On the Problem of the Reliability of Reconstructions of Greek Architecture in the Northern Black Sea Region

Sergej D. Kryžickij

The reconstruction of the original appearance of the excavated remains of any architectural structure belongs to the concluding stage of its studies. However, while researchers seek to adduce as much evidence as is within their power when trying to determine the date of a structure, studying the finds accompanying it or when proposing a historical interpretation, this is seldom the case with regard to the reconstruction of the structure.

In general, excavators limit themselves to the reconstruction of the ground plan of the structures uncovered. Unfortunately, these efforts are frequently deficient in any solid basis. They make no attempts to elucidate and do not attempt to clarify its spatial and three-dimensional parameters. Meanwhile, in many cases the correct reconstruction of the ground plan, especially that of dwellings, is possible only through analysis of the spatial design of the building.

Thus the complex argumentation for a particular reconstruction is mostly either totally lacking or is not correctly set out. Similarly, there seem to be no attempts to evaluate the proposed reconstruction more or less objectively or to compare different possible variants.

This situation is characteristic not only of the northern Black Sea area but also for the entire Mediterranean. Thus, according to V.V. Voronov, for instance, who examined 428 reconstructions of various ancient structures "… only 36, or 8%, of them have preserved all the major elements of the three-dimensional and spatial composition. As fas as the publication of the Classical architecture in Greece is concerned, only 195 examples (43%) are presented completely".[1] In other words, we can only be confident about eight percent of the buildings published. In the remaining 92% the reliability of the reconstruction is unknown.

I have several times emphasized the necessity of developing common approaches concerning the evaluation of architectural reconstructions.[2] However, no attempts have till now been made to remedy the situation. My proposal for a method for evaluating reliability can give an idea of the reliability of a particular reconstruction, without repeatedly going into detail.

In Russian scholarship the scientific approach[3] to the reconstructions of the architectural remains found in the northern Black Sea region goes back to the beginning of the twentieth century, when B.V. Farmakovskij and the architect P.P. Pokryškin proposed the first reconstruction of a dwelling house discovered during excavations in 1902-1903 in Olbia.[4] Their research founded the so-called academic school as one of the three approaches in work concerned with the reconstruction of the Graeco-Roman architecture. Based heavily on the descriptions and recommendations left by ancient authors, in particular by Vitruvius, this method also made extensive use of analogies. Such reconstructions were devoid of any analysis of the archaeological contexts as regards the construction elements of the particular building, their dating and interrelations. Now this trend may be defined as the reconstruction of the building facades on the basis of their architectural details, parallels and the accounts given by ancient authors. In the second half of the last century this school was represented by I.N. Sobolev,[5] V.D. Blavatskij,[6] L.E. Kovalevskaja,[7] B.N. Fedorov,[8] E.A. Savostina,[9] A.V. Bujskich,[10] O.G. Svitaševa,[11] and, most thoroughly, by I.R. Pičikjan.[12]

Of course, the reconstructions carried out within the frame of the direction mentioned above, suffer from a number of essential drawbacks. Mostly, these include the impossibility of achieving a reliable restoration not only of the ground plan but also of the type,[13] or even the category of the structure under investigation and its horizontal dimensions. There is also the absence of any fixation of the positioning within the site or reliable dating. The last-mentioned was usually an estimate based on stylistic peculiarities rather than any stratigraphical evidence. Moreover there is, with rare exceptions, no certainty that architectural elements uncovered actually belong to a particular type of building. This makes, the reconstruction of a pediment facade, for example, problematic since the architectural elements may have belonged to some unpedimented structures – *stoai*, *peristyles*, etc. Even if there are grounds to suppose that a certain detail belonged to a colonnade which really had a fronton, it does not necessarily mean that this pedimental portico was part of a temple. Neither is it possible to establish whether a presumed temple had a stereobate or a podium on the basis of columns or the entablature. Moreover, the possibility that certain deviations from the typical Greek schemes occured on account of the remoteness from the Mediterranean World is not taken into consideration. One can refer to the representations of five-columned temples on coins, pendants and on a gravestone found in the northern Black Sea area.[14]

Nevertheless, the method of reconstruction based on architectural details, even in the case of an unreliable attribution of the entire building, provides an opportunity to form a fairly trustworthy idea of the height of a particular portico up to the cornice crowning it (except for the tympanon of the gable and stereobate or podium). The reliability of the attribution of the

building type and the restoration of its ground plan usually does not exceed here the probability of any alternative variant, and mostly it is significantly less than 0.5 (if 1 denotes the utmost reliability). All of this limits the applicability of reconstruction based on the architectural details found *in situ* to the restoration of the architectural order and to such fairly typical buildings as temples or *stoai*.

Around the middle of the 20th century, two other trends in architectural reconstruction appeared. These are the archaeologico-architectural and the theoretical approaches.[15]

The archaeologico-architectural approach implies the elaboration of a well-grounded archaeological basis for the architectural reconstruction, namely: proving the existence of the ties (in those cases where such ties are not obvious) between particular building elements found *in situ*; establishing its outer limits, internal divisions and the existence of functional links between particular rooms; an analysis of the stratigraphy in order to identify the building periods and fix the absolute dates of the object; and, finally, substantiating the supposition that particular architectural details had belonged to the specific object under reconstruction. In all other respects, the three-dimensional reconstruction of buildings with architectural orders is carried out according to the method of the academic school. In structures devoid of an order, heights are determined on the basis of parallels, recommendations of ancient authors and the indirect evidence available.[16]

The archaeologico-architectural reconstructions offer a considerably higher reliability in determining the building-type, the ground plan and the volume, than the reliability of the reconstructed height, in particular, of the order. The application of this method is indispensable in reconstructions of non-standard buildings and dwellings. Hence, it is evident that a combined use of the first two methods is the most effective.

The most successful application of the archaeologico-architectural method in combination with the academic one is found in works of A.N. Karasev,[17] S.D. Kryžickij,[18] V.P. Tolstikov,[19] A.N. Ščeglov,[20] N.I. Sokol'skij, A.A. Voronov and Ja.M. Paromov.[21]

All the above explains the importance of the third, theoretical, approach, which is concerned with various problems of reconstruction methodology, in particular, with the problem of the evaluation of reliability. The absence of a common method of evaluation[22] makes comparative analysis of the different variants of reconstructions impossible. This is of crucial importance where extremely poorly preserved buildings are concerned or when reconstruction is based only on architectural details not found *in situ*. Such a situation is often encountered in the northern Black Sea area where the state of preservation of the buildings is so poor that it can lead to erroneous ideas about their original appearance.

Although the works representing the theoretical school are few, certain results have nevertheless been achieved in the development of a general the-

oretical approach.[23] Reconstruction of the facades of temples[24] and the reconstruction techniques used on dwelling houses has improved, and the estimation of reliability coefficients of reconstructions of private and temple architecture is more solidly based.[25]

The evaluation of the degree of reliability of a reconstruction presents a number of difficulties. These are concerned mainly with the impossibility of establishing common criteria for all categories of buildings. Indeed, the criteria should take into account whether the building is a temple or a dwelling. Thus, for a temple with columns in antis just four elements are sufficient to identify its plan (location of the four walls – the outer walls and the wall separating the *naos* from the *pronaos*), while for a dwelling house the necessary number of elements is at least twice as large (in addition to the external walls, the limits of the courtyard must be identified). Nevertheless, a numerical estimation of the reliability of a reconstruction is possible in both cases. Such a numerical criterion may be expressed either in percentages (with absolute reliability of the reconstruction expressed as 100%) or in coefficients (absolute reliability expressed as 1).

To distinguish the major elements which determine the main spatial parameters of the buildings under reconstruction, and to evaluate the relative significance of these elements presents considerable difficulties. This is true above all with regard to buildings without architectural order.

Establishing the dependence of the general estimate of the reconstruction reliability upon the series of particular estimates: reconstructions of the plan, volumes, facade, order etc. also creates a problem. Certainly, the ideal case is one where it is possible to evaluate a reconstruction of the entire building, but such opportunities rarely exist. Therefore, in many cases we must limit ourselves to estimations of the reliability of reconstructions of particular features such as – plans, facades, orders, etc.

In the development of the evaluation method, at least in the preliminary stages of this work, a subjective approach is inevitable. However, it is also evident that evaluating a number of similar buildings on the basis of some general positions (even with some subjective but constant inaccurances) we may achieve more or less comparable results. The propagation of the method proposed below will enable us to increase the objectivity of evaluation without resorting to formalised multilevel statistical calculations, the final result of which, in any case, is predetermined by the program, i.e. by that which is actually of the highest complication in our case.

As mentioned above, I developed a method some time ago to calculate the coefficients of reconstruction reliability pertaining to dwelling houses found in the northern Black Sea area.[26] According to this technique the factor of the degree of reconstruction reliability (K_r) comprises the coefficient of the reliability of reconstruction of the volume (K_v) with the correction to the coefficient of the reliability of the ground plan reconstruction (K_p). Later, an

enhanced variant of this evaluation technique offering the possibility of estimating the reliability of reconstruction not only of dwelling houses but also of temples and architectural order was proposed.[27]

The factor determining the reconstruction of the ground plan of a house devoid of architectural order is the position of the major elements of its layout: the sides of the courtyard and the external walls of the house. Of secondary importance for the reconstruction of the volume of a house is information about the number of rooms, their demarcation, interrelation of the particular rooms and the location of the entrance to the house. The major elements (*a*), in the ideal cases, are estimated to 0.1 (there are eight of them according to the number of the sides of the house and the inner courtyard), the secondary elements (*b*) each are estimated to 0.05 each.[28]

Establishing the number of the storeys, the height of the rooms or the height of the order, and the degree of the inclinations of the roof is decisive in the reconstruction of the volume of a building. The value of the first element (*a*) is assumed to be 0.4, those of the two secondary (*b*) are set at 0.2 each. The elements of minor importance such as the construction of the walls and the ceilings, doorways and window openings, and the type of the roof together make a sum of 0.2.

Since in the reconstruction of volume, it is mainly the determination of the heights of the rooms and the number and direction of the inclinations of the roofs that depends directly on the reliability of the restoration of the plan, it is reasonable to express the relation of K_p and K_v exactly through these two elements multiplying by K_p each of the elements (*b*) of the coefficient K_v. The values of the elements which compose the coefficients K_p and K_v hold good if the reliability of their reconstruction is 100 percent, the correction factors K being introduced in those cases where complete reliability is unattainable.

For dwelling houses, I proposed the following scale of the correction factors K: K=1.0 in the case of a direct confirmation on the site; K=0.9 – reconstruction on the basis of proportional or modular ratios determined fairly reliably (e.g. the determination of the height of a column by its lower diameter); K=0.8 – reconstruction based on two hypothetical suggestions;[29] K=0.7 – reconstruction based on one hypothetical suggestion; K=0.6 – reconstruction based on direct analogies; K=0.5 – in the case of different alternatives; K=0.3 – the use of arbitrary assumptions based on general rules; K =0.0 – when any basis whatsoever is lacking. Hence the resulting general formula is: K_r=0.4 x K + (0.2 x K + 0.2 x K) x K_p+0.2 x K, where K_r is the reliability index of the entire reconstruction; K – correction factors; K_p – the reliability index of the reconstruction of the plan.

Naturally, in the reconstruction of some other category of structures, in particular a temple, both the system of the structural elements considered and their values should be changed.

In order to simplify the evaluation of the reliability indexes of reconstruction of temple buildings, it is expedient to differentiate such reconstructions segregating the following coefficients: K_T – the reliability index of the identification of the type; K_P – the reliability index of the establishing of the plan; K_F – the reliability index of restoring the facade; K_O – the reliability index of the identification of the order. Each of these coefficients is equal to the sum of the corresponding main elements:

K_T (for rectangular temples): the number of the porticos – 0.7; the type of the main portico (in antis or prostyle type) – 0.3;

K_T (for circular temples): the number of the porticos – 0.5; the presence of the cella walls – 0.5;

K_P (for rectangular temples): naos (dimensions – 0.1; the location of the entrance – 0.1) – 0.2; pronaos (the number of columns alongside the main facade – 0.4; the deepness of the pronaos or portico – 0.4) – 0.8;

K_P (for circular temples): naos (dimensions – 0.1; the location of the entrance – 0.1) – 0.2; the external colonnade (the number of the columns – 0.2; the depth of the portico – 0.2) – 0.4; the internal colonnade (the number of the columns – 0.2; the depth of the colonnade – 0.2) – 0.4. If only one colonnade is present then the doubled values for its constituents are taken.

K_F the presence of a fronton – 0.1; the type of the order – 0.2; the number of columns – 0.1; height of the columns – 0.2; the height of the entablature – 0.2; the intercolumniation – 0,2 (for the early centuries AD, the height of the entablature or the type of the foundation – stereobate or podium – 0.1 each);

K_O the type of the order – 0.2; the height of the columns – 0.3 (height of the bases – 0.1, height of the shaft – 0.1, and height of the capital – 0.1); height of the entablature – 0.3 (height of the architrave – 0.1, height of the frieze – 0.1, and height of the cornice – 0.1); the diameter of the column – 0.2.

In special cases, for instance for a tholos, it is reasonable to introduce, in addition, the coefficient of the degree of reliability of the reconstruction of the volume (K_{vr}) consisting of the sum of the main elements (up to 1) each corrected by means of a corresponding correction factor. Since the reliability of the reconstruction of volumes depends on the reliability of reconstruction of the plan of the building, the former may be corrected by multiplying it by the reliability indices of the restoration of the ground plan, thus yielding the total reliability index of the reconstruction: $Kr = K_{vr} \times K_P$.

For the correction of the main elements mentioned above, I recommend the use of the following correction factors:

-absolute reliability (completely preserved) – 1.0.
-reconstruction based on reliably established proportional or modular ratios

(for instance, determination of the height of columns by their lower diameter) – 0.8.
-reconstruction based on certain other hypothetical suppositions – 0.7;
-one alternative (two equivalent possibilites for different variants of the reconstruction, any third alternative being virtually impossible) – 0.5;
-reconstruction based successively on two hypothetical suppositions – 0.4;
-the same, but with three or more suppositions – 0.3; 0.25, and so on;
-when any basis whatsoever is lacking – 0.0.

As mentioned above, the "values" of the elements of any structure and their correction factors are introduced by me rather arbitrarily on the basis of their presumed importance in the reconstructions of an order, facade, ground plan or determining their type.

Presented below (Fig. 1) as an example of the application of the proposed method of the estimation of the reliability of reconstructions are the results of approximate calculations for a number of order-possessing structures from the northern Black Sea region.[30]

Fig. 1 demonstrates that the weak spot of most of the reconstructions of buildings with architectural order is the determination of their type and plan. Of the twenty reconstructions, only seven have a degree of reliability of the determination of the type over 0.5, and only eight (virtually the same reconstructions) exceed 0.5 in their reliability index for the reconstruction of the plan. In other words, all the other structures, except for the Temple of Aphrodite from the early Christian era in Chersonesos, might actually not be the temples at all. The majority of the more or less reliable reconstructions (an index exceeding 0.5) are those of the order (12 examples), the second place being held by reconstructions of facades (9 examples). Eight of the reconstructions under consideration exceed 2.0 in the sum of the four coefficients (out of a maximum of 4.0). Except for one, all these eight cases have an index of the reliability of determination of the type over 0.5, and thus we have only eight sufficiently reliable reconstructions.

As mentioned above, the unavoidable subjectivity in the determination of the importance of different elements, i.e. the "constant error", is of no special significance for the comparative evaluation of a series of reconstructions of one and the same type of building. Of course, later, in the course of the utilisation of the proposed technique, more accurate estimations will possibly be accepted both for the "values" of the structural elements and their correction factors, and for the composition of sets depending on the category of the building under reconstruction, e.g. a semi-dugout house, an ordinary dwelling house, a temple, a burial complex or a theatre.

In this paper the problem of the estimation of the reliability of reconstruction is considered using as its examples architectural constructions found in Greek centres in the northern Black Sea area. However, the proposed method may be applied both to other types of the buildings as well as to other chronological periods.

Reconstructed buildings with an architectural order	Index of the type, K_T	Index of the plan, K_P	Index of the facade, K_F	Index of the order, K_O	SK
Buildings with architectural orders of the 6th-2nd century BC					
Temple of Aphrodite on Berezan Island (Kryžickij 2001)	0.91	0.80	0.72	0.50	2.93
Temple of Apollon Ietros in Olbia (Kryžickij 1998, 190)	0.79	0.78	0.70	0.44	2.71
Temple of Apollon Delphinios of the 5th century BC in Olbia (Karasev 1964, 49 ff.)	0.50	0.53	0.46	0.42	1.91
A similar temple but dated to the Hellenistic period (Karasev 1964, 41 ff.; cf. Kryžickij 1993, 114-115)	0.32	0.00	0.00	0.00	0.32
Temple of Zeus in Olbia (Karasev 1964, 113 ff.)	0.85	0.85	0.30	0.30	2.30
Temple (?) on Mount Mayskaya near Phanagoria (Marčenko 1963, 86 ff.)	0.91	0.80	>0.50	?	2.21
Temple of Aphrodite in Kepoi (Sokol'skij 1964, 101 ff.)	0.50	0.55	>0.50	?	1.55
The Taman' Tholos (Sokol'skij 1976, 55 ff.)	0.82	0.78	0.50	0.80	2.90
Doric temple (?) in Gorgippia (Savostina 1980, fig. 5a)	0.26	0.00	0.65	0.76	1.67
Ionic temple (?) in Gorgippia (Savostina 1980, fig. 5b)	0.00	0.00	0.36	0.61	0.97
Temple of Apollon in Pantikapaion (Blavatskij 1957, 32-33; Pičikjan 1984, 156 ff.)	0.70	0.36	0.81	0.90	2.77
Doric temple(?) in Pantikapaion, 5th century BC (Pičikjan 1984, 174-175)	0.00	0.00	0.00	0.67	0.67
Doric temple of the 4th century BC in Pantikapaion (Tolstikov 1992, 83-87; Svitaševa 1999)	0.80-0.90	0.80-0.90	0.80-0.90	0.80-0.90	3.20-3.60
Temple(?) at Myrmekion (Kovalevskaya 1958; Pičikjan 1984, 191 ff.)	0.30	0.00	0.69	0.79	1.78
Temple of the Ionic order in Chersonesos (Pičikjan 1984, 207 f.)	0.36	0.00	0.81	0.94	2.11
Temple of Aphrodite in Chersonesos (Zolotarev & Bujskih 1994)	>0.30	0.00	>0.30	<0.70	1.30
Buildings with architectural orders of the 1st-3rd century AD					
Temple of Aphrodite in Chersonesos (Pičikjan 1984, 248 ff.)	0.00	0.00	0.68	0.93	1.61
Temple with masks of Silvanus in Pantikapaion (Pičikjan 1984, 231 ff.)	0.25	0.00	0.51	0.82	1.58
Temple (?) of Aspourgos (Blavatskij 1957, 68 ff.; (Pičikjan 1984, 229-30)[31]	0.00	0.00	0.30	0.82	1.12
Temple (?) of the Corinthian order in Gorgippia (Pičikjan 1984, 245-246)	>0.30	0.00	0.71	0.42	1.43

Fig. 1. Reconstruction reliability coefficients for buildings with architectural order in the northern Black Sea region.

Notes

1. Voronov 1978, 8.
2. Kryžickij 1971a; 1993, 25-31; 2000b, 3-5; Kryžickij & Bujskich 1996, 20-23.
3. By scientific approach, I mean propositions based on archaeological evidence, analogies, theoretical calculations, etc. Unfortunately, even nowadays many excavators do not present such arguments.
4. Farmakovskij 1906. For further details on the history of reconstruction, see Kryžickij & Bujskich 1996.
5. Sobolev 1953.
6. Blavatskij 1957, 29-34.
7. Kovalevskaja 1958.
8. Fedorov 1975; 1985.
9. Savostina 1980.
10. Zolotarev & Bujskich 1994.
11. Svitaševa 1999.
12. Pičikjan 1984.
13. Perhaps the only exception in this respect is the reconstruction of the Doric temple of the 4th century BC in Pantikapaion carried out by O.G. Svitaševa (1999). This reconstruction was conducted without an analysis of the archaeological context, on the basis of the practically completely preserved foundation of the structure, and it was concerned only with the restoration of the order.
14. Kryžickij 2000a.
15. Theoretically, a reconstruction on the basis of graphical representation of the building or a literary description is possible. However, the degree of the reliability of such a reconstruction is extremely low, especially in the latter case.
16. Thus, e.g., the height of a tiled roof may be determined on the basis of the transversal gable *kalipteroi* (they yield the inclination of the roof) and the size of the roofed span.
17. Karasev 1964.
18. Kryžickij 1971b; 1982; 1993; 1998; 2001; Kryžickij & Lejpunskaja 1988.
19. Tolstikov 1989; 1992.
20. Chtcheglov 1992; Hannestad, Stolba & Ščeglov 2002.
21. Sokol'skij 1976; Voronov 1975.
22. It should be stressed that the estimates of the reliability of the reconstruction of any structure calculated according to different methods may yield results, which contradict each other. The examples of this are numerous: the temple of Zeus in Akragas, the tomb of King Mausolos in Halikarnassos, the house from the excavations of 1902-1903 near the Zeus Kurgan in Olbia, etc.
23. Voronov 1978.
24. Pičikjan 1984, 257-264.
25. Kryžickij 1971a; 1971b, 88-96; 1993, 25-31; 2000b.
26. Kryžickij 1971a.
27. Kryžickij 1993, 29-31.
28. In case a dwelling house has an architectural order, then the set of the main elements must include the degree of reliability of the determination of the number of porticos and their outer limits. In this case, a=0.08. If K_p is estimated for the plan only, without any further calculation of K_r, then it is reasonable to equalise the main and secondary elements: $a = b = 0.08$ for each of the elements in a non-order house, and $a = b = 0.07$ – for houses with order.
29. It is implied here that no direct evidence is at variance with these two hypotheses.

30. Kryžickij 1993, 132-142, 191-195; 1998; 2001.
31. A careful examination of the architrave, on the basis of which the reconstruction of the Temple of Aspourgos was proposed, showed that this architectural detail can not have belonged to a portico with an odd number of columns (Kryžickij 2000a). Therefore the reliability indexes of the reconstruction of the temple of Aspourgos calculated by me earlier (Kryžickij 1993, 194) has proven incorrect.

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