

Reply to comments on Venafro chessmen

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Abstract

Several questions asked after the dating of Venafro chessmen – concerning in particular the indicated date and its confidence range – are answered.

Riassunto

Replica ai commenti sugli scacchi di Venafro. Si risponde a diverse questioni sollevate sulla datazione degli scacchi di Venafro ed in particolare sul valore indicato per la data e relativa incertezza.

Introduction

It may be time to provide an answer to several questions that have been asked about Venafro chessmen, even after their scientific dating. I can apparently represent the required intermediate expert between scientists and collectors, being neither of these while near to both. Frankly speaking, I was in no hurry to write, fearing that further objections may come out requiring subsequent replies, and so on. My intervention however has been stimulated more than once and thus here are my replies in order of increasing relevance, a first section devoted to scattered questions, a second one to problems concerning the date and its confidence range.

Scattered questions

Are the pieces chessmen? This question actually needs no reply in this journal, and it may even be surprising that it has been asked nowa-

days – as can be read in a German newspaper communicating the dating. I have already stressed elsewhere how this kind of chessmen has been for centuries not the exception (as it appears to be in current collections) but the very rule, all over the world except for Far Eastern Asia.

Was the research stimulated by the Turin Shroud or by the Königstein group? My interest was certainly awakened by the Shroud. Thus, in a letter to Dr Chicco, dated 9 May 1988, I wrote that for some weeks I had been reflecting that a dating of Venafro chessmen finally seemed to be possible. The reason was that cloth fragments smaller than a postage stamp were used at the time for dating the Turin Shroud. In the following (as in my 1991 article in *Scacco*), I considered this task rather subordinate with respect to seeking confirmation from any similar game pieces from the classical civilisations. As a matter of fact, before the further stimulation received from Ferlito, I had no opportunity to discuss the matter with Naples teams nor to become acquainted with the details of the new analytical facilities.

Can any collector's chessman be dated? The publication of the dating of Venafro chessmen has awakened new expectations among collectors. Having seen that a very small fragment is required for dating, they may wish that any chessman of uncertain provenance existing in their own collections undergoes similar treatment. Things are not so easy. When I wrote that in Italy there is a single apparatus of this kind, you might suspect that in more advanced countries there could be several of them; not however that similar devices are available round the corner. In any case, you will have to convince the scientists that the problem requiring the measurement is interesting enough.

How could mediaeval chessmen be found in a Roman grave? The actual grave was an isolated one. Its location, at the very border of the Roman town, could be compatible in principle with a Roman tomb, even though it is far from the places round Venafro where Roman tombs had typically been found. After the dating of the chessmen, however, assigning the grave also to mediaeval times becomes much more plausible.

Problems of date and range

The most difficult questions have the dating as subject. I would deal with them with reference to the Supplement issue of *L'Italia Scacchistica*, where the dating has been published, and especially to the essential diagram of page 58, reproduced here as Fig. 1. My aim is to repeat and explain the main lines of the scientists' reasoning without discussing its theoretical foundation, which I assume to be sound. Further details can be found in the more complete report that the scientists involved are now publishing in *Archaeometry*. Here, we can separately discuss two connected topics, the specific value for the suggested dating, and its confidence range.

The date of 980 AD. In all measurements of physical quantities the experimental result is subject to some uncertainty. In this case, the experimental result is not the required dating. First one measures the concentration of carbon ions; then one obtains the radio-isotope date, expressed as years before the present (in the following, YBP) with a given confidence range; then one uses – for transferring the YBP date to the required calendar date (YCD) – a standard law, established on the basis of a very large data bank and independent confirmations (the experimental uncertainty of the law being then included in the uncertainty considered for dating the sample). This procedure does not involve anything complicated as far as the most probable value is concerned. In our case, the YBP value (horizontal dashed line in Fig. 1) directly gives 980 AD (vertical dashed line) as the actual YCD of our chessmen. Different measurements would provide somewhat different experimental YBP results. However, in our case the results of two different determinations have already been compared and merged. On the other hand, it is hardly possible that the relationship plotted in the figure may be updated in the future to give a significantly different YCD for the same experimental result of YBP. Therefore, the result obtained appears to be fully reliable.

The uncertainty of the measurement. The YBP experimental result has a symmetrical confidence range, as usual. Once systematic errors

have been avoided or corrected, statistical errors affecting measurements follow the laws of chance and can be fitted by a bell shaped Gaussian curve, as shown in Fig. 2. The percent fraction of the area is also indicated – as the curve is symmetrical, the maximum corresponds to 50 or half of the area. The width of the confidence range depends on the accuracy required. The bottom of the bell has less and less physical meaning, eventually providing too large an uncertainty as to the data; therefore, the limit is currently set at σ , the so called standard deviation. The same concept of standard deviation can be applied to a single measurement, being assumed as the a-priori error range. Thus the range of about 160 years indicated by the two horizontal full lines in Fig. 1 actually corresponds to the interval between $-\sigma$ and $+\sigma$.

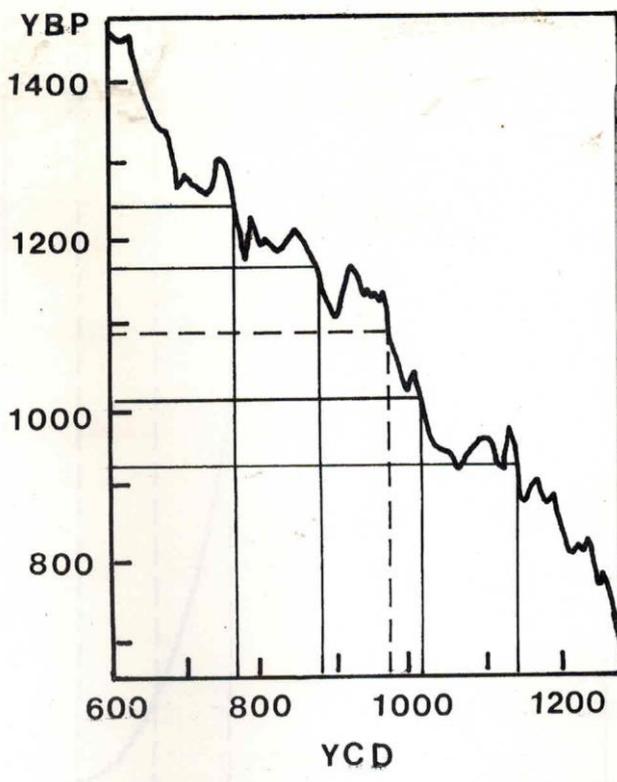


Figure 1

The non-linear dependence in the 1-sigma range. In our case, the Gaussian curve of the YBP dates cannot be transferred directly to the YCD date, because these dates are not linearly dependent. We thus encounter a first complication: the statistical range of possible errors on YCD is no longer symmetrical and a skew appears in the curve. In particular, due to the actual shape of the relationship plotted in the diagram, the new frequency distribution is skewed to the left. That can easily be seen in Fig. 1, where the two limits on the YCD are drawn as the two vertical straight lines, in correspondence to the horizontal ones for YBP limits. The non-linear dependence explains why the proposed date is 980 and the mean value of the 885-1017 confidence range would be 951.

The many-valued dependence in the 2-sigma range. For several chess experts, the most surprising result obtained by the scientists has been the appearance of the two unexpected appendages to the right of the continuous part when the confidence range is extended to 2σ . It is easy to understand that the interval increases from 885-1017 to the new values of 781-1044. The questions refer to the years 1104-1112 and 1147-1152. Why are they present? What do they mean? What happens in the intermediate regions? The explanation simply derives from a careful reading of the same Fig. 1. The relationship between YBP and YCD is not only non-linear, it is also many-valued in the range of our data. For instance, no less than 5 different values of YCD may be noted in Fig. 1 to correspond to the same 930 value for YBP.

The overall behaviour in the 3-sigma range. Generally, one is satisfied with a range from -1σ to $+1\sigma$, corresponding to 68.26% of the area below the normal probability curve – as seen, the pertinent confidence range is 885-1017 AD. If this approximation is considered insufficient, the interval may be extended from -2σ to $+2\sigma$ with the area becoming 95.44% of the total. When we do that, the range becomes fragmented, as seen before, into three zones: 781-1044, 1104-1112, and 1147-1152 AD. What about extending further the range from -3σ to $+3\sigma$ thus covering 99.74% of the area? In this case, the corresponding confidence range again becomes continuous and roughly covers the interval 700-1200 AD. Some skew is still present and the final probability curve includes the irregular features of the relationship between the values of YBP and YCD. Obviously, the possible five hundred years obtained

have not each the same probability. Keeping in mind our Fig. 2, while extending the range we are only considering more and more of the bottom values of the bell curve, which is in itself characterised by less probable values the farther we go to the right and to the left.

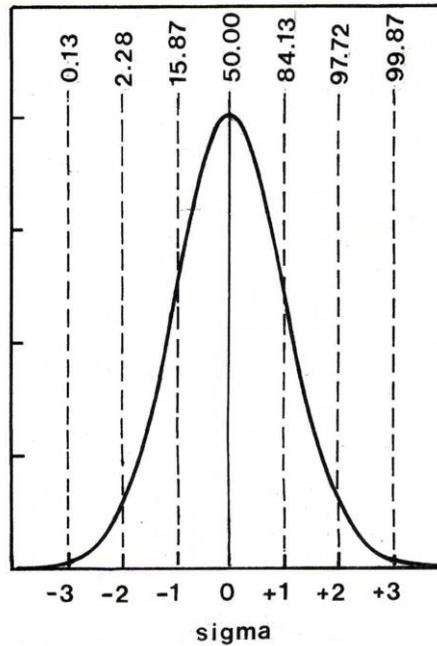


Figure 2

Conclusions

Apart from single scattered questions, rather easy to answer, the main problem has been provided by the actual date of 980 AD and especially by its confidence range. The symmetrical shape of the Gaussian curve is lost when passing from Years Before Present, experimentally determined, to the required Calendar Years. The confidence range around the value determined experimentally may be assumed more or less wide in terms of σ . The fine structure of the final probability curve can be neglected in a first approximation since it cannot have a remarkable effect on the most probable value, which remains centred at 980 AD.