It is concluded that the pattern of diversity stratification observed in the York River summer plankton community is consistent with a profit motive and, since energy is required to establish and maintain it, that the community acts to optimize its structure in the prevailing hydrography for maximum energy gain (*8*).

BERNARD C. PATTEN

Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, Virginia

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Erosion and Deposition of Italian Stream Valleys During Historic Time

Abstract. *The recent geologic history of small streams in east-central Sicily and southern Etruria has been dated archeologically. In Sicily a period of deposition began post 8th century* B.C. *and had ended by 325* B.C. *After a period of erosion, another, less extensive, alluviation took place, probably in medieval time. North of Rome in southern Etruria an alluviation that began no earlier than the late Roman empire probably continued into medieval time.*

Silting of river mouths along the Mediterranean coast has occurred in many places since classical times. For example, Ostia Antica, Rome's ancient seaport, is buried by Tiber River sediments and the fabled town of Sybaris still lies lost beneath the silts of the Crathis River, along the instep of the Italian boot. Farther east, the rivers of western Turkey have carried so much silt to the coast that the Meander River, for example, has pushed back the sea about 8 km during the last 2000 years. Deposition at the mouth of the Nile was talked of even before Herodotus (484–425 B.C.)

This report deals with silting and erosion along certain small inland valleys in Italy. These small valleys, wherever they contain a well-developed stream channel, also exhibit a flat-bottomed valley, which is the result of alluviation. The nature, extent, and date of this alluviation form the subject of this report. It deals specifically with archeologic and geologic studies along streams in east-central Sicily and southern Etruria (*1*).

The Gornalunga Valley heads on the eastern margin of the high plateaus of Sicily and flows eastward toward Catania and the Ionian Sea. In the upper reaches of this valley, 60 km from Catania, geologic and archeologic studies demonstrate a sequence of alluviation and erosion during historic time.

The local bedrock includes clay, limestone, and standstone of Tertiary age, and forms hills on either side of the valley. The stream here drains an area of about 90 km². The valley bottom itself is terraced with a series of broad flat surfaces separated by steep risers. These terraces are underlain by the sands, gravels, and silts deposited by the modern stream and by streams of the immediate geologic past. Four stream terraces can be recognized easily. Several higher gravel patches may also represent former terraces, but their significance and continuity have not been established. The surface of the highest terrace stands between 17 and 20 m above the modern stream; the next highest is between 8 and 10 m above the stream; a small terrace between 4 and 5 m is still lower; and the lowest terrace (the present flood plain) is at approximately 2 m (see Fig. 1). The two higher terraces are wide and form the bulk of the valley bottom. The two lower terraces are only narrow benches.

The 17- to 20-m terrace is the highest in the area that still retains an original upper surface. The single good exposure of its sediments is at kilometer 30.65 on the Aidone-Catania road, where the road is built on the terrace surface.

In a small draw leading toward the main Gornalunga drainage, a section approximately 3 m thick exposes dark gray clayey alluvium, which contains fragments of limestone from adjacent slopes. The alluvium is compact and has prismatic jointing. Locally there is staining by limonite, and some oxides of manganese stain the joint planes. Manganese oxide also forms nodules up to ½ cm in diameter. The gray color probably was derived from black soil on the slopes of the valley at this place. No archeological material has been discovered.

The sediments of the 8- to 10-m terrace reach to stream level in many places. In other places they are seen to be 5 to 6 m thick over bedrock. Coarse gravel, with fragments up to ½ m in size, forms the lowest 1 to 2 m of the deposit. This gravel is overlain by alluvial sand and silt that varies in color from gray-brown to yellow-brown.

Near the base of the 8 to 10-m terrace, in fine-textured facies of the basal gravel, have been found some 30 pieces of pottery and tile. None could definitely be identified as younger than the 8th century B.C. No definitely demonstrable Roman, medieval (*2*), or modern material was discovered. In the uppermost deposits of this terrace Greek burials of 325 B.C. have been discovered (*3*), and these provide an *ante quem* date for the end of deposition.

The 4- to 5-m terrace occupies narrow bands along the modern stream. It consists of sandy alluvium, buff in color, which overlies approximately 1 m of coarse basal gravel. A number of terra cotta fragments have been found in the deposits, and all of them have been identified as either ancient or medieval.

The 2-m terrace also occupies restricted positions along the modern stream. It is made up of a light, sandy, buff-colored alluvium, overlying a meter or so of coarse basal gravel, and is thus lithologically similar to the 4- to 5-m terrace. Fragments of ancient, medieval, and modern tile are present in the deposits. Hence, these terrace deposits are presumably the present flood-plain deposits and are being moved with each high-water stage.

In southern Etruria, immediately north of Rome, small stream valleys are characterized by broad, flat floors, trenched by narrow stream channels from 3 to 8 m deep. Flood plains within these trenches are 1 to 2 m high, and are restricted by the narrowness of the trenches.

The valley deposits older than the modern flood plain seem to represent a single stage of alluviation. The deposits are 3 to 8 m thick. They are characterized by basal deposits of

EVENT	EAST-CENTRAL SICILY Gornalunga Valley (near Morgantina)		SOUTHERN ETRURIA, ITALY La Crescenza Valley (10 Km N. of Rome)		Valchetta Valley (near Veii)	
	Evidence	Date	Evidence	Date	Evidence	Date
Erosion	Modern channel on bedrock bordered by deposits of 2 m, flood plain terrace	Present Began ?	Modern channel on bedrock bordered by deposits of 2 m. flood plain terrace	Present Began pre-1534 ?	Modern channel close to bedrock bordered by deposits of 2 m, flood plain terrace	Present Began pre-1534 ?
Deposition	4 to 5 meters of stream deposits	"Medieval" ?	5 m. of stream deposits bury Roman buildings and road	Post early 3d cent. A.D. to pre-1534 ?	8 m of stream deposits bury Roman buildings and road	Post 2d century A.D. In part medieval. Ends pre-1534 ?
Erosion	Topographic and stratigraphic unconformity	Began post 325 B.C.	Stratigraphic unconformity	Upper limit post early 3rd century A.D., lower limit pre-50 A.D.	Stratigraphic unconformity	Upper limit post 2d century A.D., lower limit pre 1st century A.D.
Deposition	8 to 10 m. of stream deposits	Ended prior to 325 B.C. Began post 8th century B.C.	No Evidence		No Evidence	
Erosion	Topographic and stratigraphic unconformity	Ended post 8th century B.C. Began ?				
Deposition	Stream deposits in 17 to 20 m. terrace	?				

Fig. 1. Tentative correlation of erosional and depositional events in certain valleys in east-central Sicily and in southern Etruria (north of Rome).

gravelly material overlain by buff to gray, bedded alluvial silts, sands, and clays. Some coarse, sandy alluvium is cross-bedded and in places ripple-marked.

In a number of places, this alluvium overlies structures of late Roman age (*4*), and these give a *post quem* date to the alluviation. Thus, 10 km north of Rome, in the valley of La Crescenza, the old Roman road leading from Rome to Veii is buried beneath 4 m of silt where it crosses the valley bottom. Close by, and exposed in the trench of the modern stream, stands a Roman mausoleum (about A.D. 50), which was built at a level now submerged by 5 m of river silt. Subsequent Roman structures used the already plundered mausoleum to advantage by incorporating it into their structures. A silver coin shows that this site was certainly occupied after A.D. 209. One to 2 m of alluviation occurred between the construction of the mausoleum about A.D. 50 and the later buildings. The later structures are in turn covered by an additional 3 m of stream-laid deposits (see cover photograph).

In the valley of the Valchetta, under the walls of ancient Veii, another excavation also revealed Roman structures buried in silt. A bath, built on a level at least a meter below the modern stream, dates from the 1st century A.D. This structure was added to in the 2nd or 3rd century A.D. From the level of original construction the thickness of subsequent sedimentation measures more than 8 m.

Upstream from this site the Roman road leading across the Valchetta to Veii is also buried in silt and there are other buried structures which were built originally at a level approximating the modern stream. Farther upstream some medieval pottery found in the upper part of the silt indicates that at least the final stages of alluviation were medieval or younger.

On the basis of these two excavations, in two separate valleys, the alluviation in southern Etruria is dated as late Roman Empire or early medieval.

The modern streams in southern Etruria now flow in deep, steep-walled trenches that express a recent period of erosion. As to the question "when did the streams cut down to their present position," no archeological data are immediately available. A map dated 1534, however, suggests that the trenching had been completed by that time (*5*).

The sequence of erosion and deposition just described indicates extensive changes in stream regime during historic time. Casual observation suggests that the erosion and deposition are not restricted merely to the places described in this report. Rather, these events are widely recognizable throughout the Mediterranean Basin, and alluviation and deposition are the rule rather than the exception. From the point of view of human history, the alluvial sequence buries large chapters of human activity. Extensive buildings have been submerged in silt; roads have been drowned out by stream deposits; and cultivation patterns in valley bottoms surely have been destroyed. While alluviation was going on, erosion of material from slopes must have been extensive. The manner in which these processes affected people has yet to be determined. The geologic record, however, suggests that the physical events cannot be ignored in the reconstruction of human history.

The studies have thus far not explained the causes of these events. The data are still insufficient to decide whether the alternate periods of alluviation and erosion are due to the intervention of man in the landscape, whether they are due to natural changes in the environment or climate, or whether they were brought about by some combination of natural and human causes.

SHELDON JUDSON

Department of Geology, Princeton University, Princeton, New Jersey

References and Notes

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Xenon Oxyfluoride

Abstract. *The incomplete hydrolysis of XeF_6 has been used to prepare a xenon oxyfluoride, $XeOF_4$. The latter is a clear, colorless liquid, freezing at −41°C. The infrared and Raman spectra show that the $XeOF_4$ molecule has a fourfold symmetry axis. The large Xe—O stretching force constant indicates the Xe—O bond has appreciable double bond character.*

While the hydrolysis of XeF_6 has been shown to lead to XeO_3 (*1*), less complete hydrolysis of XeF_6 has been used to prepare $XeOF_4$. The existence of this compound was noted in the first report of the Argonne National Laboratories on rare gas chemistry (*2*), and was based on the observation of a $XeOF_4^+$ ion occurring in a mass spectrometer record. I report here some details of the preparation of $XeOF_4$ by the hydrolysis of XeF_6, note a few of