Tree-Ring Research Correspondence
between Herb Sorensen and Dr. C.W. Ferguson

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[Feb 16, 1970]

Dr. C. W. Ferguson
Laboratory of Tree-Ring Research
University of Arizona
Tucson, Arizona

Dear Dr. Ferguson,

After reading your report in Science on the Bristlecone pine, I became quite interested in dendrochronology. I have read what material I could readily find, including Stokes' and Smiley's small guide and also some issues of the Tree-Ring Bulletin.

I noticed the use of skeleton plots as a first guide in locating overlaps and the extensive use of statistics to evaluate overlap. Since I found no indication that such was already in existence, I developed a computer program which systematically searches for overlap and reports areas in which there are low, average deviations of the overlapping ring indices. Indications of missing or extra rings are also displayed.

My problem is that I only have artificial data with which to test the program. I have briefly outlined some of the potential above, and believe an application to real data is important. I wonder if you might be willing to provide me with some lists of ring indices for testing? It might be interesting to let the computer sort the constituents of your 7104 year chronology.

Aside from this request, I notice that radiocarbon analysis suggests possible extension of the chronology. Have any advances been made in this direction?

Thank you for your consideration. If you choose to submit sections of ~~raw data~~ dots samples which are important in your past or present research, I ~~shall hold~~ ~~treat any results in strictest confidence~~ would expect you to have ~~the~~ priority rights for publication.

Yours respectfully,

Herbert C. Sorensen.

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

LABORATORY OF TREE-RING RESEARCH

3 March 1970

Mr. Herbert C. Sorensen
Department of Biochemistry
and Biophysics
University of California
Davis, California 95616

Dear Mr. Sorensen:

Your letter of 16 February has been circulated among interested members of the Laboratory staff. While we have come to rely heavily upon the computer and have developed correlation programs, we are extremely interested in your approach. The "archaeological" dating is very important to me in that I often am unable to date specimens with one or two thousand rings against a 7500-year master chronology, even with the "ball-park" placement provided by a radiocarbon date.

There are two immediate sources of tree-ring data. A major source is "Dendroclimatic Changes in Semiarid America" by the late Edmund Schulman. It was published in 1956 by the University of Arizona Press and sells for $3.00. My 7104-year master chronology, a filtered indices format in tabular form, is in the latest Tree-Ring Bulletin (abstract enclosed). For your test purposes, I could also provide the Pine Alpha Series used in my plot illustration. These data could be provided in tabular form, as in the bulletin, or as punched cards, if the card form is compatible. We use the CDC 6400 computer.

In regard to computer dating: we certainly have not ignored this type of program; it has proven to be more complex than we figured. It involves, in addition to the computer statistics, a firm knowledge of dendrochronology. Not always do the tree rings do what is expected of them. In the bristlecone pine,

for example, up to 10% of the rings may be missing along a given radius. Quite often, by the time we have our data searched out to our satisfaction and ready for the computer, we have visually dated the specimen or plotted data therefrom. On the other hand, we have some that are real difficult.

Since you mention the 7104-year chronology, I assume you have seen the bulletin. There were strong reasons why I published the chronology as a filtered series; thus, I would not be able to release the index values to you. However, the filtered series should be usable for your purposes. The alternative, for index values, would be Schulman's book.

The 7104-year chronology has been extended to 7485-years, but the new data, along with some recently collected material in the 5000-4000 B.C. range, is still being studied. The 9000-year specimen, dated by C-14, indicates a potential of perhaps 10,000 years.

Dr. Valmore C. LaMarche of our staff is also working on a computer program of this nature, and we would be pleased either to advise you or to evaluate your program.

Sincerely yours,

C. W. Ferguson

C. W. Ferguson
Associate Professor
of Dendrochronology

CWF/rab

Enclosures

A 7104-year annual tree-ring chronology for Bristlecone Pine, Pinus aristata From the White Mountains, California

ordered 3-11-70

C. W. Ferguson

TREE-RING BULLETIN, Vol. 29, Nos. 3-4, pp. 3-29 (in press)

This issue is a paper prepared on the occasion of the VIII International Congress of INQUA (International Union for Quaternary Research) in Paris, August 30 to September 5, 1969.

A 7104-year tree-ring chronology has been developed for bristlecone pine, Pinus aristata Engelm., in the White Mountains of east-central California. The chronology was first established from cores of living trees up to 4600 years old, then extended backward in time by incorporating records from standing snags, fallen trees, large remnants, and eroded fragments. The availability of datable wood in the 9000-year range and the potential for extension have been indicated by radiocarbon analysis. Aspects of chronology development are described. Dated bristlecone pine has been used in radiocarbon studies; approximately 500 samples of dated wood have been sent to various laboratories. This report, containing the tabular data for the total chronology, filtered to show only short-term fluctuation in growth, constitutes the first independent time control of such length for radiocarbon analysis.

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AND BIOPHYSICS

DAVIS, CALIFORNIA 95616

March 12, 1970

Dr. C.W. Ferguson
Laboratory of Tree-Ring Research
The University of Arizona
Tucson, Arizona 85721

Dear Dr. Ferguson,

Thank you so much for your letter of March 3. I was delighted to hear that the extension of the chronology proceeds apace.

The data that I have been testing indicates that my program is functioning nearly as expected and it seems that now would be as good a time as ever to test the Pine Alpha Series. Your generous offer of a deck of cards was almost too good to be true. This would save me much time in terms of key punching. Can you send them right away? In anticipation I have punched your published index values onto cards so that I can get on with the testing.

I might mention that this is just a side interest of mine and that I am spending most of my time doing molecular orbital calculations on various vitamins and other biological compounds.

Best regards,

Herb Sorensen

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

LABORATORY OF TREE-RING RESEARCH

23 April 1970

Mr. Herbert C. Sorensen
Dept. of Biochemistry and Biophysics
University of California
Davis, California 95616

Dear Mr. Sorensen:

The computer plot for the Pine Alpha series and the tabular data for it are enclosed. On it are noted certain critical ring-years--those with minimum values. I suggest that after you test the complete series, you try a correlation program, working first with only one or two "missing" rings (simply pull these minimum values from the series). Then try with up to 5% missing rings (bear in mind that we often are faced with even greater numbers of missing rings).

The tabular listing of the Pine Alpha series are filtered values, as I described in the Tree-Ring Bulletin.

I regret that this took so long to get organized, but trust that it will still be of use to you.

Sincerely,

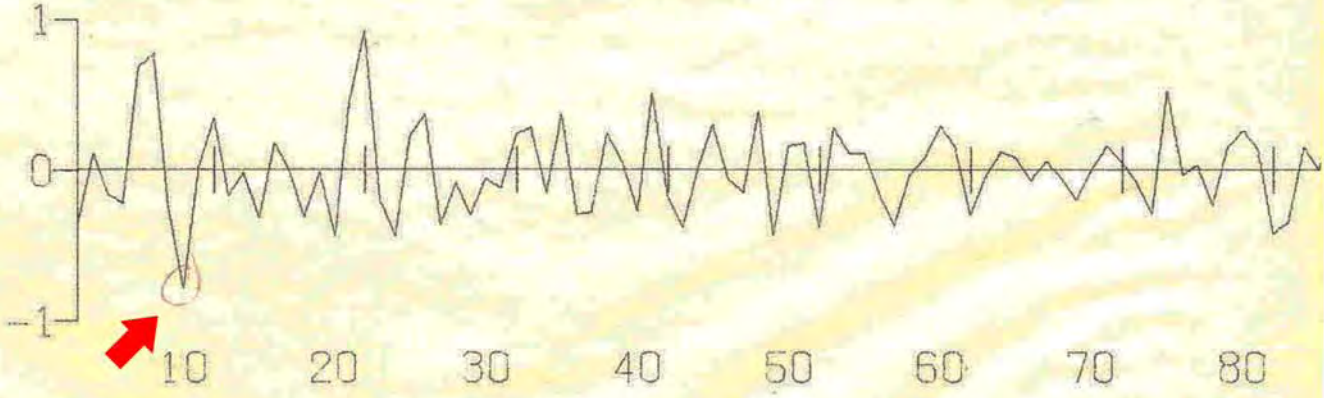
C. W. Ferguson

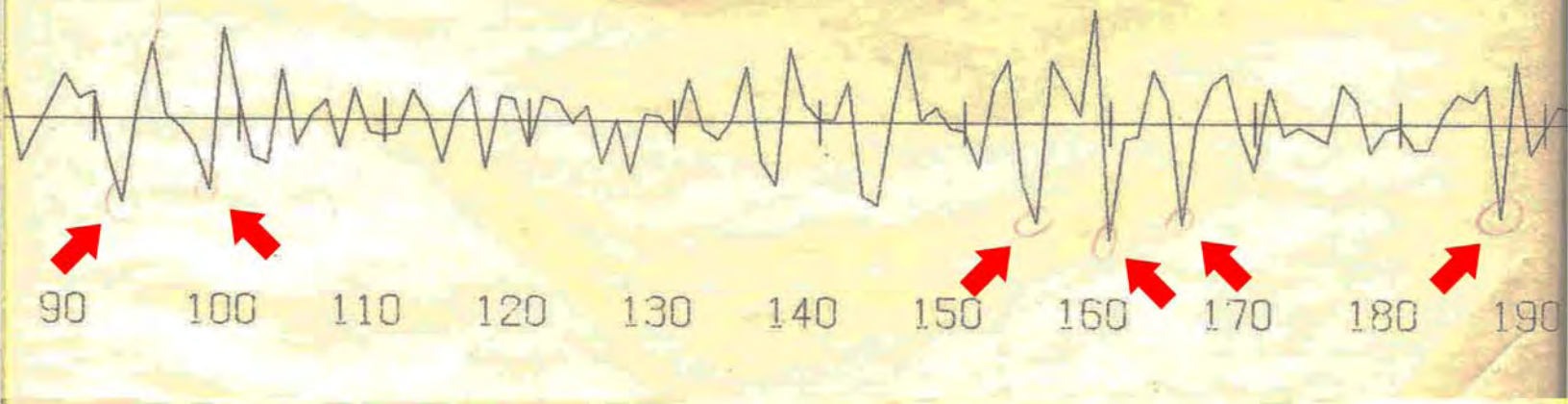
C. W. Ferguson
Associate Professor
of Dendrochronology

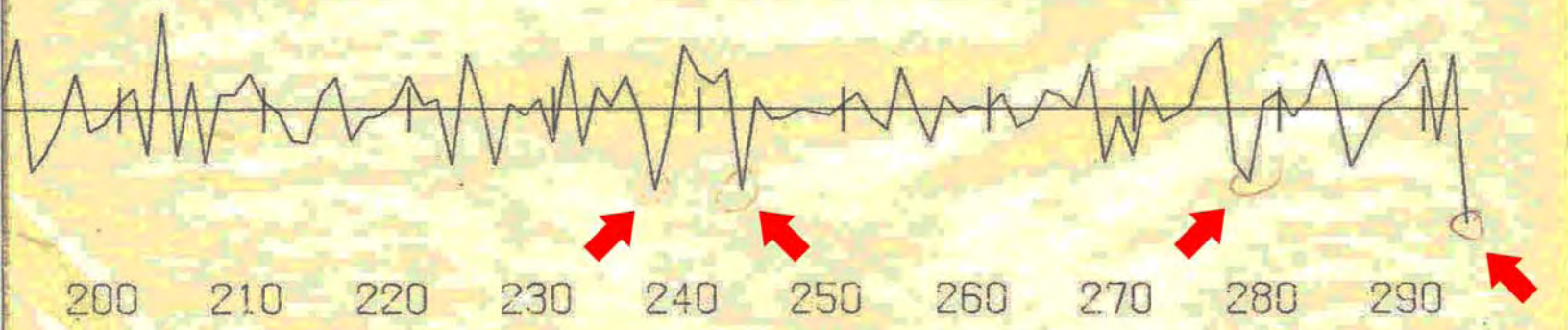
CWF/rab

Enclosures - 2

ID = 966020
PINE ALPHA, FILTERED VALUES







Pine α

966020	1	99.900	-.350	.110	-.160	-.220	.680	.770	-.240	-.780	.020
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966020	20	.920	-.200	-.440	.220	.370	-.360	-.080	-.300	-.060	-.120
966020	30	.240	.280	-.150	.370	-.290	-.280	.240	.050	-.270	.500
966020	40	-.170	-.380	.010	.300	-.060	-.150	.390	-.430	.140	.180
966020	50	-.380	.280	.110	.110	-.170	-.370	-.030	.080	.290	.150
966020	60	-.300	-.040	.120	.080	-.070	.060	-.060	-.200	-0.000	.160
966020	70	.050	-.080	-.290	.520	-.030	.030	-.230	.150	.260	.140
966020	80	-.420	-.340	.130	-0.000	.210	-.300	-.080	.100	.310	.140
966020	90	.190	-.240	-.580	.090	.530	.030	-.050	-.190	-.490	.630
966020	100	.140	-.260	-.300	.350	-.170	.040	.140	-.190	.220	-.080
966020	110	-.100	-.090	.210	.040	-.290	.070	.230	-.330	.170	.150
966020	120	-.180	.170	.140	-.010	.110	-.300	.010	-.360	.060	.040
966020	130	-.080	.290	-.050	-.120	.020	.380	-.270	-.440	.510	.130
966020	140	.020	.020	.280	-.510	-.570	.070	.550	.010	.110	-.040
966020	150	-.060	-.310	.250	.440	-.410	-.690	.430	.240	.050	.780
966020	160	-.800	-.110	-.080	.370	.150	-.700	-0.000	.260	.350	-.070
966020	170	-.330	.250	-.080	-.020	-.070	-.130	.270	.150	-.200	-.040
966020	180	-.010	-.170	-.170	.070	.210	.160	.270	-.650	.440	-.210
966020	190	-.040	.130	.110	.480	-.430	-.290	-.080	.250	-.150	-.100
966020	200	.040	.140	-.310	.660	-.320	.190	-.360	.100	.100	.240
966020	210	.060	-.020	-.220	-.230	.100	.220	-.210	-.060	-.040	.030
966020	220	.230	.030	.070	-.380	.380	.070	-.390	.040	-.040	.070
966020	230	-.230	.360	-.250	.150	.020	.230	-.040	-.560	-.150	.440
966020	240	.240	.180	.270	-.560	.080	-.070	-.060	0.000	-.020	-.040
966020	250	.030	.110	-.060	-.140	.280	0.000	-.230	.090	-.020	.020
966020	260	-0.000	.100	-.130	-.070	.120	.090	-0.000	.310	-.360	-.050
966020	270	-.320	.150	-.090	-.030	.030	.360	.490	-.370	-.500	.050
966020	280	.120	-.050	.050	.340	.050	-.400	-.200	.020	.080	.190
966020	290	.340	-.220	.370	-.790	99.900	99.900	99.900	99.900	99.900	99.900

SERIES 966020 SUCCESSFULLY READ IN. 293 RINGS. FROM 1 TO 293

PINE ALPHA, FILTERED VALUES

MISSING