ply that the x-ray data from DNA could be fitted just as well by a model with alternative base-pairing. What I said was "the Fourier method of structure refinement has, in fact, contributed nothing toward either the proof of that structure [that is, the Watson-Crick model], nor toward the elucidation of its details. . . ." This is a negative conclusion affirming that one particular model has not been established on the basis of evidence furnished by a particular method. Such models have not yet been tested rigorously.

Crick says that I did not allow for the numerous dyads in the structure which would cause many of the reflections to be effectively centric. These numerous dyads are, in fact, part of a model of a single molecule, and not of any of the proposed crystal structures, which are assemblages of molecules, and do not contain numerous dyads which must be "allowed for."

I agree with Crick that this matter needs deciding.

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Animal Remains from Lepenski vir

The vertebrate fauna of this early center of domestication represent an atypical animal husbandry.

Sándor Bökönyi

In the Iron Gate gorge, where the Danube traverses the southern chain of the Carpathians, Yugoslavia and Rumania are planning a giant hydroelectric power system. Large areas of land will be inundated by the artificial lake, which will be formed by the proposed dam. Therefore, in 1965 large-scale salvage work was begun to save the most important archeological monuments of the area. Most of this work has been done by the Archeological Institute and the National Museum, Belgrade.

The most interesting site of the area is Lepenski vir. The excavation of this site has been one of the most rewarding of any in the field of European prehistory in recent years.

Lepenski vir lies on the right bank of the Danube, about 100 miles (160 kilometers) downstream from Belgrade, near the town of Donji Milanovac, not far from the mouth of the small Boljetinska River. At the site location the valley of the Danube widens from its narrow course in the Iron Gate gorge, making room for a small but almost inaccessible settlement.

Excavation has been going on since 1965, under the direction of D. Srejović and Z. Letica, of the University of Belgrade. By 1967, 1643 square meters had been explored; since then, more of the site has been unearthed.

According to Srejović (*1*) the site has three main occupation phases, Lepenski vir I, II, and III. Archeologically, the age of the first two is not yet clear, though it is certain that they represent a period before the earliest pottery-Neolithic culture of the Balkans. The first phase is characterized by trapeziform houses with hard, red-lime plaster floors and by stone sculptures. These finds are unique in Europe, particularly the figural and abstract sculptures, and they indicate that the site will have great significance for both archeologists and art historians.

The houses of the second phase did not have hard floors, but they did have sculptures, which are more monumental, though less finely worked, than those of the first phase.

The third phase belongs to the Starčevo-Körös culture complex that heralds the beginning of the pottery-Neolithic, found in the northern Balkans and in the southeastern half of the Carpathian Basin. Radiocarbon data place the early period of this complex between 5410 ± 100 and 4449 ± 75 B.C. (*2*).

Along with the archeological features and artifacts, a rich collection of animal remains was uncovered at the excavations. The bones were fragmentary, the sample yielding only one whole skull, some larger skull fragments, and a few whole long bones. However, despite their fragmentary state, they were well preserved, so a high percentage of them could be identified.

Unfortunately, as Table 1 clearly shows, the early phases of the site are the poorest in bone material. Despite this, one can obtain much valuable information about animal husbandry, hunting, and fishing within those phases.

The domestic faunas of the two early phases are very similar, and they differ sharply from the fauna of the third phase. Their most specific characteristic is that they have only one domestic species, the dog. This is quite an unusual situation, since we have not yet found in the temperate zone of Europe any Neolithic sites where the dog was the only domestic animal. Therefore, if the two early phases do not belong to the Mesolithic period, the first of the two phases may represent an independent, local evolution, and the second may be a survival of the first.

The wild faunas of the two early phases resemble each other closely. Common to the two phases is the high ratio of fishes, proving the great im-

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portance of fishing in the food production of the inhabitants. Fish bones are particularly abundant in the first phase, being more numerous than bones of other wild animals. Fishing seems to lose much of its importance in the second period, although this cannot be stated with full certainty because of the smaller number of animal remains. Among the wild mammals, the red deer is the most frequently occurring species in both early periods. Its habitat was the dense forest. The other mammalian species represented in the sample of phases I and II were also forest dwellers. The only exception was the aurochs, which preferred the forest steppe, but it was quite rare by comparison with its frequency in Neolithic sites of neighboring regions.

The third phase is represented by a typical Neolithic domestic fauna consisting of cattle, sheep, the goat, the pig, and the dog. All five species show well-determined morphological changes from their wild forms. Moreover, the sheep and goats could not be other than domesticated, since no wild sheep and goats have lived in that area since the late Pleistocene. These five species characterize Neolithic sites from the pre-pottery level on, in central and southeastern Europe. However characteristic these species are, their proportions in Lepenski vir III are quite unusual. The archeological material of this phase belongs, as noted above, to the Starčevo-Körös complex. The animal husbandry of the latter complex was based on sheep and goats (70 to 80 percent of the domestic animals in the settlements were sheep and goats) and showed a direct continuity with that of the pre-pottery-Neolithic that appeared approximately 1000 years earlier in the southeastern region of the Balkans (*3*). The species proportions of the domestic fauna of Lepenski vir III resemble those of the Starčevo-Körös faunas only in the ratio (10 to 1) of sheep or goats to pigs. The high proportion of cattle, strengthened by their local domestication, demonstrates the existence of very strong local influences in the Starčevo fauna. A high proportion of cattle occurs also in Körös sites in Transylvania (*4*), suggesting that, in areas which were not in the mainstream of the development in Starčevo-Körös culture, local elements formed an atypical animal husbandry.

Another unusual faunal feature of the third phase is the high proportion of domesticated dogs. In the European Neolithic the proportion is about 1 percent, and in southwestern Asia domestic dogs are even rarer. Thus, the high frequency of occurrence of dogs in Lepenski vir III demonstrates, if not the survival of certain elements of the two earlier phases into the third one, at least the strong, local roots of the latter.

The percentages of wild animals in the third phase are also interesting. Mammals, birds, reptiles, amphibians, and fishes comprise 33 to 55 percent of the animal remains in Körös sites (*3*, *5*), and the particularly high proportion in Lepenski vir III clearly reflects the influence of a special natural environment. However, in this phase there is a decrease in fishes along with an increase in mammals. Lepenski vir III is unusually rich in mammalian species relative to other Neolithic sites of the Balkans. Most of the 15 species of wild mammals which occur are forest animals in this period, too, although the aurochs (which became more frequent) and the wild ass [*Asinus hydruntinus*, a Pleistocene remnant, quite common in Körös sites (*6*)] were not forest dwellers. It is interesting to note that the chamois, a species typical of high mountains now, was widespread in mountains of medium height during the Pleistocene and Neolithic.

Among the domestic animals the dog is represented in phases I and II only by individuals of small size. The dog was undoubtedly domesticated, as is evidenced by mandibles with premolars situated in overlapping positions (crowded teeth). The appearance of medium-sized dogs is observable only in the third phase, and the small dogs predominate even at that time.

The question of what purpose these dogs served next arises. One has to consider four possible types of use: as a watchdog, as a herd dog, as a source of meat, and as a hunting companion. Among these, we must rule out the use of herd dogs in the first and second phases, since at that time there were no other domestic animals. It is not possible that watchdogs could have been used where houses were built so close together. But it would be quite difficult to exclude use of the dog as a meat animal in Lepenski vir. At the beginnings of domestication probably all domestic animals were eaten, though at Lepenski vir the overwhelming majority of dog bones are from adult animals, and most of the bones were not broken up. Very often the intact skeleton of whole parts of the body was excavated with the bones in anatomical order, indicating that the dog was not simply a source of meat but was a sacrificial animal. The dog was obviously used as a hunting companion, too, as hunting, like fishing, was of considerable importance in Lepenski vir I and II. And, when hunting reached its peak—probably in phase III, though this is not perfectly clear because of

Table 1. Species represented by bone fragments of Lepenski vir, phases I, II, and III.

Species	Phase I		Phase II		Phase III	
	No. of specimens	%	No. of specimens	%	No. of specimens	%
Domestic animals						
Cattle, *Bos taurus* L.					375	15.83
Sheep, *Ovis aries* L., or goat, *Capra hircus* L.					81	3.42
Pig, *Sus scrofa dom.* L.					8	0.34
Dog, *Canis familiaris* L.	21	4.95	23	11.16	140	5.91
Wild animals						
Aurochs, *Bos primigenius* Boj.	14	3.30	7	3.40	174	7.34
Chamois, *Rupicapra rupicapra* L.					2	0.08
Red deer, *Cervus elaphus* L.	115	27.12	111	53.88	862	36.39
Roe deer, *Capreolus capreolus* L.	4	0.94	1	0.49	36	1.52
Wild swine, *Sus scrofa fer.* L.	10	2.36	6	2.91	211	8.91
Wild ass, *Asinus hydruntinus* Reg.					7	0.30
Wild cat, *Felis silvestris* Schreb.					1	.04
Lynx, *Lynx lynx* L.					6	.25
Marten, *Martes* sp.	6	1.42	3	1.45	3	.12
Badger, *Meles meles* L.	3	0.71			7	.30
Brown bear, *Ursus arctos* L.			1	0.49	27	1.14
Wolf, *Canis lupus* L.					7	0.30
Fox, *Vulpes vulpes* L.					1	.04
Beaver, *Castor fiber* L.	2	.47			4	.17
Brown hare, *Lepus europaeus* Pall.					7	.30
Birds, Aves spp.	6	1.42	1	0.49	10	.42
Cyprinids	86	20.28	1	.49	14	.59
Catfish, *Silurus glanis* L.	3	0.71	5	2.42	22	.93
Other fishes, Pisces spp.	154	36.32	47	22.81	364	15.36
Total	424		206		2369	

the scantier archeological record—so did the proportion of dogs, which exceeded that at any other Starčevo-Körös site excavated to date.

Of the other domestic species, it is obvious that the pig was domesticated at the site, since the bones of individuals range from the wild to the domestic form. Sheep and goats were introduced as fully domesticated animals from the eastern basin of the Mediterranean. Most of the cattle were animals that had been domesticated several generations before. Because the domestication of cattle first started in the Balkans, in Thessaly (*7*) and Greek Macedonia (*8*) in the second half of the 7th millennium B.C., domesticated cattle could easily have reached Yugoslavia in the 6th millennium B.C. Nevertheless, there are also evidences of a local domestication of cattle. [There are transitional individuals between the wild and domestic form. As judged on a morphological basis, some of them —the disproportioned ones—could be crosses between wild and domestic cattle, but the overwhelming majority—the small-scale "editions" of the large aurochs (*9*)—were animals newly domesticated at the Lepenski vir site.]

The wild animals of Lepenski vir show the normal range of size variation exhibited by the corresponding prehistoric forms, except for some exceptionally large catfishes that may have weighed 300 to 400 pounds (about 140 to 180 kilograms).

Finally, we come to the relationship of the animal remains to the structures in which they were found. Recent studies of the archeological material of Lepenski vir have aroused speculation that the buildings of both the first and second phases were not true houses but shrines. The bone material found in some of them seems to strengthen this theory. Animal bones were found in 30 of the buildings, and fish bones were identified in nearly all of them. A surprisingly large number (13) of the structures contained a red deer skull with antlers, and seven contained a red deer shoulder blade. Often the complex of red deer skull and shoulder blade occurred along with bones of dogs and wild swine which were in anatomical order. All of these bone assemblages may well be sacrificial remains (that is, defined bones of defined species) and many confirm the view that the buildings were shrines.

There is no doubt that Lepenski vir was one of the earliest centers of animal domestication in Europe. With the special composition of its domestic fauna it represents a form of animal husbandry that has not previously been known to have occurred in either the temperate zone of Europe or in the Middle East, but its origin and its relationship to other archeological sites can be discovered only through further investigation.

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NEWS AND COMMENT

Science in Italy: Reform Effort Takes a Sharp Turn Leftward

Rome. A *Science* correspondent reported in 1964 that "Italian scientists seeking an improved climate for research find themselves more pessimistic than usual. . . ." Today, few changes having since taken place in Italy's antique and poorly financed system of research administration, they are even more pessimistic. But what must be added is that a half-dozen years of frustration have pushed the mass of Italian research workers sharply to the left. And as a result, thousands of them, from senior investigators to bottle-washers, are now also concerning themselves with issues that go beyond the traditional and long-ignored rallying points of pay, working conditions, and research support. Endlessly discussed at mass assemblies that have recently immobilized major research centers throughout the country for months at a time, these issues are closely linked to the peculiarly downtrodden state of Italian science—which is worse off, by far, than science in any other industrialized nation. But they also transcend the usual bread-and-butter concerns and critically bring in such fundamental matters as the system of developing social priorities in research, the scientist's responsibility to the public in an economy dominated by profit-making criteria, and the linkage of financial reward to individual position and productivity. The debates and conclusions concerning these matters are not always notable for clarity or coherence, for, in general, they reflect a desire not only to reconcile good Marx with good science but also to mold the product in a fashion that will assure some chance of its surviving in Italy's enduring condition of political chaos. Thus, to arouse support within the lower echelons of the scientific community, and also to establish links of sympathy with industrial workers, major emphasis has been placed on both raising pay and narrowing the salary differentials between technicians and scientists. But the ultimate goal, as recently explained during a long evening with some dozen young physicists, chemists, and other scientists from a major research center, has little to do with money. Rather, as one young scientist put it, the pay issue is being spotlighted because it quickly shows how research workers are "manipulated" for the pursuit of goals about which they have no say. From that point, goes the explanation, one can proceed to a recognition of the manner in which capitalist systems exploit science against the interests of the masses. (After this thesis was expounded