Difficulties Associated with any Radical Revision of Egyptian Chronology
- A Reply to Bernard Newgrosh -

In this paper Dr. Mike Baillie responds to the article published in JACF 2 by Dr. Bernard Newgrosh entitled ‘Scientific Dating Methods and Absolute Chronology’ (pp. 60-68). Dr. Baillie gives here a clear statement of the scientific case, in particular the evidence in support of the new tree-ring calibration curves now accepted by the C-14 community.

M. G. L. BAILLIE

This paper represents the first stage of a reply to the recent article by Bernard Newgrosh. However, it also serves to address, or begin to address, the more fundamental questions of ancient chronology raised within JACF Volume 1.

There are several levels to this discussion and I will begin by attempting to identify two main problem areas.

1. The nature of scientific endeavour

It is clear, from reading Newgrosh, that there are different attitudes to scientific work/results. To give an example which grasps the nettle early - most scientists would not take it upon themselves to arbitrarily dismiss the edifice of the bristlecone pine tree-ring chronologies, nor would they simply dismiss calibration and revert to the discussion of ‘raw’ radiocarbon dates.

It appears - perhaps this is a mistaken impression on my part - that certain ancient historians have no such qualms and can set aside scientific results either on the basis of very slim evidence or as it suits.

2. Shortening the Egyptian chronology

It is clear that the proposed shortening of the conventional Egyptian chronology, with its consequent removal of the ‘Dark Ages’ (loosely defined as between 1200 BC and 800 BC), immediately challenges the ‘scientific’ chronologies. The logic is straightforward. If the Egyptian chronology is seriously in error it implies that the radiocarbon calibration curves are in error. This is because calibrated radiocarbon dates are broadly in agreement with the existing Egyptian chronology.

However, if the calibration were in error then the tree-ring chronologies which underpin it would also be in error. It can be inferred from this logic chain that, because the existing Egyptian historical chronology is predicted to be too long, all the tree-ring chronologies are also predicted to be too long. So we now know where we stand. If the proposed shortening of the Egyptian historical chronology has any validity then the 7000 year bristlecone pine chronology [Ferguson, 1969] would have to be wrong, the independent 5000 year upper treeline bristlecone pine chronology [LaMarche and Harlan, 1973] would have to be wrong, the 7000 year Irish oak chronology [Pilcher et al., 1984] would have to be wrong and the independent 6000 year north German oak chronology [Leuschner and Delorme, 1984] would have to be wrong. Moreover all the chronologies would have to contain an error in the same direction and each replicated pair would have to be in error by exactly the same number of years. As such, the proposed revision of the Egyptian historical chronology is of considerable interest to dendrochronologists.

I am going to choose, for the purposes of this paper, to discuss only some major chronological

Dr. Mike Baillie is recognised as one of the world’s leading authorities in the relatively new science of dendrochronology. He has been directly involved in the work to develop the new Stuiver & Pearson high-precision tree-ring calibration curve for radiocarbon dating, now universally accepted by the C-14 community. Dr. Baillie is an ISIS Research Associate specialising in scientific dating methods, and, in particular, dendrochronology. He has also recently been awarded an ISIS Fellowship and his Fellowship Lecture will be published in JACF 4.
points which derive directly from Newgrosch's paper. Subsequently it might be of interest, for the purposes of completeness, to discuss some of the internal parameters of the tree-ring chronologies and the resultant calibrations. I am not going to discuss the issues raised by Newgrosch concerning 'ice-core dating' and 'frost signatures' for the simple reason that these are secondary considerations. The principal issue relates to the correctness of the tree-ring chronologies and the radiocarbon calibration curve and these are the issues which will be dealt with here.

The nature of scientific endeavour

This is purely a personal opinion, but it would seem that science succeeds because, by its very nature, its results have to be open to replication. If scientist A measures the speed of light and publishes his result, it is open to colleague B to repeat the experiment and either confirm the result or (better still) demonstrate that A was wrong. This latter outcome makes B's result equally valid to that of A and it remains for C to repeat the experiment yet again - usually demonstrating, one way or the other, who was correct. Frequently, given the nature of scientific endeavour, replicate experiments are not conducted separately; they are conducted concurrently and independently, with the results appearing simultaneously.

In the case of both the measurement of the speed of light, and our more immediate concerns with dendrochronology and radiocarbon calibration, the entire system is underlay by replication (we will return to this later). It is this replication which makes the results acceptable to the scientific community.

An additional factor, and one not to be taken lightly, is that there is often more to be gained by proving another worker wrong than in merely proving him right. I would maintain, therefore, that independent scientists have little or no vested interest in perpetuating flawed theories or flawed measurements. This is particularly the case with dendrochronology where independent workers, in the act of dating timbers, regularly duplicate sections of existing chronologies.

So the questions applied to the scientific dating techniques simplify to 'is the bristlecone pine tree-ring chronology replicated?' and 'is the bristlecone pine calibration replicated?'. If we wanted we could throw in the additional question, asked before but still apparently current, 'is the bristlecone pine calibration curve applicable to old world radiocarbon dates?'

We may have to consider the wider implications of the acceptability of the answers. If the answers, to the above questions, are 'yes, yes and yes' respectively it is implicit that scientists will accept that result. If they do not accept the result, their only recourse is to repeat the experiment - they cannot arbitrarily set aside the bristlecone pine chronology and calibration. If ancient historians, in the same situation, can justify setting aside the bristlecone pine calibration, then it is clear that we are all talking a different language and as Newgrosch states:

Chronology is (indeed) currently at a crossroads; its students have to decide which direction to follow - that of the scientifically or that of the historically derived dates. Their paths diverge and it seems that they may never join up again.

However, we do not live in different universes. Chronological questions frequently have only one correct answer. For example, the Bronze Age eruption of Santorini did not occur in both the 17th century BC and 'circa 1500 BC'. It occurred in a single calendar year. Our interest - scientist or ancient historian - is in specifying that year as exactly as possible. In this case if our paths diverge someone has to be wrong!

Some discussions on the proposed shortening of Egyptian chronology

Let us start by defining some things which are widely regarded as correct and which are not being questioned by anyone at this time. The master tree-ring chronologies of the last two millennia, in Ireland [Baillie, 1982], Germany [Hollstein, 1980; Becker, 1981] and the western United States [Douglass, 1919, 1928; Ferguson, 1969; LaMarche and Harlan, 1973] are absolutely correct. They form a perfect calendar and were produced using robust chronology building techniques. Replicated, high-precision, radiocarbon activity measurements made on precisely dated samples drawn from these various chronologies [Stuiver and Pearson, 1986] make up the internationally accepted calibration curve for the conversion of radiocarbon dates into true dates for this time period.

The production of these chronologies and calibrations involved numerous independent workers. The end results - two high-precision radiocarbon calibration curves so similar as to be essentially identical - were performed by different workers in different laboratories using different measurement techniques; their dated wood samples being drawn from America and Germany on the one hand and Ireland on the other. It is this level of independent replication which makes the results acceptable as an international standard.
Now the irony is that exactly the same levels of replication within the tree-ring chronologies hold true far back into the BC era - certainly back to 3000 BC in America and back to at least 5000 BC in Europe. The chronologies were built using the same robust procedures and are as well replicated. The high-precision calibrations were performed independently on German and Irish wood [Becker and Stuiver, 1986; Pearson et al., 1986] with the exception of a short section between 515 BC and 625 BC where Becker was unable to provide German samples and duplicates were provided by Belfast. However, there is no gap in the other German long chronology, built at Göttingen [Leuschner and Delorme, 1984], and samples of the missing period in Becker’s chronology could have been provided by Delorme and Leuschner. The use of Irish samples over this short period in no way weakens the overall independence of the two high-precision calibration curves. So, in scientific terms, the high-precision calibration curves of Pearson and Stuiver are sufficiently well replicated to serve as the international standard.

These statements form the basis of what might be called the scientific case. All the relevant information is published and, to the best of this author’s knowledge, no one in the scientific community is currently challenging either the tree-ring chronologies or the calibrations. We can now look at the nature of the criticisms of this replicated system and attempt to assess whether or not they represent a case which is worthy of serious consideration.

Quantification of the proposed shortening of Egyptian chronology

What I find surprising, is that this whole story of shortening the Egyptian chronology, with its implied criticism of calibration and dendro-chronology, is by no means new. Velikovsky [1976 printing of the 1955 edition, p. 241] argued for a six or seven hundred year revision of the Egyptian chronology. Clube and Napier [1982] were much more specific; ...

... there is a major error in the standard chronology which, by our arguments, makes all Old, Middle and New Kingdom dates before 512 BC too early by 468 years.

The details of their historical arguments are not relevant here; what is interesting is the similarity in the implications for the scientific chronologies. It is noticeable that the period of revision is the same (broadly later 2nd/early 1st millennium BC); the direction of revision is the same (shortening) and the order of magnitude is the same (hundreds of years). So the concept of shortening the scientific chronologies has been around for some time. The consequences appear to be very similar, regardless of the details of the ancient historical arguments!

I am reliably informed [D. Rohl, personal communication] that, in ancient historical circles, the details of Velikovsky’s scheme ‘have proved to be untenable’ and that Clube and Napier ‘have had their chronological revision discredited by those in-the-know’. From the scientific viewpoint, this is extremely interesting. It would have been most unlikely for either of the schemes to be correct, because the revisions in the scientific chronologies implied by their theories would be extremely difficult to justify.

Radiocarbon and its place in the debate

Let us examine the question of radiocarbon because radiocarbon and comments about it are the unifying factor in this discussion. Velikovsky was writing just as radiocarbon dates were becoming available for the first time. These were raw ‘Libby’ dates and they were young compared with the standard chronology. Velikovsky laid down the challenge:

Soon you will be able to judge as right or wrong my unqualified statement that carbon analysis of the wooden sarcophagi of Seti, Ramses II … or Tutankhamen, would yield dates five to seven hundred years younger than those assigned by adherents of the conventional chronology. Then you will know for certain whether the conventional or the revised history … is authentic and true.

Well now we do know! His unqualified prediction was wrong - the raw carbon dates were not five to seven hundred years younger, they were around three hundred years younger. However raw radiocarbon ages are not calendar ages; only calibrated radiocarbon dates equate with calendar ages. Calibrated radiocarbon dates for Seti I, Ramses II etc. compare well with the conventional historical dates, within the realistic statistical errors associated with the individual dates. It is therefore no surprise to the scientific community to hear that Velikovsky’s arguments regarding his dates for the 19th Dynasty have been debunked by scholars originally sympathetic to his revision.

Clube and Napier were much less dogmatic than Velikovsky. In their case, writing before 1981, they knew that they had to contend with calibrated radiocarbon dates:

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... our bringing forward of the pre-22nd dynasty Egyptian civilization by 468 years must now imply also a similar advance in time of European dates based on C-14 measurements. In general terms this is possible only if one uses uncalibrated [their emphasis] radiocarbon dates.

They then go on to note that carbon dates begin to deviate from bristlecone tree-ring dates prior to 500 BC:

The deviation is around 400 years by 2000 BC, not so very much different from the error we presume in the Egyptian chronology.

This, of course, leads them to suggest the somewhat inevitable solution:

It is clear then that the simplest way of continuing to preserve the relative dates of modern European archaeology whilst correcting the absolute Egyptian scale is to propose an error in the bristlecone pine calibration.

Clube and Napier had by now worked themselves into a scientific impasse. They said:

Although this calibration has still to be checked against others, it has been widely accepted as immune from error. It might therefore in the end be an obstacle to the revision proposed ... [my emphasis]

In effect, Clube and Napier were saying that if the bristlecone pine chronology was checked and found to be correct, their theory would founder. Given the information, presented above, it is no surprise to the scientific community to hear that Clube and Napier’s arguments have been subsequently ‘discredited’.

To summarise: it should now be clear that the scientific view of any proposed, radical, shortening of the Egyptian historical chronology is the same. It can be expressed as follows:

Radiocarbon calibration is a replicated system. Both calibrations - those based on the bristlecone and those based on European oak - are totally independent of the Egyptian historical chronology. Therefore, since calibrated radiocarbon dates support the conventional Egyptian chronology, it is likely that any argument, which proposes a radical alteration of the Egyptian chronology, will be found to be wrong.

The new revision

Let us now look at the new revision proposed in JACF 1 and by Newgrosch. The following quotations are from JACF 1:

At their greatest extent the problems range between about 1200 BC and the 6th to 5th centuries BC. [Thorpe and James, p. 8]

... considered together a disturbing pattern of features seems to repeat itself - one involving frequent lacunae in stratigraphy, serious dating conflicts involving differences of as much as 200 to 400 years ... [Kokkino et al., p. 18]

Between these two bench marks, the end of the 20th Dynasty and the beginning of the 26th, lies the ‘Third Intermediate Period’. A period of some obscurity, its dates (c. 1110-650 BC) curiously parallel those of the ‘Dark Ages’ reviewed above. [James, p. 50]

All these authors argue for removing the dark ages by shortening the Egyptian chronology. Newgrosch also states:

Bimson, Bietak, Wood and Goedicke have all proposed alternative and lower chronologies for Egypt and Palestine; and ... Rohl and Newgrosch have re-dated the Amarna age about 300 years later ...

If we take, for example, the case of Ramses II, Newgrosch plots his early Ramesses II at 1060 BC and/or 990 BC, and his death of Ramesses II at 890 BC. He appears to be happy with a variable revision of the reign - between 220 and 325 years. Here then is the current call for a shortening of the Egyptian chronology, in the same general period by some several hundred years.

The above neatly demonstrates one of the major problems for the revisionists. If the standard chronology is in error then it should be in error by a fairly specific number of years. However, this is not what we see in the quotations above. The figures seem to vary between about 400 years and about 200 years. In order to challenge scientific chronologies, which are widely regarded as precisely correct, a much more specific definition of the proposed revision is essential. Scientists could justifiably claim that ancient historical arguments, with such a range of variability, present insufficient grounds to challenge a well replicated, precise, calendrical system.

At this point we should pause and attempt to consolidate the various arguments. We have seen
others challenge the Egyptian chronology using historical argument. We have seen Clube and Napier challenge the bristlecone pine calibration and the underlying bristlecone pine tree-ring chronology. We have seen that the scientific community have answered Clube and Napier’s challenge by replicating the bristlecone pine chronology and, indeed, producing a parallel, replicated, European oak chronology. We have the statement from Rohl, that Clube and Napier’s ancient historical revision has been ‘discredited’. Logic would suggest that the case has already been settled and arguments about shortening the bristlecone chronology are a waste of time.

Obviously not, we now have Newgrosh, on the basis of a ‘new’, ancient historical, revision of the Egyptian chronology, challenging the radiocarbon calibration and, by inference, the underlying tree-ring chronologies. There are inherent weaknesses in Newgrosh’s arguments and I will demonstrate some of these below. First, it is important to compare his chronological arguments to those which have gone before. I have already quoted Clube and Napier’s statements that a 400 year shortening of the bristlecone chronology would suit their theories. They also say:

The revised Egyptian chronology is better fitted by the straightforward dating uncorrected by the bristlecone pine.

This is remarkably close to Newgrosh’s statement:

It is interesting to note that the lower chronology proposed in JACF 1 is consistent with the relative chronology obtained by using non-calibrated radiocarbon dates.

There is a further similarity. Clube and Napier said of the bristlecone chronology; ‘It might therefore in the end be an obstacle to the revision proposed’, i.e. they recognised that if the bristlecone pine chronology was correct, they were wrong. Newgrosh begins by saying something similar:

In the light of the trend towards lower dates for historically derived chronologies it becomes all the more urgent that the scientific methods are reconsidered to see why their results seem consistently much older.

He goes on to say, in scientific style:

If these truly are scientific methods, and there seems no reason to doubt this, it is not a scientific approach to refuse to accept their results without good explanation. [my emphasis]

He then attempts to find a ‘good explanation’. It is at this point that Newgrosh departs from the scientific approach. His arguments are interesting not least because they highlight the difference between the scientific and historical argument alluded to above.

Newgrosh’s ‘explanation’

The explanation Newgrosh attempts can only be described as flawed. It is clear that Newgrosh thinks there is a problem in the European chronologies c. 900 BC, and, indeed, there was such a problem before 1982. Unfortunately for that argument, the steps in the completion of a number of European chronologies took place immediately after 1982 [Becker and Schmidt, 1982; Baillie, 1983; Baillie et al., 1983; Pilcher et al., 1984; Leuschner and Delorme, 1984; Brown et al., 1986; Baillie and Pilcher, 1987]. In particular, by 1984, there were two independent chronologies for Ireland and Germany back to beyond 4000 BC.

Because of this conjectured (but now purely historical) problem, Newgrosh asserts that it is impossible to produce a high-precision calibration for the BC period, quote:

But we are, of course, unable to produce ‘high precision’ curves for most of the BC record ...

While this is wrong and ignores the published European high-precision calibrations for the BC time-period [Pearson et al., 1983; Pearson et al., 1986; Stuiver and Becker, 1986; Pearson and Stuiver, 1986], it allows him to claim ‘… and (we) must make do with “smoothed” ordinary curves’.

What are these “smoothed ordinary curves”? They are the calibrations based on what would now be called ‘routine’ radiocarbon dates i.e. dates with realistic precisions of around +/- 80 years (or worse), compared with the +/-20 year high-precision dates used in all the recent calibrations. Newgrosh is essentially referring to the original bristlecone calibration. He goes on to assert that:

If the smoothing process has an inbuilt bias towards producing older dates then there is a case for not applying the calibration curve at all. [my emphasis]

This conclusion is based on his (mis)interpretation of a handful of routine dates, originally published to illustrate a quite different point [his Fig. 4 after Baillie, 1982]. Newgrosh uses these dates, from the AD period, to suggest that before AD 500 routine dates are systematically older than high-
precision dates. The existence of actual replicated high-precision calibration curves for several thousands of years BC renders his assertions completely obsolete.

Since the question of bias has been raised, it is probably worth clarifying the issue. If routine and high-precision systems were used to measure the same samples, then, providing that both are accurate, there should be no systematic bias only increased statistical scatter in the case of the routine dates. Bias can exist between systems, but it is interesting to note that in interlaboratory studies the high-precision results of Pearson and Stuiver fell very close to the mean of all participating laboratories. So the two high-precision systems used in the bulk of the recent calibrations demonstrably lack any significant bias. To quote Pearson et al. [1986] referring to comparison of the results between Belfast and Seattle:

... comparison is possible over 4500 years of calibration ... Some 214 (high-precision) measurements were compared and the resulting differences closely fit a Gaussian distribution with a standard deviation of 25.6 years and a mean difference of 0.6 years. This agreement shows that no significant bias exists.

For a prior example of lack of bias between an accurate routine system and a high-precision system (published before this current debate was known about) see the comparison between routine and high-precision dates for known age samples in Baillie and Pilcher [1983].

**Newgrosch’s chronological conclusions**

Newgrosch concludes his discussion by making two direct chronological statements which are worth repeating here.

1. ‘Radiocarbon dating is based on assumptions which we now know not to hold true. If we were going to re-invent the method, knowing what we do about these assumptions, there is a real possibility that the method would now be deemed inadmissible.’

2. ‘... the ... calibrated radiocarbon method ... produces dates which have an inbuilt bias towards excessive age.’

The assertion about the radiocarbon method being ‘based on assumptions now known not to be true’ is a gross distortion of the facts of the matter. Scientists have converted the radiocarbon method from one based on a set of unproven assumptions to a method for which an empirically derived calibration curve exists. Not only that, but the calibration curve, and the tree-ring chronologies underlying it, form a well replicated system. With this calibration system, the original assumptions, which Libby of necessity had to use, are no longer relevant. We now know the radiocarbon activity associated with all calendar ranges in the last 7000 years. Now, if we wanted, when the radiocarbon activity of an ancient sample is measured it could be converted directly to a calendar age range without ever producing a ‘radiocarbon’ date. Raw radiocarbon dates are still calculated and published purely because of convention - they are no longer necessary. Overall, the radiocarbon method is more admissible now than ever before!

I have already dealt with the ‘inbuilt bias’ point above. To summarise the argument, the issue is redundant because of the existence of a replicated high-precision calibration curve far back into the BC period - in flat contradiction to Newgrosch’s statements ‘...were we able to construct high-precision curves for the period 2500-500 BC...’ and ‘But we are, of course, unable to produce high-precision curves for most of the BC record...’.

**Conclusion**

We have now looked at the basic evidence for the validity of the scientific absolute chronologies. These chronologies, both tree-ring and radiocarbon, represent a fully replicated system upon which the scientific community relies for the production of an absolute chronology.

We have looked at the chronological parallels between previous proposals for shortening the Egyptian historical chronology and the new case argued for by Newgrosch. I believe that the revisionist case has been found wanting in a number of important respects and that, as a case, it represents insufficient grounds for suspecting a catastrophic error in the tree-ring chronologies. If the scientific chronologies are accepted as sound, then calibrated radiocarbon dates are also sound and there cannot be a great deal wrong with the conventional Egyptian historical chronology. It would seem reasonable that the revisionists should now consider the implications for their current arguments.

This brings me back to the crux of the matter: the difference between the scientific and the revisionist approach to chronology. My concern would be that irrespective of the scientific case the revisionists will continue with their arguments for shortening the chronologies. The reasons for my concern are well exemplified by the tone of one of Newgrosch’s statements. Newgrosch says:
If these truly are scientific methods, and there seems no reason to doubt this, it is not a scientific approach to refuse to accept their results without good explanation.

This statement is fine and conforms to what might be called a scientific ethos. However, his next line is quite different in tone, departs dramatically from the nature of scientific endeavour and explains his 'explanation' detailed above. It says:

Such an explanation must exist, and one will be sought here ... [my emphasis]

This is not the open-minded statement of a disinterested observer; this is the statement of a believer. It seems that Newgrosh, and, I suggest, other revisionists, do not allow that an explanation might not exist; that the scientific methods might be correct and that it is the revisionist theories which might be in error.

It is this tone, combined with the flawed arguments used to justify his two principal chronological conclusions, which demonstrate that these are not really the criticisms of a fair and neutral observer. Newgrosh's argument, reduced to its most basic elements, simply says 'The scientific methods must be wrong'. Ironically that is the very reason why his suggestions do not represent a case worthy of serious consideration.

Addendum

There are a number of errors in Newgrosh's paper which are not dealt with in the above. Two, in particular, need to be singled out because they may be somewhat confusing to a non-scientific readership.

(i) In his Figure 1, and in the text, he claims that 'the concentration of carbon-14 in the atmosphere is ... thought to have varied considerably - by as much as 50% - over the last seven thousand years'. This derives from his failure to note that the scale on the original figure (his Ref. 22), which he reproduces, was not in percent (%) but in parts-per-mill (‰) i.e. parts per thousand not in parts per hundred. So the concentration of carbon-14 in the atmosphere, over the last several thousand years has varied only by a few percent not by 50%.

(ii) Referring to his Figure 6, he claims that 'the lower chronology proposed in JACF 1 is consistent with the relative chronology obtained by using non-calibrated radiocarbon dates. Indeed, in many examples the raw radiocarbon date corresponds quite well with that predicted by the new chronology'. This is a most misleading diagram because it gives the impression that revised historical dates are perfectly correlated (lie on a straight line) with raw radiocarbon dates. However this is not what is actually represented. The figure plots (raw radiocarbon dates) against (raw radiocarbon dates minus 1950 years). This is a completely meaningless diagram because it is simply plotting radiocarbon dates against themselves. To illustrate just how meaningless the diagram is; every radiocarbon date ever produced lies on this same straight line!

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Editor’s Note

In response to Mike Baillie’s criticism of the chart on page 65 of JACF 2, I should point out that the responsibility for Fig.6 lies with me rather than Bernard Newgrosh. I would note, however, that the purpose of the diagram was to visually demonstrate that uncalibrated C14 dates for historical figures living before 650 BC are consistently lower than the orthodox historically assigned dates but entirely consistent with the dates suggested by the New Chronology. Of course all uncalibrated dates fall on the theoretical curve; what was intended was that the reader should compare the uncalibrated date (by reading it off the BC scale) to the historical BC date given in the name box of each king.