15 1865 2010 146

. . . . . . . . . . . . . . . . <================> . 597-b 16 1847 2010 164

. . . . . . . . . . . . . . . . . . <=======> . 598-a 17 1936 2010 75

. . . . . . . . . . . . . . . . . .<=========> . 598-b 18 1910 2010 101

. . . . . . . . . . . . . . . . . . <======> . 599-a 19 1941 2010 70

. . . . . . . . . . . . . . . . . . <=======> . 599-b 20 1936 2010 75

: : : : : : : : : : : : : : : : : : : : :

1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050

PART 3: Master Dating Series: 145\_BRI\_corr1-30 13:44 Tue 22 Mar 2011 Page 3

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Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab

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1750 -.269 1 1800 .303 2 1850 -.768 3 1900 .543 8 1950 -.190 14

1751 -.396 1 1801 1.756 2 1851 -.484 3 1901 -.268 8 1951 .980 14

1752 -.514 1 1802 2.028 2 1852 .739 3 1902 .340 8 1952 .275 15

1753 1.379 1 1803 1.541 2 1853 -.187 3 1903 -.085 8 1953 -.701 15

1754 -.881 1 1804 .966 2 1854 .043 3 1904 1.292 8 1954 1.056 16

1755 -.127 1 1805 .687 2 1855 .492 3 1905 .997 8 1955 .645 16

1756 .687 1 1806 -1.573 2 1856 -.024 3 1906 .125 8 1956 -.384 16

1757 -1.813 1 1807 -1.102 2 1857 1.137 3 1907 1.026 8 1957 .187 17

1758 .023 1 1808 -1.170 2 1858 .526 3 1908 -.067 9 1958 .744 17

1759 1.498 1 1809 -1.205 2 1859 .171 3 1909 .708 9 1959 .435 17

1760 2.245 1 1810 -1.186 2 1860 -.974 3 1910 -.110 10 1960 -.817 17

1761 .772 1 1811 -.372 2 1861 .666 3 1911 -.756 10 1961 .622 17

1762 1.462 1 1812 -.711 2 1862 .324 3 1912 -1.963 10 1962 -2.105 18

1713 .986 1 1763 .825 1 1813 -.468 2 1863 .485 3 1913 -.782 10 1963 -.334 18

1714 1.212 1 1764 -.935 1 1814 -1.009 2 1864 .657 3 1914 -.078 10 1964 -.589 18

1715 .879 1 1765 .628 1 1815 .677 2 1865 -.181 4 1915 -.548 10 1965 -1.430 18

1716 .380 1 1766 .251 1 1816 -.803 2 1866 -.254 4 1916 1.064 10 1966 -.937 18

1717 -1.954 1 1767 -.269 1 1817 1.993 2 1867 -3.073 4 1917 .924 10 1967 -.245 19

1718 -1.204 1 1768 -.081 1 1818 .063 2 1868 -.894 5 1918 .332 10 1968 .297 20

1719 -.010 1 1769 .746 1 1819 -.797 2 1869 .074 5 1919 -.150 10 1969 -.214 20

1720 -1.150 1 1770 -.556 1 1820 -.153 2 1870 .137 5 1920 -.164 10 1970 -.233 20

1721 -.841 1 1771 -.345 1 1821 .282 2 1871 .027 5 1921 -1.486 10 1971 .520 20

1722 2.025 1 1772 .740 2 1822 -.143 2 1872 1.365 5 1922 .170 10 1972 1.091 20

1723 .161 1 1773 -.592 2 1823 .574 2 1873 -.711 5 1923 -.963 10 1973 1.193 20

1724 1.568 1 1774 -1.802 2 1824 1.649 2 1874 1.097 5 1924 -.328 10 1974 .542 20

1725 1.901 1 1775 -1.863 2 1825 -.605 2 1875 .218 7 1925 .359 10 1975 -1.028 20

1726 -.675 1 1776 -1.882 2 1826 -.936 2 1876 .046 8 1926 .340 10 1976 .978 20

1727 -.592 1 1777 -2.009 2 1827 -.372 2 1877 -.215 8 1927 .283 10 1977 -1.928 20

1728 -1.779 1 1778 -.999 2 1828 .563 2 1878 .402 8 1928 .614 10 1978 .213 20

1729 .373 1 1779 -.323 2 1829 -1.819 2 1879 -.982 8 1929 1.633 10 1979 .077 20

1730 -2.267 1 1780 .033 2 1830 1.006 2 1880 -.319 8 1930 1.075 10 1980 .536 20

1731 1.296 1 1781 .900 2 1831 -.119 2 1881 -.392 8 1931 -.007 10 1981 .693 20

1732 -1.664 1 1782 2.420 2 1832 .942 2 1882 1.554 8 1932 .654 11 1982 .535 20

1733 1.008 1 1783 1.304 2 1833 1.983 2 1883 .439 8 1933 .756 11 1983 -.781 20

1734 -1.222 1 1784 1.200 2 1834 .393 2 1884 .188 8 1934 -.798 11 1984 -1.022 20

1735 -.301 1 1785 .974 2 1835 1.730 2 1885 -.353 8 1935 -.461 11 1985 .546 20

1736 -.562 1 1786 1.179 2 1836 .939 2 1886 -.406 8 1936 -1.213 13 1986 .184 20

1737 .342 1 1787 .197 2 1837 1.158 2 1887 -.284 8 1937 -1.765 13 1987 1.045 20

1738 .284 1 1788 .058 2 1838 -.551 2 1888 .706 8 1938 -.532 13 1988 -2.140 20

1739 -.226 1 1789 -.462 2 1839 -2.687 2 1889 .569 8 1939 -.078 13 1989 .685 20

1740 -.250 1 1790 -.180 2 1840 -2.134 2 1890 -1.892 8 1940 .613 13 1990 .094 20

1741 .482 1 1791 .171 2 1841 -.112 2 1891 -.043 8 1941 -.579 14 1991 -.277 20

1742 -1.327 1 1792 -1.361 2 1842 .311 2 1892 .436 8 1942 .064 14 1992 .811 20

1743 -1.506 1 1793 1.488 2 1843 -1.157 2 1893 -.508 8 1943 -.616 14 1993 1.037 20

1744 -1.902 1 1794 -1.617 2 1844 1.221 2 1894 1.138 8 1944 -.042 14 1994 1.013 20

1745 .184 1 1795 -.583 2 1845 .159 2 1895 -1.373 8 1945 .871 14 1995 -.209 20

1746 .687 1 1796 .121 2 1846 1.103 2 1896 .225 8 1946 .384 14 1996 -.545 20

1747 1.675 1 1797 -2.394 2 1847 -.574 3 1897 .656 8 1947 .693 14 1997 -1.179 20

1748 2.569 1 1798 -1.561 2 1848 .437 3 1898 -.088 8 1948 .020 14 1998 -1.090 20

1749 2.379 1 1799 -.340 2 1849 -.189 3 1899 -1.632 8 1949 -.715 14 1999 -1.029 20

PART 3: Master Dating Series: 145\_BRI\_corr1-30 13:44 Tue 22 Mar 2011 Page 4

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Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab

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2000 -.469 20 1

2001 -.189 20 1<<

2002 .221 20

2003 -.270 20

2004 .727 20

2005 .185 20

2006 .390 20 1<<

2007 1.148 20 1<<

2008 -1.392 20 6

2009 -.028 20 6<<

2010 1.629 20 6<<

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PART 4: Master Bar Plot: 145\_BRI\_corr1-30 13:44 Tue 22 Mar 2011 Page 5

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Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value

1750----a 1800------A 1850--c 1900-------B 1950----a 2000---b

1751---b 1801----------G 1851---b 1901----a 1951---------D 2001----a

1752---b 1802----------H 1852--------C 1902------A 1952------A 2002------A

1753----------F 1803----------F 1853----a 1903----@ 1953--c 2003----a

1754--d 1804---------D 1854-----@ 1904---------E 1954---------D 2004--------C

1755----a 1805--------C 1855-------B 1905---------D 1955--------C 2005------A

1756--------C 1806f 1856-----@ 1906-----@ 1956---b 2006------B

1757g 1807-d 1857---------E 1907---------D 1957------A 2007---------E

1758-----@ 1808-e 1858-------B 1908-----@ 1958--------C 2008-f

1759----------F 1809-e 1859------A 1909--------C 1959-------B 2009-----@

1760----------I 1810-e 1860-d 1910----@ 1960--c 2010----------G

1761--------C 1811---a 1861--------C 1911--c 1961-------B

1762----------F 1812--c 1862------A 1912h 1962h

1713---------D 1763--------C 1813---b 1863-------B 1913--c 1963---a

1714---------E 1764-d 1814-d 1864--------C 1914----@ 1964--b

1715--------D 1765--------C 1815--------C 1865----a 1915--b 1965-f

1716------B 1766------A 1816--c 1866----a 1916---------D 1966-d

1717h 1767----a 1817----------H 1867l 1917---------D 1967----a

1718-e 1768----@ 1818-----@ 1868--d 1918------A 1968------A

1719-----@ 1769--------C 1819--c 1869-----@ 1919----a 1969----a

1720-e 1770--b 1820----a 1870-----A 1920----a 1970----a

1721--c 1771---a 1821------A 1871-----@ 1921f 1971-------B

1722----------H 1772--------C 1822----a 1872----------E 1922------A 1972---------D

1723------A 1773--b 1823-------B 1873--c 1923-d 1973---------E

1724----------F 1774g 1824----------G 1874---------D 1924---a 1974-------B

1725----------H 1775g 1825--b 1875------A 1925------A 1975-d

1726--c 1776h 1826-d 1876-----@ 1926------A 1976---------D

1727--b 1777h 1827---a 1877----a 1927------A 1977h

1728g 1778-d 1828-------B 1878-------B 1928-------B 1978------A

1729------A 1779---a 1829g 1879-d 1929----------G 1979-----@

1730i 1780-----@ 1830---------D 1880---a 1930---------D 1980-------B

1731---------E 1781---------D 1831----@ 1881---b 1931-----@ 1981--------C

1732g 1782----------J 1832---------D 1882----------F 1932--------C 1982-------B

1733---------D 1783---------E 1833----------H 1883-------B 1933--------C 1983--c

1734-e 1784---------E 1834------B 1884------A 1934--c 1984-d

1735---a 1785---------D 1835----------G 1885---a 1935---b 1985-------B

1736--b 1786---------E 1836---------D 1886---b 1936-e 1986------A

1737------A 1787------A 1837---------E 1887---a 1937g 1987---------D

1738------A 1788-----@ 1838--b 1888--------C 1938---b 1988i

1739----a 1789---b 1839k 1889-------B 1939----@ 1989--------C

1740----a 1790----a 1840i 1890h 1940-------B 1990-----@

1741-------B 1791------A 1841----@ 1891-----@ 1941--b 1991----a

1742-e 1792-e 1842------A 1892-------B 1942-----@ 1992--------C

1743f 1793----------F 1843-e 1893---b 1943--b 1993---------D

1744h 1794f 1844---------E 1894---------E 1944-----@ 1994---------D

1745------A 1795--b 1845-----A 1895-e 1945--------C 1995----a

1746--------C 1796-----@ 1846---------D 1896------A 1946------B 1996--b

1747----------G 1797j 1847--b 1897--------C 1947--------C 1997-e

1748----------J 1798f 1848-------B 1898----@ 1948-----@ 1998-d

1749----------J 1799---a 1849----a 1899g 1949--c 1999-d

PART 5: CORRELATION OF SERIES BY SEGMENTS: 145\_BRI\_corr1-30 13:44 Tue 22 Mar 2011 Page 5

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Correlations of 30-year dated segments, lagged 15 years

Flags: A = correlation under .4226 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1770 1785 1800 1815 1830 1845 1860 1875 1890 1905 1920 1935 1950 1965 1980 1995

1799 1814 1829 1844 1859 1874 1889 1904 1919 1934 1949 1964 1979 1994 2009 2024

--- -------- --------- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----

1 590-a 1962 2010 .66 .62 .75 .75

2 590-b 1954 2010 .52 .49 .63 .65

3 591-a 1952 2010 .48 .75 .80 .80

4 591-b 1957 2010 .78 .85 .78 .78

5 592-a 1932 2010 .56 .68 .72 .77 .60 .63

6 592-b 1908 2010 .56 .59 .61 .63 .76 .69 .70

7 593-a 1772 2010 .62 .49 .40A .47 .32B .31A .42 .34B .47 .46 .45 .47 .59 .48 .40B .39B

8 593-b 1713 2010 .62 .49 .40A .47 .33A .25B .43 .29B .31B .39B .24B .36B .54 .52 .46 .47

9 594-a 1875 2010 .66 .80 .79 .70 .58 .62 .71 .83 .84

10 594-b 1868 2010 .20B .53 .58 .56 .60 .29B .47 .63 .69 .73

11 595-a 1968 2010 .46 .26A .34A

12 595-b 1967 2010 .47 .38A .40A

13 596-a 1876 2010 .30B .48 .36B .32A .74 .70 .62 .57 .61

14 596-b 1875 2010 .38A .58 .49 .51 .77 .78 .65 .63 .65

15 597-a 1865 2010 .59 .61 .64 .59 .68 .79 .66 .46 .44 .48

16 597-b 1847 2010 -.09B .34A .35A .33A .43 .49 .46 .64 .49B .53 .53

17 598-a 1936 2010 .53 .55 .75 .74 .77

18 598-b 1910 2010 -.12B-.02B .41A .64 .76 .55 .58

19 599-a 1941 2010 .41A .68 .75 .55 .59

20 599-b 1936 2010 .47 .68 .76 .63 .65

Av segment correlation .62 .49 .40 .47 .32 .15 .40 .43 .52 .45 .46 .54 .63 .64 .60 .62

PART 6: POTENTIAL PROBLEMS: 145\_BRI\_corr1-30 13:44 Tue 22 Mar 2011 Page 6

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For each series with potential problems the following diagnostics may appear:

[A] Correlations with master dating series of flagged 30-year segments of series filtered with 32-year spline,

at every point from ten years earlier (-10) to ten years later (+10) than dated

[B] Effect of those data values which most lower or raise correlation with master series

Symbol following year indicates value in series is greater (>) or lesser (<) than master series value

[C] Year-to-year changes very different from the mean change in other series

[D] Absent rings (zero values)

[E] Values which are statistical outliers from mean for the year

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590-a 1962 to 2010 49 years Series 1

[B] Entire series, effect on correlation ( .671) is:

Lower 1974< -.023 1973< -.023 1994< -.021 1968> -.015 1983> -.011 1987< -.010 Higher 1988 .085 1962 .020

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1968 +3.6 SD

590-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1962 157 268 225 204 211 225 393 289

1970 267 238 232 185 151 158 181 142 208 214

1980 183 156 196 173 135 228 143 141 67 155

1990 147 152 188 234 126 120 88 104 96 99

2000 121 163 136 84 172 205 205 221 91 125

2010 236

====================================================================================================================================

590-b 1954 to 2010 57 years Series 2

[B] Entire series, effect on correlation ( .580) is:

Lower 1977> -.064 1986< -.031 1994< -.022 1956> -.018 1975> -.017 2006< -.011 Higher 1962 .081 1988 .051

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1977 +3.6 SD

590-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1954 268 277 283 230 281 236

1960 212 217 113 132 132 140 152 181 247 151

1970 167 203 215 224 160 173 174 169 185 182

1980 154 120 125 91 62 99 47 77 36 82

1990 57 48 66 72 47 46 37 45 34 55

2000 61 72 65 83 104 82 64 99 46 64

2010 110

====================================================================================================================================

591-a 1952 to 2010 59 years Series 3

[B] Entire series, effect on correlation ( .603) is:

Lower 1959< -.038 2008> -.027 1977> -.027 1996> -.015 1957< -.012 1958< -.008 Higher 1988 .091 2007 .010

[D] 3 Absent rings: Year Master N series Absent

2008 -1.392 20 6

2009 -.028 20 6 >> WARNING: Ring is not usually narrow

2010 1.629 20 6 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

591-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 149 146 168 207 162 125 141 105

1960 130 206 131 196 186 148 163 168 201 165

1970 187 187 202 185 173 109 212 152 155 167

1980 160 185 141 98 94 139 133 121 49 100

1990 88 83 73 60 76 48 63 24 6 15

2000 12 16 15 18 17 6 13 19 0 0

2010 0

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591-b 1957 to 2010 54 years Series 4

[B] Entire series, effect on correlation ( .743) is:

Lower 1960> -.027 2008> -.022 1997< -.018 1959< -.011 1978< -.008 1996> -.006 Higher 1988 .055 1962 .032

[D] 3 Absent rings: Year Master N series Absent

2008 -1.392 20 6

2009 -.028 20 6 >> WARNING: Ring is not usually narrow

2010 1.629 20 6 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

591-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 181 197 146

1960 174 190 117 155 124 100 116 156 184 145

1970 134 142 173 156 134 109 173 110 111 121

1980 136 137 152 95 99 131 146 127 58 120

1990 110 79 85 67 65 56 51 12 4 9

2000 7 15 15 17 12 2 21 24 0 0

2010 0

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592-a 1932 to 2010 79 years Series 5

[B] Entire series, effect on correlation ( .639) is:

Lower 1998> -.042 1997> -.029 1948> -.021 1934> -.016 1992< -.014 1953< -.010 Higher 1988 .069 1962 .029

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1997 +3.5 SD; 1998 +5.3 SD

592-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 144 102 91 76 52 34 55 62

1940 78 63 76 66 104 111 87 92 126 92

1950 75 132 108 64 117 128 96 132 137 163

1960 126 175 82 111 123 123 168 221 257 183

1970 154 187 203 202 151 120 190 105 133 124

1980 106 97 104 60 56 76 71 96 37 67

1990 60 54 49 57 54 36 47 63 78 54

2000 60 53 53 47 59 57 61 58 43 54

2010 77

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592-b 1908 to 2010 103 years Series 6

[B] Entire series, effect on correlation ( .623) is:

Lower 1908> -.013 2007< -.010 1996> -.008 1998> -.008 1997> -.007 1934> -.007 Higher 1988 .054 1912 .014

592-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1908 72 58

1910 56 58 33 41 52 61 80 72 92 64

1920 81 72 90 73 107 114 114 108 118 126

1930 106 110 117 111 100 88 81 56 79 94

1940 116 96 112 105 98 121 90 134 120 77

1950 69 106 110 69 124 150 113 123 142 141

1960 65 111 79 151 169 138 154 173 214 143

1970 142 194 172 188 117 82 157 105 134 134

1980 118 111 112 70 54 108 102 134 56 105

1990 124 129 135 135 99 95 121 109 115 84

2000 81 115 119 86 134 104 109 98 71 149

2010 184

====================================================================================================================================

593-a 1772 to 2010 239 years Series 7

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1800 1829 0 -.17 -.03 -.02 -.28 -.27 -.16 -.05 .14 .16 .34 .40\*-.14 .09 -.17 -.10 -.44 -.04 -.22 -.36 -.08 .15

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

1830 1859 -9 .23 .43\*-.24 -.10 -.07 -.16 .01 .12 .08 -.03 .32| .00 .14 -.12 -.07 -.17 -.27 -.12 -.13 -.13 -.13

1845 1874 0 .09 .14 -.01 -.02 .11 -.11 -.07 .00 -.03 -.28 .31\*-.14 .16 -.04 .15 -.19 .14 -.37 -.12 -.22 .19

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

1875 1904 9 .10 -.09 .06 -.28 .18 -.25 .30 -.15 -.31 -.02 .34|-.29 .05 -.24 .09 .28 .01 -.02 -.12 .39\* .08

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

1980 2009 -2 -.11 -.04 .09 -.01 -.33 -.29 .16 .05 .51\*-.18 .40|-.08 - - - - - - - - -

1981 2010 -2 -.11 -.07 .07 -.04 -.35 -.26 .13 .14 .50\*-.19 .39| - - - - - - - - - -

[B] Entire series, effect on correlation ( .433) is:

Lower 1868> -.011 1834> -.010 1984> -.009 1827< -.008 2010< -.008 1881< -.008 Higher 1867 .020 1782 .008

1800 to 1829 segment:

Lower 1804> -.056 1827< -.054 1819< -.051 1818> -.044 1811> -.029 1816< -.018 Higher 1829 .069 1817 .050

1830 to 1859 segment:

Lower 1834> -.059 1856< -.041 1859> -.040 1848< -.039 1850< -.022 1853< -.020 Higher 1839 .107 1833 .044

1845 to 1874 segment:

Lower 1868> -.089 1859> -.049 1848< -.037 1856< -.035 1860> -.029 1847> -.027 Higher 1867 .268 1872 .042

1875 to 1904 segment:

Lower 1895> -.058 1881< -.056 1892> -.036 1875> -.030 1885< -.021 1886< -.015 Higher 1890 .066 1882 .051

1980 to 2009 segment:

Lower 1984> -.091 1985< -.046 2001< -.029 2009< -.022 1986< -.018 1992< -.014 Higher 2008 .067 1989 .029

1981 to 2010 segment:

Lower 1984> -.089 2010< -.076 1985< -.037 2001< -.022 2009< -.017 1986< -.013 Higher 2008 .072 1988 .041

[D] 3 Absent rings: Year Master N series Absent

2008 -1.392 20 6

2009 -.028 20 6 >> WARNING: Ring is not usually narrow

2010 1.629 20 6 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

[E] Outliers 6 3.0 SD above or -4.5 SD below mean for year

1774 +3.0 SD; 1859 +3.3 SD; 1868 +4.4 SD; 1892 +5.1 SD; 1984 +4.5 SD; 1989 +3.3 SD

593-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1772 34 21 18 12 14 14 24 33

1780 43 54 89 56 61 55 63 51 46 43

1790 52 60 39 82 40 43 56 20 28 39

1800 46 66 58 49 55 48 31 31 29 26

1810 29 34 26 27 23 30 22 38 31 22

1820 27 27 29 28 35 28 26 26 33 26

1830 51 34 41 57 52 59 53 47 33 30

1840 33 40 43 31 51 40 44 36 31 28

1850 25 29 34 27 27 32 26 32 32 34

1860 29 31 27 27 28 27 26 21 33 28

1870 30 25 37 21 29 34 27 25 28 25

1880 27 19 32 25 24 20 21 27 28 26

1890 23 27 48 29 30 30 32 37 32 26

1900 37 33 31 25 37 29 25 34 23 36

1910 28 24 27 29 36 29 38 32 26 26

1920 20 18 18 18 21 24 19 20 26 32

1930 30 29 38 36 25 29 26 27 26 33

1940 27 24 40 27 33 35 41 39 34 33

1950 36 37 38 34 44 46 33 42 50 47

1960 29 39 35 39 38 30 29 29 33 33

1970 28 31 41 48 52 34 48 35 44 46

1980 48 45 48 42 53 39 37 42 36 53

1990 36 33 34 38 47 26 29 26 20 16

2000 23 11 20 22 24 21 25 25 0 0

2010 0

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593-b 1713 to 2010 298 years Series 8

[\*] Early part of series cannot be checked from 1713 to 1771 -- not matched by another series

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1800 1829 0 .20 .18 -.18 -.05 .01 -.57 -.20 -.16 .09 -.13 .40\* .19 .22 .17 -.12 -.18 -.08 -.07 -.02 .24 .08

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1830 1859 0 -.04 -.24 -.02 -.14 -.40 -.29 -.28 -.02 .17 .15 .33\* .01 .04 .08 .18 -.10 -.29 -.01 .06 .15 -.24

1845 1874 -2 -.01 -.31 -.05 -.20 .04 -.30 .08 .14 .36\*-.12 .25|-.21 .07 .01 -.06 -.21 .05 .16 .30 -.19 -.04

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1875 1904 9 .13 -.38 .31 -.12 -.05 -.19 .27 -.19 .06 -.21 .29|-.12 -.18 .04 .05 .11 .12 -.26 .00 .60\* .04

1890 1919 9 .08 -.28 .00 .06 -.11 -.13 .20 .10 .05 -.28 .31|-.12 -.22 .13 -.22 .08 -.06 -.01 .24 .56\* .04

1905 1934 3 .25 .22 -.18 .16 -.05 -.23 -.16 .04 .04 -.13 .39| .20 -.15 .41\*-.02 -.31 .14 -.02 -.17 -.07 -.02

1920 1949 3 .16 .28 .12 .13 -.19 -.25 -.10 .05 .19 .01 .24| .13 -.07 .49\* .24 -.11 .07 -.06 -.34 -.26 -.02

1935 1964 -2 -.11 .02 -.06 .15 -.21 -.15 .27 .23 .37\*-.20 .36|-.15 .11 .12 .02 .18 .02 .06 -.29 .02 .03

[B] Entire series, effect on correlation ( .394) is:

Lower 1797> -.012 1895> -.012 1847> -.012 1819> -.008 1834< -.008 1903< -.008 Higher 1867 .013 1839 .009

1800 to 1829 segment:

Lower 1804< -.056 1827> -.054 1819> -.051 1818< -.044 1811< -.029 1816> -.018 Higher 1829 .069 1817 .050

1830 to 1859 segment:

Lower 1847> -.108 1834< -.060 1851< -.055 1856> -.027 1853> -.018 1852> -.018 Higher 1839 .139 1833 .042

1845 to 1874 segment:

Lower 1847> -.096 1851< -.066 1860< -.059 1869< -.031 1870< -.024 1868> -.022 Higher 1867 .216 1873 .048

1875 to 1904 segment:

Lower 1895> -.109 1903< -.077 1899> -.037 1889< -.030 1881< -.027 1891< -.017 Higher 1890 .130 1882 .069

1890 to 1919 segment:

Lower 1895> -.097 1903< -.084 1905< -.052 1899> -.032 1919> -.020 1891< -.018 Higher 1890 .121 1912 .050

1905 to 1934 segment:

Lower 1920< -.074 1905< -.065 1933< -.035 1919> -.035 1923> -.033 1924> -.014 Higher 1929 .089 1921 .063

1920 to 1949 segment:

Lower 1949> -.076 1948> -.070 1920< -.069 1933< -.034 1945< -.031 1923> -.030 Higher 1929 .141 1921 .082

1935 to 1964 segment:

Lower 1949> -.108 1948> -.104 1945< -.028 1964< -.027 1950> -.014 1944< -.014 Higher 1962 .113 1954 .045

[C] Year-to-year changes diverging by over 4.0 std deviations:

1977 1978 4.1 SD

[D] 3 Absent rings: Year Master N series Absent

2008 -1.392 20 6

2009 -.028 20 6 >> WARNING: Ring is not usually narrow

2010 1.629 20 6 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

[E] Outliers 10 3.0 SD above or -4.5 SD below mean for year

1797 +3.2 SD; 1819 +3.2 SD; 1827 +3.5 SD; 1847 +4.0 SD; 1851 -4.5 SD; 1895 +3.4 SD; 1949 +4.1 SD;

1967 +3.1 SD; 1977-10.0 SD; 1998 +3.2 SD

593-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1713 77 76 69 61 43 45 50

1720 40 40 58 41 49 49 31 30 24 31

1730 21 31 21 28 21 22 21 23 23 22

1740 22 24 19 19 18 25 27 33 39 38

1750 24 24 24 32 22 25 28 19 25 30

1760 34 27 29 26 20 25 23 21 22 26

1770 21 22 23 19 10 16 16 17 27 36

1780 39 57 81 83 73 75 71 55 58 47

1790 41 39 29 47 21 32 31 26 26 32

1800 35 45 55 48 28 26 13 15 15 17

1810 13 14 17 17 18 21 19 23 17 20

1820 20 22 20 24 27 20 21 24 26 19

1830 23 23 27 29 21 27 24 27 22 15

1840 16 21 22 20 23 21 24 26 28 23

1850 20 17 24 24 23 23 25 27 25 22

1860 17 25 24 22 22 21 23 16 22 18

1870 17 19 28 18 29 25 26 19 27 24

1880 25 17 29 27 23 22 21 22 28 22

1890 19 21 25 27 30 31 36 31 27 30

1900 36 33 30 20 34 25 26 38 28 29

1910 27 26 21 23 25 19 23 24 19 24

1920 15 14 18 20 24 25 28 22 23 37

1930 26 22 32 22 22 25 21 19 21 25

1940 29 24 36 30 27 32 32 78 116 128

1950 113 84 63 53 77 52 42 45 53 49

1960 34 45 31 36 25 35 30 44 31 31

1970 27 26 29 37 37 33 32 19 32 33

1980 33 33 33 33 40 40 44 48 39 56

1990 44 39 46 54 54 35 45 36 44 23

2000 26 9 17 19 22 14 21 20 0 0

2010 0

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594-a 1875 to 2010 136 years Series 9

[B] Entire series, effect on correlation ( .683) is:

Lower 1968< -.026 1875> -.012 1953> -.009 1885> -.007 1886> -.007 1961< -.005 Higher 1890 .017 1977 .016

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1968 -6.2 SD

594-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1875 85 65 66 57 45

1880 54 57 65 64 65 66 69 53 58 58

1890 35 65 67 53 59 36 50 57 48 38

1900 50 34 41 47 63 78 41 46 34 54

1910 39 34 16 35 28 30 43 49 39 26

1920 35 25 45 23 41 48 47 57 50 66

1930 57 47 65 60 32 38 38 38 55 46

1940 60 45 45 33 47 45 49 44 36 28

1950 83 144 84 77 74 63 47 45 41 38

1960 17 22 12 24 28 16 16 15 6 14

1970 30 34 40 48 38 30 51 23 56 48

1980 56 60 69 45 42 59 45 58 31 64

1990 48 43 69 70 52 26 16 14 8 12

2000 14 8 20 19 18 16 19 46 6 15

2010 54

====================================================================================================================================

594-b 1868 to 2010 143 years Series 10

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1868 1897 5 -.01 -.09 .10 -.21 -.13 .21 -.08 .09 .00 .09 .20|-.08 -.17 .05 -.32 .26\* .01 .06 .00 .13 -.11

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1935 1964 7 -.34 .01 .04 .16 .03 -.17 -.28 -.01 .35 -.09 .29| .03 .15 -.13 .16 .28 .00 .41\*-.34 -.23 .10

[B] Entire series, effect on correlation ( .446) is:

Lower 1868< -.059 1873> -.031 1955< -.018 1953> -.014 1919< -.013 1948> -.013 Higher 1977 .031 1895 .024

1868 to 1897 segment:

Lower 1868< -.170 1873> -.104 1886> -.018 1878< -.017 1892< -.015 1877> -.011 Higher 1895 .149 1890 .106

1935 to 1964 segment:

Lower 1955< -.117 1953> -.086 1948> -.077 1961< -.018 1945< -.014 1958< -.014 Higher 1962 .074 1954 .064

[E] Outliers 5 3.0 SD above or -4.5 SD below mean for year

1868 -5.6 SD; 1873 +3.8 SD; 1948 +3.1 SD; 1953 +3.6 SD; 1981 +3.3 SD

594-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1868 30 90

1870 110 113 107 138 121 124 126 116 84 74

1880 68 64 77 60 65 67 79 79 91 69

1890 45 69 49 35 46 25 36 45 34 31

1900 40 35 49 47 49 64 33 29 26 25

1910 25 19 13 17 15 14 22 28 37 18

1920 24 21 43 23 36 44 45 51 46 57

1930 49 38 45 50 31 31 25 19 32 32

1940 53 49 40 32 34 39 59 83 131 104

1950 73 85 84 118 132 54 50 48 40 44

1960 20 23 16 24 21 24 29 24 22 39

1970 38 39 36 38 37 26 44 19 42 40

1980 89 126 84 53 56 59 47 55 34 57

1990 34 30 63 59 59 46 23 18 11 9

2000 14 9 18 22 29 24 30 31 13 19

2010 32

====================================================================================================================================

595-a 1968 to 2010 43 years Series 11

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1980 2009 0 -.28 -.20 -.26 .02 .15 .21 -.10 -.16 .01 .06 .26\*-.06 - - - - - - - - -

1981 2010 0 -.30 -.18 -.21 .06 .19 .17 -.04 -.23 -.05 .08 .34\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .398) is:

Lower 1989< -.138 1990< -.028 1998> -.026 1980< -.025 2000> -.023 2007< -.022 Higher 1988 .152 1977 .046

1980 to 2009 segment:

Lower 1989< -.174 1998> -.034 1980< -.031 1990< -.028 1996> -.027 2007< -.026 Higher 1988 .298 1992 .022

1981 to 2010 segment:

Lower 1989< -.183 1990< -.033 1998> -.032 2007< -.029 1996> -.026 2000> -.026 Higher 1988 .262 2010 .050

[D] 4 Absent rings: Year Master N series Absent

2006 .390 20 1 >> WARNING: Ring is not usually narrow

2007 1.148 20 1 >> WARNING: Ring is not usually narrow

2008 -1.392 20 6

2009 -.028 20 6 >> WARNING: Ring is not usually narrow

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1989 -6.2 SD; 2000 +3.3 SD

595-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1968 218 199

1970 208 263 253 254 236 174 306 147 233 150

1980 136 187 142 135 167 182 238 170 99 95

1990 97 131 152 141 141 107 153 88 142 85

2000 206 77 85 72 109 99 0 0 0 0

2010 106

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595-b 1967 to 2010 44 years Series 12

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1980 2009 0 -.34 -.13 -.11 -.02 .13 .10 .08 .08 .18 -.04 .38\*-.31 - - - - - - - - -

1981 2010 0 -.35 -.12 -.09 .01 .14 .08 .12 .03 .20 -.03 .40\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .534) is:

Lower 1988> -.038 2003< -.034 1979< -.034 1975> -.027 1996> -.026 1984> -.022 Higher 1977 .103 2008 .065

1980 to 2009 segment:

Lower 2003< -.074 1988> -.045 1996> -.037 1984> -.031 1980< -.016 1981< -.013 Higher 2008 .122 2007 .034

1981 to 2010 segment:

Lower 2003< -.074 1988> -.037 1996> -.036 1984> -.030 1986> -.014 1981< -.012 Higher 2008 .116 2007 .029

[D] 3 Absent rings: Year Master N series Absent

2008 -1.392 20 6

2009 -.028 20 6 >> WARNING: Ring is not usually narrow

2010 1.629 20 6 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

595-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1967 227 267 237

1970 214 232 230 210 228 189 197 64 129 66

1980 106 112 155 91 160 193 225 189 100 127

1990 99 106 125 104 144 108 123 71 68 48

2000 68 53 56 23 40 29 28 45 0 0

2010 0

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596-a 1876 to 2010 135 years Series 13

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1876 1905 -9 -.14 .37\*-.23 -.03 .09 .18 -.36 .09 -.06 .00 .30|-.20 -.08 .31 -.13 .16 -.05 -.01 -.07 .24 -.24

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1905 1934 9 -.30 -.11 -.37 -.10 -.21 .31 .09 .21 -.05 -.03 .36|-.18 .03 -.15 -.15 -.24 -.08 .03 .16 .43\* .29

1920 1949 0 -.35 -.64 -.43 -.15 .01 .15 .14 .15 -.04 .20 .32\*-.17 -.05 -.25 -.18 .17 -.01 .00 .04 .24 .01

[B] Entire series, effect on correlation ( .494) is:

Lower 1876< -.029 1921> -.027 1892< -.026 1900< -.009 1920> -.009 1898> -.008 Higher 1962 .044 1890 .033

1876 to 1905 segment:

Lower 1876< -.086 1892< -.083 1900< -.028 1898> -.026 1877> -.022 1881> -.021 Higher 1890 .225 1894 .038

1905 to 1934 segment:

Lower 1921> -.155 1920> -.051 1932< -.026 1926< -.018 1925< -.014 1923> -.012 Higher 1912 .068 1934 .034

1920 to 1949 segment:

Lower 1921> -.170 1920> -.051 1932< -.030 1926< -.023 1925< -.017 1943> -.013 Higher 1937 .069 1945 .051

[E] Outliers 4 3.0 SD above or -4.5 SD below mean for year

1876 -5.3 SD; 1892 -5.5 SD; 1920 +3.3 SD; 1921 +5.1 SD

596-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1876 21 73 88 62

1880 76 90 93 83 74 77 60 63 69 71

1890 49 58 49 50 69 57 56 59 65 57

1900 52 56 61 60 53 57 48 63 45 71

1910 51 28 26 37 42 31 47 45 34 39

1920 70 68 57 39 27 23 18 21 22 33

1930 44 23 18 30 17 19 10 8 12 17

1940 21 21 26 30 28 56 63 46 31 28

1950 45 51 40 38 63 47 57 59 50 75

1960 59 92 35 51 41 49 44 75 86 66

1970 54 95 96 90 100 50 66 58 67 79

1980 108 76 70 61 68 81 64 75 51 70

1990 69 52 64 60 80 69 37 16 3 10

2000 3 12 16 16 20 24 22 37 23 45

2010 56

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596-b 1875 to 2010 136 years Series 14

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1875 1904 0 -.10 .19 .15 .03 .18 -.02 .01 -.21 .18 -.23 .38\*-.31 .01 .01 .12 -.21 .10 -.14 -.13 -.11 -.08

[B] Entire series, effect on correlation ( .527) is:

Lower 1875< -.044 1925< -.012 1932< -.010 1906> -.010 2001< -.010 1877> -.010 Higher 1962 .021 1895 .020

1875 to 1904 segment:

Lower 1875< -.124 1877> -.037 1892< -.026 1881> -.024 1898> -.016 1879> -.016 Higher 1895 .098 1899 .056

[D] 2 Absent rings: Year Master N series Absent

2000 -.469 20 1

2001 -.189 20 1 >> WARNING: Ring is not usually narrow

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1875 -6.2 SD

596-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1875 12 66 99 81 67

1880 77 87 92 73 63 64 64 54 66 65

1890 49 54 44 45 83 39 47 46 53 28

1900 46 36 36 44 46 44 52 61 44 54

1910 52 28 26 33 40 30 45 41 33 33

1920 37 22 39 24 31 17 18 23 40 42

1930 32 17 15 35 23 19 21 18 20 26

1940 31 20 21 17 24 40 36 35 28 23

1950 39 61 52 32 47 41 44 38 47 48

1960 40 61 32 54 44 34 38 51 66 40

1970 38 47 69 67 65 31 49 35 43 46

1980 76 64 52 54 49 60 39 50 35 46

1990 42 44 46 49 48 42 26 11 5 12

2000 0 0 22 22 18 18 24 38 14 25

2010 31

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597-a 1865 to 2010 146 years Series 15

[B] Entire series, effect on correlation ( .598) is:

Lower 1988> -.017 1997> -.013 1879> -.013 1977> -.011 2000< -.011 1868> -.009 Higher 1867 .028 1962 .028

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1974 +3.1 SD; 1988 +3.5 SD; 1996 -4.8 SD

597-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1865 56 57 43 55 61

1870 68 64 61 44 57 40 45 31 50 59

1880 57 59 81 58 55 37 32 35 41 45

1890 33 33 50 40 48 27 37 38 27 26

1900 39 37 46 38 56 48 41 41 38 26

1910 29 33 18 17 19 20 24 27 19 15

1920 14 7 14 10 28 39 49 35 35 45

1930 48 37 38 42 14 18 19 22 41 49

1940 58 46 50 36 45 41 46 54 27 24

1950 22 38 29 21 42 51 24 26 51 54

1960 35 58 16 39 51 51 56 68 58 47

1970 56 83 123 146 179 116 99 90 96 90

1980 108 99 114 76 71 123 123 139 100 89

1990 106 70 90 104 84 63 47 78 73 85

2000 53 62 59 69 81 72 71 117 47 105

2010 173

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597-b 1847 to 2010 164 years Series 16

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1847 1876 8 -.17 -.13 .19 .08 -.02 -.03 .08 -.02 .16 -.21 -.09| .03 .21 .10 -.07 -.29 .18 .08 .27\* .10 -.14

1860 1889 0 .23 -.35 -.12 -.14 .24 -.22 .09 -.07 .11 -.01 .34\*-.07 .16 -.24 -.27 -.12 .06 .04 .05 -.20 .12

1875 1904 0 .22 .02 -.01 -.21 .26 -.26 .27 -.14 -.02 -.23 .35\*-.18 .05 -.42 .15 -.06 -.14 .12 -.12 -.25 .07

1890 1919 0 -.05 .30 .13 -.13 -.05 -.11 -.14 .05 -.20 -.18 .33\* .06 .05 -.25 .19 -.08 -.16 -.35 -.01 -.16 .03

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1965 1994 2 -.18 -.03 -.08 -.01 .26 -.15 -.10 -.13 -.21 .03 .49|-.03 .57\*-.18 -.09 -.17 -.22 -.06 -.25 .13 -.10

[B] Entire series, effect on correlation ( .312) is:

Lower 1847< -.028 1850> -.027 1948< -.025 1851> -.018 1890> -.017 2010< -.011 Higher 2008 .019 1962 .019

1847 to 1876 segment:

Lower 1847< -.092 1850> -.084 1851> -.059 1852< -.035 1858< -.029 1870< -.015 Higher 1867 .229 1872 .040

1860 to 1889 segment:

Lower 1860> -.032 1861< -.030 1863> -.025 1870< -.020 1877< -.019 1879< -.018 Higher 1867 .081 1882 .060

1875 to 1904 segment:

Lower 1890> -.120 1877< -.021 1879< -.019 1893> -.018 1880< -.015 1876> -.015 Higher 1895 .064 1899 .061

1890 to 1919 segment:

Lower 1890> -.101 1907< -.073 1912> -.034 1909< -.033 1893> -.019 1919> -.014 Higher 1895 .089 1899 .075

1965 to 1994 segment:

Lower 1994< -.063 1989< -.027 1991> -.026 1973< -.019 1986< -.016 1976< -.009 Higher 1975 .049 1965 .023

[D] 1 Absent rings: Year Master N series Absent

2010 1.629 20 6 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

[E] Outliers 7 3.0 SD above or -4.5 SD below mean for year

1847 -5.7 SD; 1850 +4.7 SD; 1851 +5.3 SD; 1879 -4.9 SD; 1880 -4.7 SD; 1890 +4.6 SD; 1893 +3.1 SD

597-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1847 43 111 118

1850 147 160 103 94 99 92 86 83 65 59

1860 62 55 56 67 61 42 34 27 26 35

1870 27 30 36 29 37 35 41 23 31 14

1880 16 32 55 39 45 35 38 39 45 66

1890 56 52 68 58 47 30 41 38 27 19

1900 29 21 22 25 24 23 18 13 13 11

1910 10 9 11 9 13 10 23 21 13 15

1920 12 6 14 13 18 16 16 13 13 20

1930 16 12 13 13 8 12 10 6 10 16

1940 22 17 21 20 23 21 26 35 12 14

1950 14 18 14 13 18 20 10 11 15 13

1960 15 16 7 8 5 5 5 10 12 17

1970 24 38 41 31 29 13 21 18 25 42

1980 62 47 36 29 23 31 25 43 32 29

1990 39 45 54 55 33 22 17 27 16 14

2000 23 24 29 35 28 33 30 38 5 7

2010 0

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598-a 1936 to 2010 75 years Series 17

[B] Entire series, effect on correlation ( .626) is:

Lower 1977> -.024 1974< -.021 1960> -.018 1952< -.018 2006< -.016 1954< -.014 Higher 1988 .069 1962 .031

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1945 +3.1 SD

598-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 78 73 76 70

1940 96 87 95 108 146 193 117 126 113 98

1950 113 118 62 50 80 97 62 130 134 110

1960 118 151 60 89 125 53 89 91 118 113

1970 112 133 135 147 78 78 184 108 116 153

1980 97 144 106 81 59 113 126 131 47 104

1990 101 68 128 124 121 89 67 75 87 96

2000 71 149 152 101 172 100 65 119 88 126

2010 248

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598-b 1910 to 2010 101 years Series 18

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1910 1939 10 .15 .26 -.25 -.28 -.03 .05 -.17 .08 -.15 .11 -.12| .05 .13 .00 -.15 -.25 -.16 .01 -.19 -.09 .35\*

1920 1949 -10 .22\* .15 -.21 -.17 .11 .13 -.19 .20 -.31 .15 -.02|-.08 .00 -.04 -.09 -.29 -.02 .12 -.20 -.18 .20

1935 1964 0 .38 .18 -.03 .32 .18 -.10 -.29 .06 -.32 -.20 .41\*-.18 -.13 -.11 -.25 -.14 -.05 .19 -.31 .17 -.18

[B] Entire series, effect on correlation ( .335) is:

Lower 1924< -.103 2006< -.015 1915> -.014 1938> -.010 1910< -.010 1951< -.010 Higher 1988 .079 1977 .025

1910 to 1939 segment:

Lower 1924< -.144 1915> -.022 1919> -.016 1933< -.015 1910< -.007 1932< -.003 Higher 1916 .029 1921 .027

1920 to 1949 segment:

Lower 1924< -.227 1923> -.016 1934> -.015 1938> -.014 1947< -.014 1933< -.013 Higher 1929 .031 1940 .028

1935 to 1964 segment:

Lower 1951< -.065 1938> -.064 1947< -.048 1964> -.019 1944< -.014 1960> -.013 Higher 1954 .053 1962 .051

[C] Year-to-year changes diverging by over 4.0 std deviations:

1923 1924 -5.4 SD

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1915 +3.6 SD; 1924 -9.2 SD; 1938 +4.2 SD

598-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1910 23 61 72 75 96 140 114 94 113 126

1920 108 85 84 89 40 76 83 96 91 89

1930 94 65 69 61 75 92 63 64 154 123

1940 110 50 59 46 38 53 44 29 33 13

1950 20 22 34 23 77 49 34 52 101 73

1960 53 64 31 30 60 20 35 27 31 40

1970 50 61 73 74 46 42 51 30 39 46

1980 40 52 44 34 26 37 34 37 22 47

1990 42 27 41 39 49 54 36 49 44 56

2000 47 77 83 63 83 53 32 73 56 62

2010 109

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599-a 1941 to 2010 70 years Series 19

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1941 1970 0 .11 -.19 -.28 .02 .17 .22 .01 .29 -.13 -.22 .41\* .15 .26 .01 .13 -.22 .05 .16 -.33 .09 .05

[B] Entire series, effect on correlation ( .579) is:

Lower 1997< -.055 1947< -.020 1983> -.019 1950> -.010 1962> -.009 1955< -.008 Higher 1977 .042 2008 .031

1941 to 1970 segment:

Lower 1947< -.073 1950> -.037 1955< -.031 1949> -.025 1946< -.024 1942< -.023 Higher 1951 .060 1954 .051

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1997 -7.5 SD

599-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1941 107 112 124 138 267 141 117 179 208

1950 372 446 329 236 329 137 128 240 132 122

1960 57 83 43 59 49 30 33 31 40 53

1970 53 64 66 76 80 53 99 29 67 33

1980 46 63 65 70 50 55 65 75 45 80

1990 51 52 60 66 90 50 45 13 46 42

2000 67 83 83 66 81 65 82 67 35 52

2010 99

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599-b 1936 to 2010 75 years Series 20

[B] Entire series, effect on correlation ( .612) is:

Lower 1937> -.054 1953> -.019 2007< -.016 1975> -.015 1997< -.013 2000> -.009 Higher 1977 .042 1988 .022

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1937 +5.0 SD

599-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 113 159 144 142

1940 149 120 118 127 113 194 120 142 85 80

1950 81 178 229 214 260 135 120 203 169 150

1960 79 115 71 98 79 43 47 53 66 77

1970 65 71 100 105 96 85 143 47 103 70

1980 93 115 96 76 42 61 86 137 55 109

1990 74 83 89 81 118 81 58 31 55 67

2000 130 129 115 76 126 130 153 114 94 139

2010 206

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Corr //-------- Unfiltered --------\\ //---- Filtered -----\\

No. No. No. with Mean Max Std Auto Mean Max Std Auto AR

Seq Series Interval Years Segmt Flags Master msmt msmt dev corr sens value dev corr ()

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1 590-a 1962 2010 49 4 0 .671 1.76 3.93 .615 .551 .255 2.72 .451 -.044 1

2 590-b 1954 2010 57 4 0 .580 1.29 2.83 .735 .892 .247 2.50 .467 -.013 2

3 591-a 1952 2010 59 4 0 .603 1.10 2.12 .686 .877 .303 2.52 .496 -.007 1

4 591-b 1957 2010 54 4 0 .743 .96 1.97 .613 .883 .334 2.56 .586 .033 1

5 592-a 1932 2010 79 6 0 .639 .98 2.57 .485 .794 .243 2.61 .423 -.043 1

6 592-b 1908 2010 103 7 0 .623 1.08 2.14 .345 .594 .228 2.42 .463 -.002 1

7 593-a 1772 2010 239 16 6 .433 .33 .89 .120 .668 .204 2.97 .458 -.004 1

8 593-b 1713 2010 298 16 8 .394 .30 1.28 .165 .866 .191 2.46 .260 -.017 2

9 594-a 1875 2010 136 9 0 .683 .44 1.44 .202 .660 .311 2.74 .453 -.097 1

10 594-b 1868 2010 143 10 2 .446 .48 1.38 .299 .836 .268 2.70 .439 -.112 1

11 595-a 1968 2010 43 3 2 .398 1.44 3.06 .735 .658 .342 2.78 .647 .246 1

12 595-b 1967 2010 44 3 2 .534 1.20 2.67 .758 .857 .316 2.73 .538 -.064 1

13 596-a 1876 2010 135 9 3 .494 .50 1.08 .233 .763 .278 2.58 .435 -.025 1

14 596-b 1875 2010 136 9 1 .527 .41 .99 .186 .713 .295 2.79 .450 -.002 1

15 597-a 1865 2010 146 10 0 .598 .55 1.79 .317 .816 .257 2.55 .403 -.052 1

16 597-b 1847 2010 164 11 5 .312 .31 1.60 .258 .903 .275 2.71 .397 -.025 1

17 598-a 1936 2010 75 5 0 .626 1.07 2.48 .353 .188 .303 2.76 .501 -.038 1

18 598-b 1910 2010 101 7 3 .335 .60 1.54 .289 .688 .308 2.61 .372 -.063 1

19 599-a 1941 2010 70 5 1 .579 .98 4.46 .846 .802 .341 2.51 .407 .044 2

20 599-b 1936 2010 75 5 0 .612 1.09 2.60 .463 .590 .305 2.67 .531 .029 1

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Total or mean: 2206 147 33 .510 .65 4.46 .330 .746 .263 2.97 .427 -.023

- = [ COFECHA 145BRCOF ] = -