14. THE PROBLEMS AND DEFICIENCIES OF DENDROCHRONOLOGY AND SEVERAL OTHER DATING METHODS

14.1. The consequent scale of dendrochronological datings does not extend further back in time than the X century A.D.

The *dendrochronological* method is one of the modern dating methods claiming to be capable of dating historical artefacts independently. It is based on the assumption that the yearly growth of tree rings is uneven. Annual ring thickness rates are supposed to be roughly similar for the trees of the same kind that grow in similar conditions.

In order to make this method fit for actual dating, one has to construct a reference scale of annual ring thickness for trees of a particular kind for a historical period of sufficient length. Let us call this graph a dendrochronological scale. If such a scale is constructed, it might aid one in the attempt at dating archaeological findings containing wooden pieces. One has to determine the timber type, saw off a sample, measure the thickness of rings, build a diagram and try to find out whether it concurs with any part of the reference scale. One should also consider the question of what deviations of compared diagrams can be ignored safely.

However, the European dendrochronological scales only reaches several centuries back in time, which does not allow for the dating of "ancient" constructions.

"Many European scientists have started to experiment with the dendrochronological method… however, obtaining results appeared a formidable task. *The oldest trees in the European forests are only 300-400 years old…* Deciduous trees have *vaguely defined* rings which are hard to study and most reluctant to tell the researcher anything about the past… Quality archaeological material proved extremely scarce, against all expectations." ([616], page 103)

American dendrochronology exists in better conditions, since it is based on Douglas fir, mountain pine and yellow pine ([616], page 103). However, this region is far away from the zone of "ancient history." Furthermore, there is always a large number of ignored factors, such as the weather conditions for the period in question, soil quality, the humidity level fluctuation for the area in question, its geography, etc. All of them affect the growth rate of the rings significantly ([616], pages 100-101). It is most important that the creation of dendrochronological scales had been based on *the existing Scaligerian chronology* ([616], page 103). Thus, any alteration of the chronology of documents should *automatically* alter these scales, whose independence is thus greatly compromised.

It appears that the dendrochronological scales for Europe and Asia only reach several centuries back from our age. We shall give a more detailed account of the contemporary state of such scales for Italy, the Balkans, Greece, and Turkey.

Let us refer to a diagram of *dendrochronological dating scales* for those countries that reflects the state of affairs in this area as of the spring of 1994 (fig. 1.58). This diagram was kindly provided by Professor Y. M. Kabanov (Moscow). He took part in a conference in 1994 where the American Professor Peter Ian Kuniholm had made a report on the modern state of dendrochronology, presenting this rather noteworthy diagram that had been compiled in the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology, Cornell University, Ithaca, New York, USA.

In fig. 1.58 we can see fragments of dendrochronological scales for different kinds of timber: oak, box, cedar, pine, juniper, and conifers in general.

All of these scales have a very obvious gap around 1000 A.D. Thus, none of them can be continued without intervals further back in time than the X century A.D.

All of the earlier fragments of dendrochronological scales as shown on the diagram cannot be used for independent datings, since their attachment to the temporal axis is wholly dependent on the Scaligerian chronology, which had served as a basis for the dating of several individual "ancient" pieces of wood.

A piece of wood found in a Pharaoh's tomb thus gets the dating of some distant millennium before Christ due to "historical considerations" which are naturally based on the Scaligerian chronology. After that, other "ancient" pieces of wood are linked to the one that has already been dated. These attempts occasionally succeed, which results in the construction

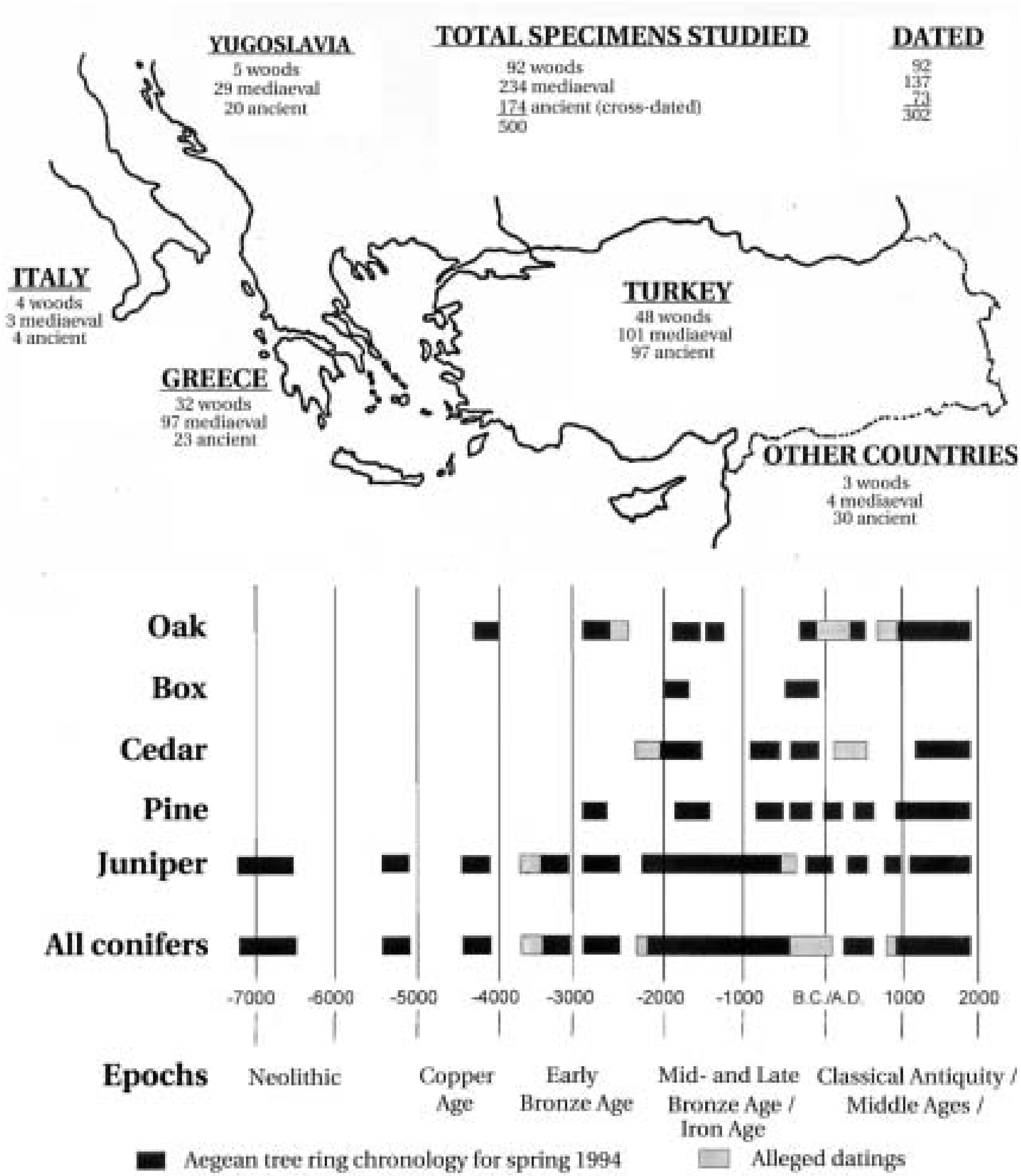

Fig. 1.58. The modern condition of the dendrochronological scales. One can observe that they are considered to extend until as late as the X century A.D. uninterrupted. The "scale" pertinent to earlier epochs is merely an assortment of unrelated fragments.

of a fragment of the dendrochronological scale around the first piece of wood. Relative datings of ancient findings within this fragment may be correct. However, their absolute dating, that is, the placement of this fragment on the temporal axis, is *wrong*. The reason is that the first dating has been based on the erroneous Scaligerian chronology.

Let us return to the basics of the dendrochronological methods. In theory, the dendrochronological scale is supposed to grow, beginning with the current period and extending into the past. This implies the collation of ring thickness scales of different specimens. What is the principle of this collation? A modern source [1055] gives an in-depth analysis of the problem on page 341. It turns out that the method used is a combination of mathematical statistical methods and "visual" subjective assessments. Hence, the boundary between dated and undated dendrochronological scales becomes a very vague one.

The book [1055] tells us rather frankly that:

"If we can find a collation position whose diagrams concur with those of the traditional chronology to the best of our certainty and knowledge, the new specimen is considered dated. If we fail to discover such collation position, the specimen remains undated, although even in this case a dendrochronologist can point out one or more collation methods whose concurrence is 'good,' but not 'perfect' (in his opinion). Needless to say, *the Dendrochronological Society has to agree on what is to considered perfect concurrence.*" ([1055], page 341)

Dendrochronology is thus affected by subjectivity and arbitrariness. Different dendrochronological datings have generally speaking different veracity. The veracity of a dendrochronological dating depends on the certainty of the collations on the dendrochronological scale. Dubious collations cast the shade of ambiguity over the entire scale. The book [1055], page 341, uses a special term for referring to such datings, namely, "the grey zone" (with the white zone referring to certain datings, and the black one, to the total absence of datings of any kind).

The recently published book by Christian Blöss and Hans-Ulrich Niemitz subjects the dendrochronological method to a number of very sharp criticisms that leave no stone unturned ([1038]).

14.2. Sedimentary layer datings. The methods of radium-uranium and radium-actinium analysis

The Scaligerian chronology implicitly or explicitly affects the scale graduations of methods, even the rough physical ones supposed to give the absolute age of objects.

A. Oleinikov tells us that:

"Over the eighteen centuries that have passed since the time of the Roman invasion [in reference to the territory of the modern Savoy – A. F.], the weathering processes have created a 3 mm erosion layer on the walls near the quarry's entrance. Comparing the thickness of this 1800-year-old layer [according to the Scaligerian chronology – A. F.] to the 35-cm erosion crust that covers the glacier-polished hills leads one to believe that the Ice Age left these latitudes about 216 thousand years ago… The proponents of this method have been well aware of the difficulty of obtaining a referential scale for something like erosion speed… it differs for various climates: the same type of rock erodes at varying speeds in the tropics and beyond the Arctic Circle. Erosion speed also depends on the temperature, humidity, rainfall and sunshine. This means that every biospheric zone requires the compilation of special scales and diagrams; besides, one cannot be certain that the weather conditions had remained unaltered since the exposure of the layer that we're interested in." ([616], pages 34-35)

There were many attempts of deducing absolute age by the speed of sedimentary layer formations. They didn't lead anywhere, which is perfectly understandable.

Oleinikov tells further that:

"The research in this direction had been conducted by the scientists of many countries; however, the results failed to meet the expectations. It became apparent that *similar types of rock erode at different rates even under similar conditions, and establishing a regular pattern of these processes is hardly possible at all*. For instance, ancient documents [a reference to the Scaligerian chronology yet again! – A. F.] tell us that the Egyptian Pharaoh Ramses II reigned about 3000 years ago. The buildings that were constructed in his lifetime are now covered by a three metre layer of sand. This means that about a metre of sand accumulated every millennium. At the same time, certain areas of Europe have a *millenarian* rate of three centimetres of sediment, whereas for the firths in the South of the Ukraine this is an *annual* rate." ([616], page 39)

The development of other methods was attempted as well. "The radium-uranium and radium-actinium methods are valid for the time interval of 300 thousand years. They are convenient for the datings of geological formations when the required precision does not exceed 4-10 thousand years" ([616], page 70). However, this isn't precise enough for the ends of historical chronology, and cannot contribute to it in any substantial manner at all.

15. ARE RADIOCARBON DATINGS TO BE TRUSTED?

15.1. The radiocarbon datings of ancient, mediaeval, and modern specimens are scattered chaotically

15.1.1. Libby's initial idea. The first failures

The most popular method claiming the capability of dating ancient artefacts independently is the radiocarbon method. However, the accumulation of the radiocarbon datings has exposed the difficulty of the method's application.

According to Oleinikov,

"Another problem had to be considered. The intensity of the atmospheric radiation is affected by many cosmic factors. The radioactive carbon isotope production rate should also vary, and one needs to find a method that would consider these variations. Apart from that, over the period when highways and industrial plants have been introduced by the civilization, a gigantic amount of carbon from the combustion of wood, coal, oil, turf, oil-shales and their products emanated into the atmosphere. How does this atmospheric carbon affect the production of its radioactive isotope? In order to get veracious datings, one has to introduce complex corrections into calculations that reflect the changes in the content of the atmosphere over the last millennium. *This issue, as well as a number of technical difficulties, casts a shadow of doubt over the precision of many radiocarbon datings.*" ([616], page 103)

W. F. Libby, the author of the method, wasn't a historian, and did not question the veracity of the Scaligerian datings, which were used for the justification of his method according to his book. However, the archaeologist Vladimir Miloicic had proved this method to give random errors of 1000-2000 years, while its "independent" dating of the ancient specimens faithfully follows the datings offered by the consensual chronology. Naturally, there can be no talk of "proof" here ([391], pages 94-95).

Let us quote some rather meaningful details. As we have already noted, W. F. Libby had a priori been certain of the veracity of Scaliger's datings. He wrote that they "…had no contradictions with the historians in what concerned ancient Rome and Egypt. *We did not conduct extensive research related to this epoch* [sic! – A. F.], since its chronology in general is known to the archaeologists a lot better than whatever our methods could estimate, so the archaeologists were doing us a favour providing specimens [which are actually destroyed, being burned in the radiocarbon measurement process – A. F.]"([478], page 24).

This confession of Libby's tells us a lot, since the deficiencies of the Scaligerian chronology directly concern the regions and epochs that he and his team "*did not research extensively enough.*"

We can see that the Scaligerian archaeologists had been most reluctant about letting the radiocarbon method enter the "certainty epochs" of Scaliger's history for fear of uncovering embarrassing discoveries. Archaeologists have naturally no objections against applying this method to the undocumented prehistory since nothing capable of compromising consensual chronology can possibly be found there.

In what concerns the several reference measurements that were conducted on ancient artefacts, the situation is as follows. The radiocarbon dating of the Egyptian collection of J. H. Breasted "suddenly discovered the third object that we analyzed to have been contemporary," according to Libby. "It was one of the findings… that had been considered… to belong to the V dynasty [2563-2423 B.C., or roughly four millennia before our time. – A. F.]. *It had been a heavy blow indeed*" ([478], page 24).

Why could it have been such a blow? The physicists appear to have restored the veracious dating of the Egyptian specimen, proving the old one to have been wrong. What's the problem with that?

The problem is of course the simple fact that any such dating would prove a menace to the Scaligerian chronology. Carrying on in that vein would lead Libby to compromising the entire history of ancient Egypt.

The specimen that Libby had been careless enough to have claimed as modern had to be *called a forgery* and disposed of ([478], page 24), which is only natural since the archaeologists could not have possibly let the heretical thought of the XVI-XVII century A.D. (considering the method's precision) origin of the "ancient" Egyptian finding enter their minds.

"The evidence that they [the proponents of the method – A. F.] use for proving the veracity of their method is rather insubstantial, with all the indications being indirect, the calculations imprecise, and the interpretation ambiguous, the main argument being the radiocarbon datings of the specimens whose age is known for certain used for reference… Every time referential measurements are mentioned, everybody quotes the results of the first referential datings that had been obtained *for a very limited number of specimens* [sic! – A. F.]" ([391], page 104).

Libby recognizes the absence of substantial referential statistics. Together with the *millenarian* dating deviations mentioned above (explained as a consequence of a series of forgeries), we may thus question the very validity of the method as used for dating specimens belonging to the period that we're interested in, covering the two millennia preceding our century. This discussion does not pertain to the use of the method for geological purposes, however, where millenarian deviations are considered insubstantial.

W. F. Libby writes that "there was no deficiency in materials belonging to the epoch preceding ours by 3700 years for checking the precision and the dependability of the method" ([478], pages 24-25). However, there is *nothing* here to compare radiocarbon datings to, since there are no dated written documents belonging to those epochs. Libby also informs us that his historian acquaintances "are *perfectly certain* of the veracity of the datings referring to the last 3750 years, however, their certainty does not spread as far as the events that precede this era" ([478], pages 24-25).

In other words, the radiocarbon method has been used most extensively for the period of time that doesn't allow the verification of the results by any other independent method, which makes life a lot easier for the historians. The example that we quote below is most typical.

"The radiocarbon datings of the three inscription-bearing plaques found in Romania have put archaeologists in a quandary… The ashes that they had been found in prove them to be 6000 years old at the very least. Could the discovery of literacy have happened in a rural community in Europe and not in the urban and highly-developed Sumerian civilization? [Such an awful lot of space for the flight of exalted fantasy – A. F.] The scientists consider this probability to be very low… There have been many theories put forward for the explanation of this discovery that apparently refuted the reigning opinion on the origins of written language. Some of the archaeologists, without doubting the scientific principles of the radiocarbon method have suggested *the method to be error-prone due to the effects of factors that haven't been studied as of yet*" ([478], page 29).

Could it be that the errors of the method are rather insubstantial and allow for an approximate dating of the specimens belonging to the last two or three millennia? The state of affairs appears to be a graver one. The errors of radiocarbon dating are too great and too chaotic. They can amount to several millennia in what concerns contemporary and mediaeval objects (q.v. below).

In 1984 the ***Technology and Science*** magazine had published the results of the radiocarbon method-related discussions from the two symposiums in Edinburgh and Stockholm (No 3, page 9):

"*Hundreds* [sic!] of analysis examples were quoted with dating errors ranging from 600 to 1800 years. In Stockholm the scientists lamented the fact that the radiocarbon method appears to produce the greatest distortions when applied to the history of ancient Egypt in the epoch preceding ours by 4000 years. There are other examples, some of them referring to the history of Balkan civilizations… Specialists have reached solidarity in their opinion that the radiocarbon method remains ambiguous due to the impossibility of proper calibration, which renders it unacceptable since it gives no calendarian datings."

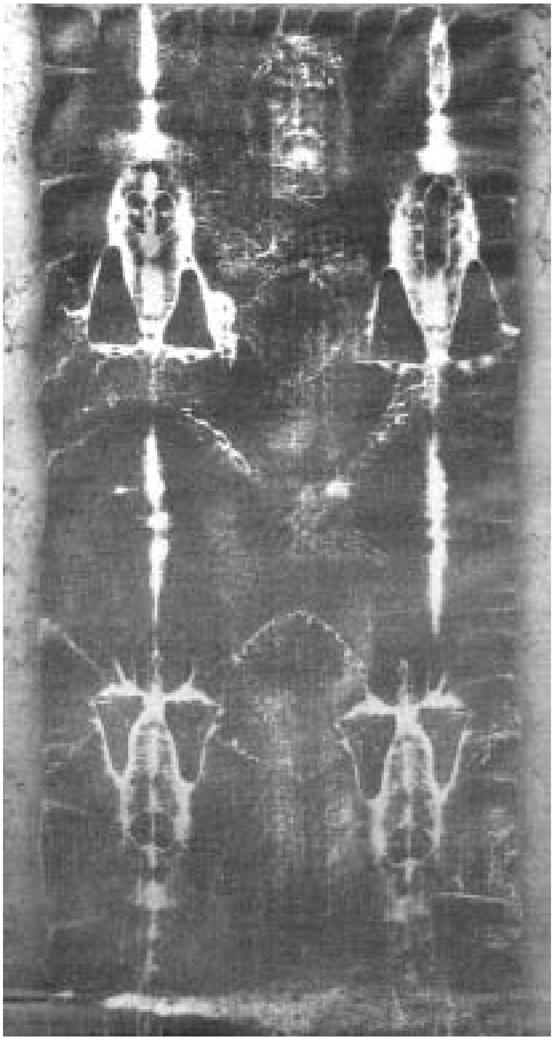

Fig. 1.59. Photograph of the celebrated Shroud of Turin ([387], pages 16-17).

15.1.2. A criticism of the application of the radiocarbon method to historical specimens

According to L. S. Klein, the radiocarbon datings "…have confused the archaeologists greatly. Some of them were characteristically overzealous… to follow the advice of the physicists… These archaeologists hastened to reconstruct the chronological schemes [which implies they aren't constructed firmly enough – A. F.]… The first archaeologist to have opposed the radiocarbon method was Vladimir Miloicic, who… attacked the practical usage of radiocarbon datings, as well as… criticising the very theoretical foundation of the physical method sharply and bitterly… The comparison of the individual measurements of modern specimens with their average value allowed Miloicic to support his scepticism with a series of brilliant paradoxes.

The shell of a *living* American mollusc has the radioactivity index of 13.8 as compared to the average value of 15.3, which makes it 1200 years old. A *live* North African wild rose flower with the radioactivity of 14.7 has been dead for 360 years, according to the physicists… as for the Australian eucalyptus with a radioactivity of 16.31, it isn't likely to exist anywhere in the next 600 years. A shell from Florida with a value of 17.4 shall only appear in 1080 years…

Since in the past radioactivity hasn't been spread any more evenly than it is now, similar fluctuations and errors may afflict ancient objects as well. A prime example is the result of the radiocarbon dating of a mediaeval altar fragment in Heidelberg… which showed that the wood used for the repair of the altar hadn't existed at that time… In the Iranian Welt cavern the lowest layers have been dated to 6054 B.C. (give or take 415 years) and 6595 (give or take 500 years) before Christ, whilst the layer on top was dated as 8610 B.C., give or take 610 years. The upper layer is thus 2556 years older than the lower, which is clearly an impossibility. There is a vast number of similar examples…" ([391], pages 94-95)

Thus, the radiocarbon dating method can only be used for the approximate datings of objects whose age amounts to dozens of millennia, when the error rate is *comparable with the actual specimen age* reaching *one-two or more thousand years.*

Live molluscs have been dated with the radiocarbon method, and proved to be *2300 years old* as a result, which is perfectly preposterous (q.v. in ***Science*** magazine, No. 130, dated 11 December 1959). The radiocarbon dating deviation amounts to *twenty-three hundred years* here.

A few more examples of relatively recent radiocarbon datings made around 1970-1971:

1) No. 225 of ***Nature*** magazine dated 7 March, 1970 reports the results of analyzing the C-14 content of organic material contained in the mortar of an English castle which is known to have been built 738 years ago. The radiocarbon dating gave the age

of 7370 years as a result, being *6500 years off the mark.* The radiocarbon dating deviation amounts to *six millennia and a half.* One wonders whether there was any point in quoting decades with such precision.

2) The radiocarbon analysis of seals that have just been shot defined their age as 1300 years, i.e. dating mistake of 1300 years. The seals mummified 30 years ago have been dated as 4600 years old, i.e. dating mistake of 4570 years. Quote from the ***Antarctic Journal of the United States,*** No. 6, 1971.

The examples given show that radiocarbon dating can deem the specimens thousands of years older than they really are. As we have seen, there are examples of the opposite, when the specimen is dated as belonging to the distant future.

One shouldn't wonder about radiocarbon analysis making mediaeval objects fabulously old.

Let us return to L. S. Klein's review. He writes that:

"Miloicic suggests to cease the tendentious "critical" *editing* of the radiocarbon datings, which is constantly done by the physicists, and calls upon their patrons the archaeologists to do away with the "critical" *censorship* that axes the publishing of the complete result. He appeals to both physicists and archaeologists to publish all of the results of their research without filtering out the dates that strike them as improbable. He also tries to convince the archaeologists to stop the practice of familiarizing the physicists with the age of the finding, and not giving them any figures until they publish theirs! Otherwise, after such editing which reflects the private viewpoints of the researchers themselves, the dating is bound to be subjective, so the study of the concurrence between historical and radiocarbon datings becomes impossible.

Thus, in Groningen, where the archaeologist Becker had been a supporter of the short [European – A. F.] chronology, radiocarbon datings are usually recent, whereas in Schleswig and Heidelberg, where Schwabedissen and others have been proponents of the longer version of chronology, these datings are usually a lot more ancient." ([391], pages 94-95)

We think that no commentary to this is required.

We may be told that the radiocarbon method may have attained a higher level of precision in the last couple of years. This may be true concerning the theory and the actual measurements. The question is, however, whether these improved methods are used in modern archaeological practice, and if so, what results are obtained in this manner. *Do the new radiocarbon datings concur with the Scaligerian chronology?* Let us quote a relatively fresh example.

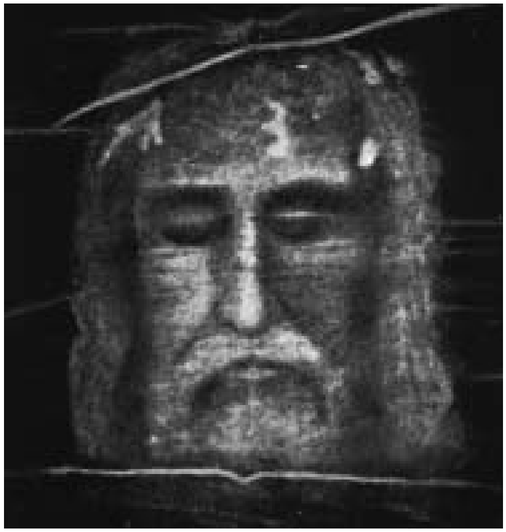

Fig. 1.60. A fragment of the Shroud. Taken from [46]. Also see [1055], page 138, ill. 7.1, as well as [358], pages 16-17.

15.2. The dating of the Shroud of Turin

The reports of the radiocarbon dating of one of the most famous Christian holy objects – the Shroud of Turin, q.v. in figs. 1.59, 1.60, 1.61 – had caused a great resonance in 1988. According to the traditional version, this piece of cloth bears the image of the body of crucified Christ and is dated to the I century A.D., allegedly being about two thousand years old. However, radiocarbon datings have given a different dating: roughly XI-XIII century A.D. The radiocarbon analysis has been conducted in three laboratories – in Oxford University, Arizona University, and the Swiss Technological Institute in Zurich ([769], page 80).

A scientific work specially dedicated to the radiocarbon dating of the Shroud of Turin claims the linen fabric that the shroud is made of to have been produced between 1050 and 1350 A.D. ([1055], page 141). The authors cite the results of the Shroud's radiocarbon analysis performed in the laboratory of the Oxford University ([1055], page 140). The laboratories of Arizona and Zurich have given more recent

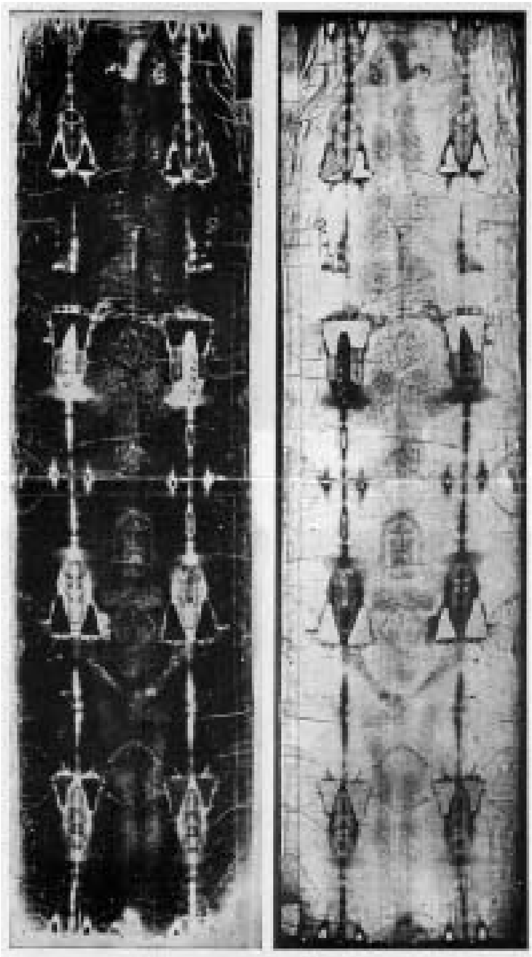

Fig. 1.61. Negative and positive images of the Shroud of Turin ([358], pages 16-17).

datings, 1304 and 1274 (with the error rates of 31 and 27 years) respectively ([769], page 82).

These results have proved shocking for many. "In September 1988… a report appeared telling of the analysis and the fact that it *gave a certain dating of the shroud's fabric which was a thousand years more recent than the alleged date of Christ's death… even if the Shroud is dated as a XI century artefact…*" ([46], page 25). The author ceases the discussion of the dating after this, and begins to ponder the veracity of Christ's image as seen on the Shroud.

One arrives to the following conclusions:

1) Either the Shroud of Turin is a forgery;

2) the radiocarbon datings can contain errors of several centuries or even millennia;

3) or the Shroud of Turin is original, but dated to the XI-XIII century A.D. If this be the case, it is natural to ask about the century that Christ's lifetime falls on. Could it really have been the XI?

The radiocarbon dating of the Shroud of Turin to the XI-XIII century A.D. made the historians rather worried, and provoked a series of attempts to refute the result. A. Agureyev, the ITAR-TASS correspondent, had made a report from New York in 1998 that can be found printed in the ***Gudok*** newspaper dated 4 April 1998. This report stated that the radiocarbon dating of the shroud "contradicts the Biblical tradition. However, according to the scientists of the University of Texas, their Italian colleagues *should not have used the radiocarbon analysis system*". The Shroud could allegedly "fall prey to a fungus" in the XI-XIII century, that may have affected the radiocarbon dating. "However, the scientists have no opportunity of conducting further research, since the Catholic church refused to provide any more specimens, and even insisted on the return of all of the ones that were at scientists' disposal" (same source).

Since the results of the radiocarbon dating of the Shroud gave results that contradicted the Scaligerian dating of the life of Jesus Christ, the radiocarbon method had to be exposed to public attention. The protection of the Scaligerian dating of Christ's life had been provided by the publication of new facts important enough to considerably aggravate the dubiety of the radiocarbon method in what concerns its applicability to historical chronology, already great enough. Let us quote some of the critical materials belonging to the proponents of the Scaligerian chronology ([358]). The publication belongs to Rev. Gleb Kaleda, a prominent geologist, Professor, and Doctor of Sciences. Also see [717] for critical material.

"There are several other factors, either local or planetary, that affect the concentration of C-14 in the atmosphere, hydrosphere, and organic matter, thus complicating and limiting the use of the radiocarbon method in chronology.

a) Natural or artificial radiation. Neutrons released in nuclear and thermonuclear reactions, as well as cosmic rays, turn N-14 into C-14. The atmosphere content of C-14 had *doubled* in the period between 1956 and August 1963. A *drastic increase* in C-14 content began after the thermonuclear explosions in 1962.

…

d) The local effect of volcanic gases on C-14 content had been described by L. D. Sulerzhitsky and V. V. Cherdantsev ([717]).

In a number of cases radiochronological age calculations give *results that are clearly absurd* and contradict the entirety of accumulated geological and palaeontogical data. In such cases "absolute chronological figures" are to be ignored as blatantly erroneous. *The discrepancies between geochronological definitions using different isotope methods may reach a factor of 10x.*

In 1989 the British Science and Technology Council had analyzed the precision of the radiocarbon method (see the 8th issue of the ***New Scientists*** magazine for 1989). 38 laboratories from all across the world were involved in the research. All of them received specimens of wood, turf, and carbonate salts whose age had only been known to the organizers of the experiment, and not to actual analysts. Only seven laboratories (of thirty-eight! – A. F.) reported satisfactory results; *others proved wrong by factors of 2x, 3x and higher.* The comparison of the data received by different researchers that used various analysis methods had shown that the causes of the dating errors were not limited to the imprecision of a specimen's radioactivity estimation as it had been assumed; apparently, the technology of preparing specimens for analysis had also served as an entropy agent. The diagnostic errata are caused by the calefaction of specimens as well as some methods of preliminary chemical processing. *Everything points at the necessity of using the radiocarbon dating method with the utmost caution*" ([358], pages 14-16).

In 1997 the German authors Christian Blöss and Hans-Ulrich Niemitz have published a book titled suggestively enough ***C-14 Crash*** ([1038]). They have collected a great body of *modern* material demonstrating rather convincingly the fact that *the radiocarbon method in its current form cannot serve as a valid reason for absolute datings of historical artefacts.*

More on this can be seen in the bulletin [1491] that contains the following critical publications dated 1991-1995 that are of interest to us:

1) Christian Blöss und Hans-Ulrich Niemitz (1996), ***Der Selbstbetrug von C14-Methode und Dendrochronologie;***

2) Hans-Ulrich Niemitz (1995), ***Die "magic dates" und "secret procedures" der Dendrochronologie;***

3) Herbert Illig (1991), ***Dendrochronologische Zirkelschüsse.***

As we can see, radiocarbon dating might prove more or less effective in analyzing objects whose age is measured by tens and hundreds of millennia. The errors of tens and thousands of years naturally inherent to the methods are of minor importance here, although this is far from being obvious. However, the mechanical use of the method for the dating of objects no older than two thousand years, which is the historical epoch that interests us most in what concerns the reconstruction of the true history of documented civilization, appears perfectly impossible without being preceded by extensive and detailed statistical research and calibrations employing specimens of known ages. As far as we know, no such research ever took place, so there are no referential statistics to be had. There is also no knowledge of whether improving the method's precision is a possibility at all. Also see [718].

Other physical dating methods do exist; unfortunately, the spectrum of their applicability is considerably more limited than that of the radiocarbon method, and their precision is also insufficient for the historical epochs relevant to our ends. For instance, in the early XX century some scientists proposed to define the ages of buildings by the shrinkage of their foundations or the deformation of columns; however, no steps have been made in this direction due to the impossibility of calibrating this method and estimating the real shrinkage and deformation speed.

Two more methods have been suggested for dating ceramics: the archaeomagnetic method and the thermoluminescent method. However, they have calibration issues of their own. The archaeological datings offered by these methods for the Eastern Europe, for instance, are limited to the Middle Ages.

Let us return to the Shroud of Turin for a second in order to put forth the following hypothesis concerning the nature of the alleged human figure that one sees on the Shroud's fabric. One shouldn't exclude the possibility that an embalmed body had really been wrapped in this linen at some point. Let us remind that the "ancient" Egyptians had the practice of wrapping a body up in several tight layers of cloth saturated with various elixirs. This may have resulted in a "carbon copy" of a body on the fabric of the cloth which was later removed for some reason, and stored with great care.

15.3 Modern radiocarbon analysis of Egyptian artefacts demonstrates serious contradictions

We shall once again consider the alleged reliability of the radiocarbon method as used for supporting the traditional version of the "ancient" history, particularly Egyptian, as reflected in a fundamental and detailed article published by the Manchester Museum in England in 1979 as part of the project named "The Mummies of the Manchester Museum" ([1196]). This most remarkable material was recommended to us by Professor A. Kravtsevich from the Alberta University Department of Mathematics, Edmonton, Canada.

The topic of the article is a dating that had amazed the authors of the article and put them in a quandary ([1196]). The radiocarbon dating of the mummy #1770 from the Manchester Museum collection had ascribed the mummy's bones to 1000 B.C., whereas the cloth that the mummy has been wrapped in received the dating of 380 A.D. The discrepancy between the datings of the mummy and the cloth equals to roughly 1400 years, although the dates should be equal. The cloth may have been somewhat older than the mummy if an old cloth had been used by the embalmers, but it couldn't possibly have belonged to a later age.

According to the authors of the article, this gap of nearly a millennium and a half cannot be explained by the possible errors of the radiocarbon dating, the way it is usually done today. That is why they had to come up with the rather amusing "explanation" that the old mummy had been exhumed after fifteen hundred years, and re-wrapped in a *new* cloth, and then restored to its rightful place as though it had remained unperturbed all the while.

We think this to be perfectly preposterous. Our take is that we encounter yet another imprecision of the actual method of radiocarbon dating which is apparently affected by effects of an undefined nature leading to great discrepancies in datings of 1,500 years, for instance (see the examples of the greatly misdated modern specimens cited above, with the fluctuation amplitude reaching up to two millennia).

The authors of the article also confess to the fact that at the very dawn of the radiocarbon method *"ancient" Egyptian specimens* had been used for its calibration, *with their dates taken from history textbooks* ([1196], page 137). Here's a verbatim quote: "the use of the method commenced in 1948 in Chicago University and was initiated by Professor W. F. Libby… the Egyptian chronology played a great role in the naissance of the method, since Egyptian specimens, such as wood or charcoal, among others, have been used as standards for the known historical dates" ([1196], page 137). Thus, the radiocarbon scale used nowadays had initially been made largely dependent on the Scaligerian chronology of the "ancient" Egypt, and therefore needs to be revised.

16. CRITICAL ANALYSIS OF THE HYPOTHESES ON WHICH THE RADIOCARBON METHOD IS BASED

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16.1. W. F. Libby's initial idea

A better representation of the modern problems most frequently encountered in the archaeological application of the radiocarbon method requires that we return into the 50-s and the 60-s for a close study of the foundations that the edifice of historical and archaeological applications is based upon. The matter is that the first steps of the method's creation and development led to a large number of natural complications, many of which *afflict it to this day, and lead to further error aggravation.* Also see the book [1038], and the article [1491] recently published in Germany. These complications need to be addressed again in order to attract the attention *of the physicists* to the necessity of a fresh analysis of the foundations of this method's archaeological applications, especially considering what we learn about the Scaligerian chronology.

The actual concept of radiocarbon dating belongs to W. F. Libby ([1250]). "Shortly after the end of WW II, the American Willard Frank Libby had published the results of the discovery that made him world famous and had received the Guggenheim Award and the Nobel Prize. Studying the interaction between artificially produced neutrons and nitrogen atoms, Libby came to the conclusion (1946) that the nuclear reactions observed in his experiments should also occur naturally – that is, the neutrons produced by the atmosphere of the Earth should become absorbed by nitrogen atoms and transform into C^{14}, the radioactive isotope of carbon. Minute amounts of this radioactive carbon mix with the stable isotopes of carbon, C^{12} and C^{13}, taking part in the formation of carbon dioxide molecules that are subsequently consumed by plants, and animals (including humans) further up the food chain. Such molecules should be present in the tissues as well as the effluvia of living bodies. The discovery of mild radioactivity of the miasma emanated by Baltimore sewage in 1947 had been the first proof of the correctness of Libby's estimations. The radioactivity of growing trees, seashells etc had been estimated in the following two years, 1948-1949. As well as any other radioactive element, the radioactive carbon isotope has a constant hallmark decay rate. Its global concentration would keep on diminishing by a factor of two every 5568 years, according to Libby, if it hadn't been for the constant generation of C^{14} in the atmosphere that keeps the supply regular. The amount of C^{14} lost equalling the amount gained.

The death of a living organism excludes it from this process and makes it stop accumulating carbon from air (plants) or food (animals). The radioactivity of a dead organic body (a corpse, piece of wood, charcoal) keeps on falling – at a constant rate, which is an important fact.

Therefore it suffices to measure how much the overall radioactivity of a dead organism has decreased in comparison to the living ones in order to determine the time when this organism stopped refreshing its cells – the date when a tree had been cut down, a bird had been shot, or a human had died. This is naturally far from being an easy task, since the radioactivity of carbon as found in natural conditions is very weak (even before the death of an organism – *one C^{14} atom per every 10 billion atoms of regular carbon).* However, Libby had developed the means and the techniques of measurement and numeric conversion that led to the naissance of the radiocarbon method of dating ancient objects" ([390], pages 52-53).

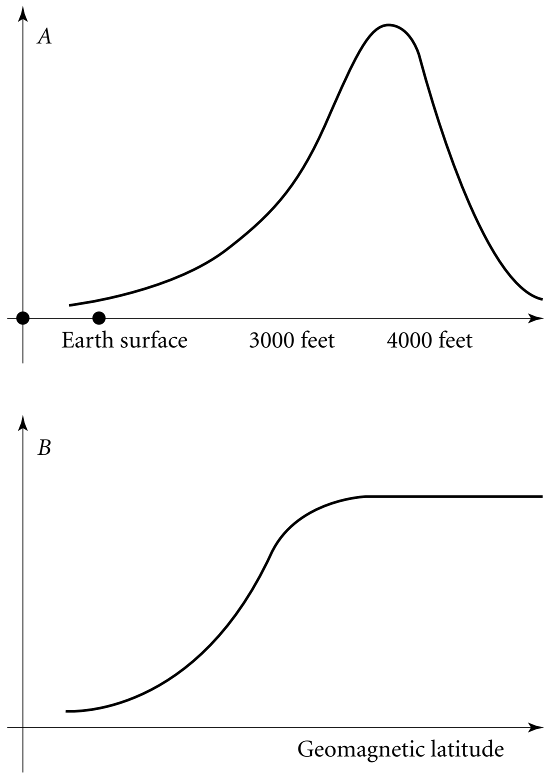

Fig. 1.62. Atmosphere neutron density as a height function. Taken from [986], page 138.

Let us now consider the basics of this method, particularly [390], [391], [1250], [1080], [986], [110], [1081], [1082], [1480], [414], [1431], [1432], [1433], [1025], [1124], [1473], [567], [480], and [478].

16.2. Physical basics of the radiocarbon method

Cosmic rays produce neutrons as they pass through the atmosphere of Earth. The density of the neutron current depends on the altitude. The results of density measurement of this current with aerostatic probes can be seen in fig. 1.62 on graph A ([986], page 138). The measurements were conducted in the state of New Jersey, USA, and belong to the period preceding 1955. The peak of neuron content falls on the height of approximately 40 thousand feet (12 kilometres). Close to the actual surface of Earth, the neutron current density drops to zero. This leads us to the following two conclusions:

1) Neutrons are generated in the stratospheric layers of the atmosphere, thus being secondary cosmic ray particles that are born with the passing of the primary cosmic rays through the atmosphere.

2) All of these neutrons immediately engage in nuclear reactions, and only a minute part of them reaches the surface of the Earth.

Graph *B* in fig. 1.62 reflects the dependence of the neutron current on the height of 30 thousand feet on the geomagnetic latitude ([986], page 139). The measurements were conducted before 1955. This graph makes one think that the primary particles of cosmic radiation that give birth to neutrons are charged and reflected by the magnetic field of the Earth. It is significant that the neutron current density in the latitudes of 50 degrees (the latitude of Paris, Prague, Kiev and Kharkov) is *three times higher* than measured at the latitudes of 20-30 degrees (the Red Sea coast, the north coast of Africa).

The atmospheric neutron generation rate per minute equals roughly 6×10^{20} neutrons/min, with error rate equalling 25% ([986], p. 139). Thus, every minute $4.5 \times 10^{20} - 7.5 \times 10^{20}$ neutrons are generated on planet Earth. These neutrons collide with the atoms of atmospheric nitrogen and oxygen and react with them. The probability rate of a neuron reacting with a nitrogen atom is supposed to be a few thousand times higher than such for oxygen atoms ([986], pp. 139-140). Neutrons of low energy levels (heat neutrons) engage in C^{14} radioactive carbon reactions for the most part:

$$N^{14} + n \rightarrow C^{14} + H^{1} \quad (1)$$

The section of this reaction comprises roughly 1.7×10^{-24} cm^2. See [986], page 140. Fast neurons may react in two more ways:

$$N^{14} + n \rightarrow B^{11} + He^{4} \quad (2)$$
$$N^{14} + n \rightarrow C^{12} + H^{3} \quad (3)$$

However, compared to the section of the reaction (1), their sections are very small. The reaction (3) results in the production of tritium H^3 that has a half-life period of 12.5 years and transforms into He^3, a stable helium isotope. The speed of tritium H^3 generation is estimated to equal 1% of that of C^{14} generation.

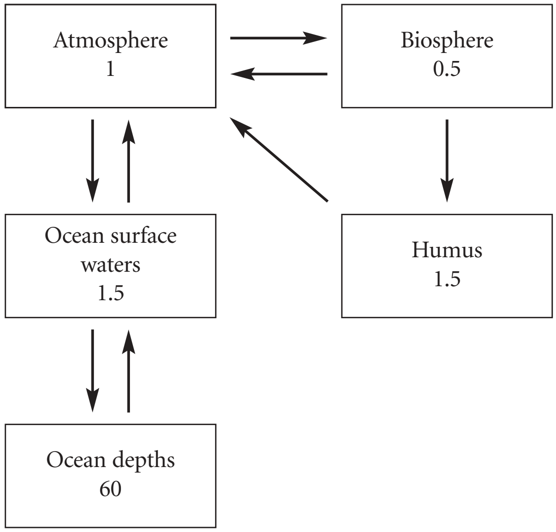

Fig. 1.63. The structure of the carbon exchange reservoir.

M. J. Aitken writes the following in his monograph titled ***Physics and Archaeology:***

"A relatively small amount of neutrons reaches the surface of the Earth… and it would be *reasonable to suggest* (? – A. F.) that every neutron produced by the cosmic rays creates a radiocarbon atom, hence the speed of neutron generation equals that of radiocarbon production. This amounts to roughly 7.5 kilos of radiocarbon per year" ([986], page 104). Radiocarbon C^{14} decays according to the formula:

$$C^{14} \rightarrow N^{14} + \beta^{-} \quad (4)$$

The half-life period equals approximately 5600 years, so 1% of radiocarbon decays in about 80 years. It is thus easy to estimate that the amount of C^{14} that is constantly present on Earth equals about 60 tonnes, with the error rate comprising about 25%, that is, 45 to 75 tonnes.

The generated radiocarbon mixes with other elements in the atmosphere, and is assimilated by oceans and living beings. The carbon propagation sphere is called the carbon exchange reservoir. This includes the atmosphere, the biosphere, sea surface and ocean depths, q.v. in fig. 1.63 ([986], page 30). The numbers on this picture refer to the carbon content in one part of the carbon reservoir or the other, with atmosphere carbon content equalling 1. The part of carbon that escapes the reservoir as oceanic sediment is not shown on the diagram. "We use the term *radiocarbon age* in order to refer to the period of time between the point that the object ceases to be part of the exchange reservoir and the moment the C^{14} measurements are conducted" ([110], page 32).

16.3 The hypotheses that the radiocarbon method is based upon

In theory, the radiocarbon age measurement concept is a simple one. It suffices to know:

1) The radiocarbon volume for the moment of the object's departure from the exchange reservoir;

2) the exact half-life period of radiocarbon C^{14}.

After that, provided the possession of a sufficient specimen volume, one has to measure the current radiocarbon content, and calculate the time passed since the object stopped taking part in carbon exchange by simple subtraction and division. However, this seemingly simple idea encounters a number of serious complications in practical application. We should also note right away that any *diminishing* of the relative C^{14} content in the specimen for any reason at all leads to the *increase of its alleged age*.

16.4. The moment of the object's departure from the exchange reservoir

So, what does "the moment of the object's departure from the exchange reservoir" actually mean? *The first hypothesis* of Libby's is that this moment should coincide with the time of the object's death. However, despite the fact that the moment of death might differ from the moment that interests the historians (for instance, a piece of wood from a Pharaoh's tomb may belong to a tree that had been cut down a lot earlier than the sepulchre had been built), it is obvious that identifying the moment of death with that of an object's departure from the carbon exchange reservoir only seems correct initially. The matter is that carbon exchange *does not stop with death*. It just slows down and assumes a different form, and one has to bear this in mind. At least three processes may alter the radiocarbon content in a body ([110], page 31):

1) Organic decomposition;

2) Isotopic exchange with foreign carbon;

3) The absorption of environmental carbon.

According to M. J. Aitken, "The only possible kind of decomposition results from the production of carbon oxide or dioxide. However, this process *isn't relevant to us*, since it only concerns the *carbon lost by an object*" ([986], page 149). M. J. Aitken seems to imply that since the oxidation of carbon isotopes has the same speed, it does not affect the percentage of radiocarbon. However, in a different place he proceeds to tell us the following:

"Although C^{14} is identical to C^{12} chemically, its greater atomic mass manifests as a result of natural processes. The exchange mechanism between the atmospheric carbon dioxide and the oceanic carbonates provides for a higher (by 1.2%) concentration of C^{14} in carbonates; on the other hand, the photosynthesis of atmospheric carbon dioxide by the plants of Earth leads to their possessing a somewhat lower (by 3.7% in average) concentration of C^{14}." ([986], page 159)

Craig Harmon offers the following table of carbon and radiocarbon propagation for the various parts of the exchange reservoir ([1080] and [986], page 143).

	Carbon content, trillions of tonnes	*Division effect for C^{14}*
Atmosphere	0.64	1.037
Living biosphere of the Earth	0.30	1.000
Humus	1.10	1.000
Biosphere of the sea	0.01	1.024
Sea-solved organic substances	2.72	1.024
Inorganic substances in the sea	35.40	1.049

Therefore, *biosphere and humus are the lowest in radiocarbon content, whereas inorganic substances and sea water are the highest.*

The book [110] tells us nothing of the difference between the carbon isotope oxidation speed differences in decomposition processes, but the information cited above gives reason to believe them to be quite visible. In any case, *the carbon oxidation process is the reverse process to that of its photosynthesis from atmospheric gas, hence the isotope C^{14} should oxidize faster (or with greater probability) than the isotope C^{12}. Thus, decomposing (or decomposed) specimens should have a* *lower content of radiocarbon C^{14}, which should make the specimens appear a lot older than they really are.* This is one of the mechanisms that leads to the gathering of *extra age* by the specimens that distorts the true picture. We have witnessed actual examples of such artificial ageing above, which distorts radiocarbon datings often throwing them considerably off the mark.

Counting other possibilities of carbon exchange between the specimens and the exchange reservoir is *altogether next to impossible.* It is supposed that "wood and organic matter appear to be the most inert in what concerns carbonization, whereas a large quantity of bones and shell carbonates show frequent changes in isotope content" ([110], page 31). *Since measuring the actual carbon is de-facto an impossibility, it gets ignored, by and large.* Standard methods and procedures of radiocarbon measurements are at best concerned with the ways of possible cleansing of the specimen from foreign radiocarbon and reasons of specimen contamination. S. V. Boutomo finds it sufficient to merely state that "charred organic matter and wood in *a good condition* (?! – A. F.) are dependable enough in most cases" ([110], page 31).

M. J. Aitken adds that "in order to work with any specimen at all, one has to clean it thoroughly from foreign roots and other fibres, and treat it with acid in order to solve all sedimentary carbonates. The removal of humus is achieved by washing the specimen in a base solution" ([986], page 149).

Note that the important question of whether this chemical cleansing might affect the specimen's radiocarbon content had not been raised back in the day – and we're talking about the time when it was claimed that the radiocarbon method "gives solid proof to historical chronology".

16.5. Radiocarbon content variations in the exchange reservoir

The second hypothesis of Libby's is that the radiocarbon content in the exchange reservoir *remains constant all the time.* Quite naturally, this hypothesis is also an *erroneous* one, and one has to consider the effects that affect the radiocarbon content of the exchange reservoir. The estimations of the general volume of radiocarbon on Earth as cited above imply that in a modern specimen the ratio is one radiocarbon atom per every 0.8×10^{12} atoms of regular carbon. This means that every minute *about 15 decays* occur in a gramme of natural carbon ([986], page 143). Thus, if the radiocarbon content in the exchange reservoir for the moment of a specimen's death differed from the current by a ratio of 1%, the calculations of this specimen's age shall contain an error of about 80 years, 2% shall give an error of 160 years etc (!). A deviation of 10% shall give a dating error of 800 years, and higher deviations shall also alter the linear rule, and so a 20% deviation shall lead to an error of 1760 years, and not 1600, and so on. The radiocarbon content in old specimens for the moment of their departure from the carbon reservoir cannot be estimated in any other manner but via the comparison with the radiocarbon content of the modern specimens considering several effects that alter the radiocarbon content in specimens with the passage of time. M. J. Aitken cites the following well-known effects that influence the radiocarbon content in the exchange reservoir:

1) The change of radiocarbon generation speed in accordance with the changes in the intensity of cosmic radiation;

2) The change of the size of the exchange reservoir;

3) The finite speed of mixing between the different parts of the exchange reservoir;

4) The separation of isotopes in the exchange reservoir.

M. J. Aitken makes the justified remark that "any concrete data concerning points 1 and 2 is hard to obtain in any other way except for measurements conducted on the specimens veraciously dated with other methods" ([986], page 153). This pours light on the existence of a very important circumstance. The physicists required veracious external reference for the correct graduation of the radiocarbon scale. Having absolute trust in the historians, they took the dates from history textbooks and chronological tables. It appears that the physicists have been misinformed from the very beginning, since the radiocarbon method had been based on the same old *Scaligerian chronology* of historical specimens. Its reconstruction shall invariably affect at least some of the fundamental concepts that define the actual method.

Furthermore, one has to notice two more modern effects that affect the current radiocarbon concentration, namely, the increase in radiocarbon content due to experimental thermonuclear explosions, and the decrease (the so-called Süss effect) thereof that is caused by the burning of fossil fuels – oil and coal, whose radiocarbon content should be minute due to their great age. The estimation of the change in radiocarbon production speed (see point 1) had been attempted by many authors. Crowe, for instance, had researched the "materials with veracious historical datings" and shown that there was a correlation between the errors of radiocarbon dating and the changes in the magnetic field of the Earth ([1082], also [110], page 29). The measurements of the yearly layers formed by sequoia trees are cited nearby for comparison ([110], page 29; [1480]).

It is assumed that the specific activity has been varying within the range of 2% in comparison to the average from 600 A.D. to the present time, with the maximal alterations occurring every 100-200 years ([110]). We see yet again that the creation of the "radiocarbon scale" involved the materials that the Scaligerian chronology dated as belonging to 600 A.D. or maybe even earlier. We do already know, however, that this chronology isn't to be trusted with anything that concerns the times preceding the XIII-XIV century. The physicists have been deceived by the Scaligerian chronology yet again.

Thus, the radiocarbon dating is implicitly based on the same old incorrect chronology of Scaliger and Petavius. In order to separate it from the very basics of radiocarbon dating, we shall have to trust the historical objects that can really be dated veraciously. However, we're beginning to understand that the age of such "trustworthy objects" cannot be more than 500-600 years, since none of them predate the XIV century A.D. Thus, *all the work on the calibration of the radiocarbon method shall have to be done again.* The results that the physicists will achieve in this case may come as some surprise.

"Apparently, the changes in cosmic radiation occurred before, but due to the brevity of their period, the effect of these fluctuations is *hard to consider.* We base our assumption that the intensity of cosmic radiation over the last 35000 years has been constant within the error range of 10-20% on the coincidence of the calculated value of specific activity and on the proximity of the age of oceanic sediment estimated with the aid of mutually independent carbon and ionium methods" ([110], page 29). Let us remind the reader that the "constancy" within the range of 20% means an error of 1760 years in the dating of the specimen. It isn't that significant an age compared to 35000 years, but the fluctuation rate is unacceptably high for what concerns the issues of the so-called "ancient" history. We have already given examples of discrepancies amounting to *a millennium or two* between the radiocarbon datings and Scaliger's "ancient" chronology. The fluctuations of 10-20% mentioned by the physicists are a reality, and not just theory.

In America – the regions withdrawn from the entire "Classical scene" – the dendrologists of the Arizona University have discovered plantations of bristlecone pine (*Pinus aristata)* whose age exceeded 4000 years. Some dead standing trees have been found nearby which have remained in their current condition for several thousand years ([414], page 6). It is assumed that cross-dating, that is, the temporal superposition of living and dead tree specimens, allowed for the creation of a dendrochronological scale spanning 7117 years ([1431], [1432], [1433]). However, this American dendrochronological scale, even if it is indeed correct, cannot help "ancient" European and Asian dendrochronology in any way at all, q.v. above.

In [414] on page 7 we can see a schematic drawing of the correlation of dendrochronological and radiocarbon datings based on the measurements conducted with the aid of over 300 specimens. If we're to consider the dendrochronological dating absolutely veracious (which is wrong, as we have already pointed out), the maximal radiocarbon dating error equals to the following values:

Dendrochronological dating	*Radiocarbon dating*	*Error*
300	30	- 270
500	250	- 250
800	900	+100
1500	1000	+100
1900	2100	+200
2700	2400	- 300
4000	3500	- 500
5000	4300	- 700

The error rate keeps on growing with a negative value.

This American data can be interpreted in the following manner. The radiocarbon content in American bristlecone pine has been varying over the years in the following manner (in comparison to its current radiocarbon content):

Years	*Radiocarbon content*
1965	1
1700	1.035
1500	1.031
1200	0.988
100	0.975
- 700	1.038
- 2000	1.063
- 3000	1.100

Furthermore, on page 7 the authors of [414] write that "it is estimated, that the C-14 variations are of a global character – that is, they happen simultaneously all across the planet". No argumentation is given. It would thus be appropriate to inquire about the possible grounds for making hypotheses that arose from the analysis of nothing but American materials, and ones belonging to a rather small and very specific geographical location at that, valid for the entire planet.

The authors of [414] also make the conclusion that the difference between the dendrochronological and radiocarbon datings is a result of a *temporal* variation of radiocarbon content in the exchange reservoir. However, this very difference might lead one to an alternative hypothesis that a growing tree *continues to take part in carbon exchange* after the formation of the rings, which isn't even mentioned in [414]!

On page 4 of [414] we see the schematic drawing also included in [1025] that displays the correlation between the historical dates of the "ancient" Egypt and the hypothetical radiocarbon datings, and comparisons of the same dates to European monuments and artefacts. The commentary is that "this drawing shows us that the datings of the Roman period are virtually identical, whereas the datings of the early dynastic period differ by 500-700 years" ([414], page 7). Apart from this, we have already seen the data showing that the radiocarbon datings of at least some of the "ancient" Egyptian specimens really gives *late mediaeval* datings.

In 1964 Kigoshi had conducted precise measurements of C^{14} concentration in the tree rings of an old Japanese cryptomeria whose age reached 1890 years ([567], page 172). This data is also of little utility for the European dendrochronology and radiocarbon scale. The results of this research proved somewhat different from the ones related to a small area in America as cited above, but show the radiocarbon concentration for 1000 A.D. to have been 2% lower than it is currently ([567]). The conclusion is apparently valid for some small area in Japan.

The variations in the exchange reservoir (see point 2 above) are primarily determined by the alterations of the ocean level. Libby claims that a change of 100 metres in the sea level curbs the volume of the reservoir by 5% ([986], page 157). If this had been accompanied by a temperature drop, during the Ice Age, for instance, the concentration of carbonates in the water would diminish, and the entire carbon exchange reservoir would shrink by 10%. We are to be aware that we are considering hypotheses that are extremely hard to prove nowadays, and all such proof is, it turn, based on other hypotheses that are as hard to prove.

The data that concern the mixing speed as mentioned in point 3 are somewhat contradictory. Ferguson, for instance, having studied the radioactivity of tree rings (also in a small geographical area) reckons that this speed is rather high, and that the average time that it takes the carbon molecule to reach a different part of the reservoir equals seven years maximum ([986], page 158). On the other hand, thermonuclear test explosions have produced about half a tonne of radiocarbon, which shouldn't affect the general radiocarbon mass of 60 tonnes that greatly in theory – however, the activity of the specimens *grew by 25% as measured in 1959, and this growth had reached 30% by 1963.* This speaks in favour of the *low mixing level* hypothesis.

According to Süss, it takes about 1500 years for all of the water to mix in the Pacific, and 750 is the figure given for the Atlantic ocean by E. A. Olson and W. S. Brecker ([480], page 198). But the mixing of ocean waters is greatly affected by the temperature.

Specimens	*Geomagnetic latitude*	*Per minute decay frequency for one gramme*
White fir (Yukon)	55 degrees in lat. North	14.84 ±0.30
Norwegian fir (Sweden)	55 degrees in lat. North	15.37 ±0.54
Fir (Chicago)	53 degrees in lat. North	14.72 ±0.54
Ash (Switzerland)	49 degrees in lat. North	15.16 ±0.30
Honeysuckle leaves (USA)	47 degrees in lat. North	14.60 ±0.30
Pine branches (USA, 3.6 km above sea level)	44 degrees in lat. North	15.82 ±0.47
Heather (North Africa)	40 degrees in lat. North	14.47 ±0.44
Oak (Palestine)	34 degrees in lat. North	15.19 ±0.40
Unidentified timber (Iran)	28 degrees in lat. North	15.57 ±0.31
Manchurian ash (Japan)	26 degrees in lat. North	14.84 ±0.30
Unidentified timber (Panama)	20 degrees in lat. North	15.94 ±0.51
Chlorophora excelsa timber (Liberia)	11 degrees in lat. North	15.08 ±0.34
Sterculia (Bolivia, 2.7 km above sea level)	1 degree in lat. North	15.47 ±0.50
Ebony tree (The Marshall Isles)	0 degree	14.53 ±0.60
Unidentified timber (Ceylon)	2 degrees in lat. South	15.37 ±0.49
Eucalyptus (Australia)	45 degrees in lat. South	16.31 ±0.43
Seal-oil (The Antarctic)	65 degrees in lat. South	15.69 ±0.30

A 50% increase in the mixing of both shallow and deep waters shall increase to a 2% shrinkage of the atmospheric radiocarbon concentration.

16.6. Variations in radiocarbon content of living bodies

The third hypothesis of Libby's is that the radiocarbon body content is *equal for all of the organisms on the entire Earth,* and thus independent from the *latitude* and the species. In order to verify this hypothesis, Anderson (Chicago University) had conducted an in-depth research and discovered *that the radiocarbon content does indeed fluctuate, as one should have expected* ([480], page 191). See the table above.

Thus, modern radiocarbon activity varies from 14.03 (North African heather) to 16.7 (Australian eucalyptus) decays per minute depending on the geographical location and the species of the tree. This gives a deviation rate of 8.5% as compared to the average radiocarbon content value. Libby tell us the following:

"Over the ten years that have passed since that time, this information has not been refuted; the only exceptions concern the carbonate rock formations, where ground waters dissolve and wash away a significant part of ancient carbon, thus making carbon-14 content lower in comparison with the average planetary rate of the atmosphere-biosphere-ocean system. Such cases are extremely rare (? – A. F.), and can easily be accounted for" ([480]).

17. SUMMARY

Let us sum up the information that we have just considered. We have learnt that the real activity of ancient specimens may alter from the average value for the following reasons:

1) A temporal change in timber activity: 2% deviation range;

2) Cosmic ray intensity changes (theoretical estimation): 20% deviation range;

3) Short-term changes of solar activity: additional 2%;

4) An increase in the mixing rate of the oceanic water: minus 2%;

5) Variations in radiocarbon concentration depending on the geographical location and the tree species: 8.5% deviation range;

6) Variations in radiocarbon content resulting from decomposition processes: ? (unknown);

7) Variations in radiocarbon content resulting from a specimen's chemical processing: ? (unknown);

8) The variations in the exchange reservoir radiocarbon content resulting from the washing out of carbonate rock formations: ? (unknown);

9) Variations in radiocarbon content caused by large quantities of carbonates produced by volcanic eruptions: ? (unknown). This reason can provide for significant distortion of radiocarbon datings for the areas close to volcanoes, such as Italy with its Vesuvius and Etna.

One should also bear in mind the dating deviation resulting from the temporal gap between the cutting of a tree, for instance, and the use of the wood for the object or building researched. Finally, one has to consider the imprecision of the currently used C^{14} half-life value, that has been corrected *by almost 10%* as of late, and the errors of experimental measurement of a specimen's radioactivity (background radioactivity consideration etc). We do not cover these errors (whose correction cost the physicists lots of labour) here, since having learned of all the factors mentioned, we deem it nonsensical to attempt the precise measurement of a value whose theoretical *uncontrolled error rate* may equal 10% if we're to make modest assumptions. *The most optimistic calculations give a radiocarbon dating uncontrolled error range of 1200 years of arbitrarily added or subtracted age.*

This makes the placidity of the following conclusion made by B. A. Kolchin and Y. A. Sher most peculiar indeed: "Summing up the brief overview of the centurial C^{14} variation research, one has to point out that apart from its mere failing to undermine the trust that we have in radiocarbon chronology, this research had made its precision even higher (?! – A. F.)" ([414], page 8). Another specialist in radiocarbon datings, S. V. Boutomo, is of a more realistic opinion: "due to the *considerable fluctuations* of C^{14}'s specific activity rate, the radiocarbon datings of *relatively young specimens (under 2000 years of age) cannot be used as fundamental referential data for the absolute chronological scale*" ([110], page 29). However, from the point of view of the "Classical age" studies, including those of the "ancient" history of Egypt, these "relatively young specimens" are of the greatest interest. Thus, certain specialists in the field of radiocarbon dating confess openly (albeit in special scientific literature) that the use of the radiocarbon method in its current state for the specimens whose age is 2000 years or less appears a most dubious endeavour.

We could have finished our overview of the radiocarbon dating method here if it hadn't been for the criticisms of the method coming from archaeologists and certain oddities in the behaviour of the radiocarbon method specialists themselves. We have quoted some of the examples above. The first thing to attract one's attention is the absolute certainty of the authors in the infallibility of historical datings, who write that "the ages of specimens younger than 5000 years concur well (?! – A. F.) with the historical estimations" ([986], page 155). Such statements appear very odd indeed considering what we have just learnt.

Libby wrote that "further research had been undertaken involving specimens of known ages… The results… span a historical period of 5000 years… Thus, the general reliability of the radiocarbon method is well-proven" ([986], page 135). As we have already demonstrated, the popular myth of the "concurrence" between the Scaligerian chronology and the radiocarbon datings is based on flimsy foundations, and proves immaterial at closer study; the myth's popularity is clearly of an unnatural origin. Let us remind the reader of something that Libby himself had mentioned in this respect: "One of the exceptions had been found when we have worked on the materials of a large collection collected by James H. Breasted in Egypt together with the specialists of the well-known Chicago Institute for Oriental Studies. The third object suddenly turned out to have proved modern after analyzing. The finding belonged to a collection ascribed to the time of the V dynasty. It had really been a heavy blow" ([478], page 24). As we have already mentioned, this object was claimed a forgery. The fact that Libby mentions this "strange occurrence" makes one wonder how many of those he remained taciturn about.

As we have already demonstrated, the calibration of the radiocarbon method had been largely based on the Scaligerian chronology. It would be most expedient to check *whether the radiocarbon method can actually be made independent from written sources.*

Libby cites the table of modern carbon activity for various rock formations claiming that "it has been shown that there are no significant differences between the studied specimens collected at various latitudes from pole to pole" ([480], page 191).

Wait a second, we have just learnt that the deviation range equals 8.5% in one direction or the other, that is, *over 700 years.* How is it possible to claim five pages further on that "the carbon content that we have estimated concurs well with the expected value, all deviations being nothing but acceptable reference point errors" ([480], page 196). Could it be that Libby had been certain that the readers will not be interested in the details of Anderson's table? Libby also says that their "conclusions may have proved wrong if the measurement errors of all kinds – those of cosmic ray intensity, mixing rate and ocean depths, had been in correlation. However, since this is not the case, we reckon that large error rates are improbable" ([480], page 193).

We are not quite certain as to what kind of improbability is being talked about here, since the cosmic ray intensiveness, mixing speed, and other physical values affecting the initial radiocarbon content in a specimen for the moment of its departure from the exchange reservoir are *far from being random – all of these values had all equalled something at a given point in time.* If we do not know these values and have to make a choice from some interval of possible values, *the radiocarbon dating error shall equal the sum (!) of all the errors that have been made in the estimation of the source data for the specimen.*

Libby writes that "despite the *great differences* between the cosmic ray intensiveness values at different geographical latitudes (they are a lot higher in the northern and southern latitudes than they are around the equator), *one has to expect* (? – A. F.) the radioactive carbon propagation rate to be *homogenous* for the entire planet" ([478], page 23). The effect mentioned may nevertheless result in "extra age" gathered by specimens in Egypt, for example.

Libby proceeds to tell us the following:

"The coincidence of the age of the core and the entire tree shows that the sap from the core of gigantic sequoias is not chemically balanced in comparison to the fibre and other molecules of the tree. In other words, the carbon in the central part of the tree had been stored there about 3000 years ago, although the actual tree had only been cut down several decades ago" ([480], page 195).

However, three years after this, the radioactivity of tree rings had been researched by Süss, who had found the discrepancies between the radiocarbon datings and the dendrochronological ones. Did he make the conclusion that Libby's initial hypothesis was wrong? He did not. Süss made the claim that the radiocarbon content in the ancient times had been higher than it is today instead. What we see is a vicious circle.

L. S. Klein gives a similar example in [391]. First Libby proves the veracity of the radiocarbon method using the historical chronology of the "ancient" Egypt; however, when control measurements showed deviations, Libby immediately questioned the Egyptian chronology concerning these particular specimens ([391], page 104). Similarly, Libby had used dendrochronology in support of the radiocarbon method, explaining arising deviations by the fact that several tree-rings may be formed in a year. However, Libby is far from being the only one to demonstrate the lack of logic where its presence is undesired.

In the article by Kolchin and Sher ([414]) we read that "the dates calculated in assumption of the constancy of atmospheric C^{14} content from the ancient times to our age need to be revised. Does this mean they aren't true? The following analogy appears congruent…" ([414], page 6). The authors proceed to tell us how the distance between the Earth and the Moon had been calculated in several stages, each time with a greater precision. The same allegedly applies to the radiocarbon method where gradual corrections make the calculations more precise as time goes by. This may well be so in theory. However, we read in the very same article that "the half-life period for C^{14} is 5570 years, with the possible deviation range of 30 years in each direction…" (page 4), and that "the half-life period for C^{14} is set (!? – A. F.) at 5730 years, give or take 40". 160 years – that's some correction!

M. J. Aitken writes that "an important characteristic of all these methods is their output, that is, the carbon content in the original volume that is transformed into gas. It would be expedient to have an output of 100% in order to eliminate all possibility of C^{14} turning into gas more readily than C^{12}, or the other way round" ([986], page 168). We also learn that "the shortcoming of the synthesis of the latter is that only 10% of the carbon is transformed into benzol; this increases the possibility of an error resulting from isotope separation" ([986], page 17. The author appears to have full awareness of the necessity of considering the isotope separation effect in all chemical reactions. However, in 6.3, while discussing the issues of a specimen's suitability for measurements, M. J. Aitken writes that "charcoal and wood in good condition are considered the best specimens: their taking part in exchange is improbable (? – A. F.), and the only possible kind of decomposition results from the production of carbon oxide or dioxide. However, this process *isn't relevant to us*, since it only concerns the *carbon lost by an object*" ([986], page 149). What about isotope separation? The radiocarbon content in a specimen may change as a result of decomposition!

Such careless attitude of specialists to the effects that may greatly affect the research results remains enigmatic for us. We have listed some of these effects in the general list. Some of them may really be difficult to evaluate currently. *However, a number of effects reflected in literature may be quantitatively assessed after a series of experiments. No careful activity reports of either living or dead specimens have been made for any of the below:*

1) latitude;
2) longitude;
3) proximity to certain geological and geographical formation on dry land and in the ocean;
4) altitude above the sea level;
5) climate etc.

Without such analysis, the self-righteous claims of the alleged independence of specimen activity from their locations and other characteristics are altogether impossible to understand.

Therefore, we have to concede the following:

1) The radiocarbon method in its current condition has deviation rate of 1000-2000 years for the specimens whose age is estimated as being under 1000 years. This means there's not much to be learn about the events of the last two millennia from this method.

2) The radiocarbon method needs a fresh graduation that would not be based on the Scaligerian chronology at the very least.

3) Other physical dating methods are even less precise, ergo, they can tell us nothing of the dating of objects younger than 2000 years.

4) The actual archaeological methods that aren't based on documented chronology can give no absolute dates; these methods can only aid the estimation of relative chronology of some findings in a limited number of cases.

5) The Scaligerian chronology implicitly or explicitly affected the graduations of scales used for archaeological methods and even physical methods, including the radiocarbon one. This also questions the usability of the method in its current shape for the dating of historical objects.

6) According to a number of archaeologists (see above), the unacceptable practice of familiarizing the physical laboratories that perform radiocarbon datings with the opinions of the archaeologists about the estimated ages of findings still exists.

18. NUMISMATIC DATING

It is assumed that in some cases certain archaeological findings can be dated by the ancient coinage found on the site. However, one should be aware that the so-called numismatic dating as used today *is wholly dependent on the Scaligerian chronology.* This chronology was created in the XVI-XVII century, and all the kings and rulers described in chronicles and other documents took their chronological places. Then the ancient coins were distributed along the temporal axis – for instance, coins bearing the legend "Nero" were dated as the I Scaligerian century A.D., the ones saying "Justinian," as the VI Scaligerian century A.D., etc., since those were the centuries in which Scaliger's chronology placed the Roman emperors Nero and Justinian.

After that, all of the coins found in the XVIII-XX century have either been dated by the same "method," or compared to the ones that have already received datings, and placed on the temporal axis accordingly.

It is perfectly obvious that any alteration of the Scaligerian chronology that this "method" is based upon shall automatically alter the "numismatic datings" as well. Furthermore, an independent comparison of different coins that isn't based on external chronological considerations, *cannot even tell us any-*

thing about the relative chronology of the coins compared, let alone their absolute chronology. Comparing actual coins as metallic objects bearing graphical designs of some sort cannot give us exact knowledge of which coin is older and which is newer. Analyzing the metal of the actual coin can point at its *geographical point of origin* in some cases. However, the calculation of the *date* – absolute or relative – sadly remains an impossibility. Maybe the development of a method that would allow for the determination of a more or less absolute metal alloy that the coin is made of is possible in time. However, as far as we know, no such method has yet been developed. This opens a great many opportunities for physicists, chemists and metallurgists.

The historians write that "numismatics as a science is a *relatively recent phenomenon.* The transition period between the collection of coins to scientific methods of their study… can be estimated to fall into the very end of the XVIII century" ([345], pages 13-14). We shall thus repeat that all of the numismatics are based on the Scaligerian chronology that was built on written sources, and can in no way be considered an independent dating method.

As a result, we encounter many oddities nowadays when we compare "ancient" coins with the mediaeval ones. An abnormally large number of parallels and even direct coincidences appear between the "ancient" and the mediaeval – sometimes even late mediaeval – coinage. These parallels have been known for a long time, and their number keeps on growing. Historians try to explain them by elaborate and nebulous theories of "imitation", "copying," etc. The English Edwardian pennies allegedly dated 1042-1066 A.D. *copy* the Constantinople solidi of Justin II dated 565-578 A.D. in the Scaligerian chronology ([1163], page 449). The chronological difference between the "original" and the "copy" exceeds 450 years here! No such cases of "copying" coins from 450-year-old "originals" have been registered in either late mediaeval or newer history.

The coinage history has allegedly seen an "ancient dawn," then the Dark Ages are supposed to have come, and later on the Renaissance epoch. It is assumed that starting with the VIII century A.D. and until the XIII century, nearly all Roman golden coinage disappears from Italy ([1070]). This strange effect is noticeable enough to have entered the names of chapters of certain monographs on history and numismatics, such as "The End of Roman Coinage (V century)," or "Imitation epoch (VI century)" ([1164]), or "The Lack of Gold Coinage" ([64], page 151).

Let us pay close attention to the following information provided by numismatist historians. It turns out that in the Middle Ages "the West of Europe did not try to compete with Byzantium and the Muslims in this respect [coin minting – A. F.]. The idea of having regular gold coinage had been given up, and most mints produced silver coins" ([1070], page 20; [1435]). It is also said that "regular golden coinage had *practically ceased* in VIII-century Western Europe, and towards the end of the same century on the Italian peninsula as well. Even in Muslim Spain *no golden coinage had been minted* between the beginning of the VIII century and the beginning of the X" ([1070], page 20).

Numismatists attempt to give some sort of explanation to this mysterious "mediaeval gap" in coinage history. It is suggested that "gold coinage had been ceased by an order issued by Pepin". The council at Reims allegedly forbade the use of the golden solidi of imperial Rome, and the type of coinage used allegedly "became barbaric" in the VIII century ([64], page 151).

Doesn't this imply that the "ancient" Western European coinage is really mediaeval and minted after the XIV century A.D., cast way back in time by the Scaligerian chronology?

Historians proceed to tell us that "there are *no Papal coins* from the time of Benedict VII (who died in the alleged year 984 A.D. – A. F.) to that of Leo IX [allegedly the middle of the XI century – A. F.] *in existence*; this is purely incidental, since the coinage must have existed, naturally… There is only one coin from the times of Leo IX… Even stranger is the fact that not a single coin remained from the times of Gregory VII" ([196], Volume 4, page 74, comment 41).

Where did all these mediaeval coins go? Let us formulate a hypothesis. All of these coins have been misdated, and been thrown back into the past, having been "transformed into ancient coins" as a result. Some of them are exhibited in museums as "very old ones" nowadays.

Apparently, the naissance of golden and silver coinage in Western Europe really began in the XIII century A.D. at the earliest. Confronted by the non-existence of mediaeval Western European coins predating the XIII century A.D., the numismatists have had to invent various theories for explaining the economical stagnation of Europe that allegedly followed the "flourishing Classical age". The strange "stagnation" in Roman minting between the VIII and XIII century A.D. is all the more amazing since it follows a very fruitful and glorious period of Roman coinage of the alleged I-VI century A.D. Golden coins of this "ancient" empire are on a par with the mediaeval ones dated as XIII-XVII century in quality and detail. This oddity is most probably explained by the misdating of the XIII-XVII century coins that have been moved a long way into the past.

Let us point out another strange effect. According to the historians, the coin caches of the X-XIII century found in the territory of Russia *hardly contain any* Italian, French, or Spanish coins of X-XIII century A.D. ([685]). Only *single Italian coins* (!) of the X-XIII century have been found among the tens of thousands of coins belonging to that period. Historians have created a theory that is supposed to explain this strange occurrence – namely, that there have been no economical or trade connexions between Russia and Italy in the X-XIII century ([685], pages 200-211). This "numismatic theory" contradicts written sources explicitly mentioning extensive trade and economical relations ([685], page 201). The historian's commentary is that "the contradictions between the numismatic and other data is purely illusionary" ([685], page 201). However, no explanations of any kind are given. We shall formulate the following supposition: Western Europe and Italy in particular really minted a very small number of gold coins before the XIII century, which is why they aren't found in treasure caches in the territory of Russia.

However, in 1252 A.D. full-scale golden coinage is allegedly "resurrected" in Rome all of a sudden, which becomes international currency over a very short period of time, chasing the Byzantine coinage off the market ([1070]). This sudden appearance of Italian gold coinage in the XIII century is considered to be "a dramatic change of the situation prevailing for the first half of the mediaeval period" ([1070], pages 20-21). However, most probably, no such dramatic occurrences really took place. What we appear to witness here is more likely the real naissance of European coinage in the XIII-XIV century as a result of serious changes that happened in the life of Western Europe. See more about the nature of these changes in CHRON5.

The concept of uniform mass coinage is extremely close to that of printing engravings and books. Thus, qualified coin minting shouldn't predate the birth of book-printing by too long, and that event is dated as the XV century nowadays ([797], page 352).