(18.4 percent) contents. The low FeO and MgO contents reflect the low abundance of mafics. The plagioclase ranges from $An_{97.1}$ to $An_{99.0}$; MgO in the plagioclase is below detection, in contrast with the high MgO content in the plagioclase of the spinel troctolite. The feldspathic glass has an Al_2O_3 content too low for plagioclase, and its FeO (0.1 to 4.1 percent) and MgO (0.10 to 3.3 percent) contents are higher than those found in lunar plagioclase. The olivine grains are small, ranging from minute specks to 0.2 mm; compositionally they are in the range $Fo_{59.0}$ to $Fo_{61.4}$ (Table 2). Orthopyroxene is a minor phase and clinopyroxene is very rare; the grains are found as small discrete crystals. The orthopyroxene ranges from $En_{54.6}$ to $En_{69.8}$ (Table 2). The clinopyroxene has a very limited range and the analysis in Table 2 is typical; compositionally it is transitional between augite and salite. Spinel is a rare constituent, and only two grains large enough to analyze were found. The analysis given in Table 2 shows that it is enriched in $FeCr_2O_4$.

The spinel troctolite described here confirms earlier suggestions (*4*) that troctolite is a lunar igneous rock type. It is the best example to date of a cumulate texture in a "primitive" rock. Cumulate textures noted previously in lunar igneous rocks, especially in Apollo 12 samples, are in rocks that appear to be related to mare basalts. A lunar spinel troctolite assemblage was first reported as a fragment in an Apollo 11 microbreccia (*6*), and other troctolitic lithic fragments were described in the same samples (*4*). An olivine-plagioclase (troctolite) lithic fragment was found in an Apollo 12 sample, but with no spinel (*7*), and rare spinel troctolite fragments were found in Apollo 14 samples (*8, 9*). When a spinel phase is present in these troctolites it is enriched in $MgAl_2O_4$. In addition, olivine is rather magnesian (Fo_{74}–Fo_{88}), plagioclase is highly calcic (An_{94}–An_{98}), and no pyroxene or ilmenite is found.

Lunar anorthosites differ from the troctolites, not only in containing more plagioclase, but in the nature of the mafic minerals. Anorthosites usually contain pyroxene, whereas spinel troctolites do not. When spinel is found in anorthosites it is enriched in $FeCr_2O_4$, as shown in Apollo 11 and Apollo 12 fragments (*7, 10*), and in an Apollo 15 rake sample specimen very similar to 15415 (Genesis Rock) (*11*). Olivine is usually relatively iron-rich, and opaque phases present in anorthosites include ilmenite, armalcolite, troilite, and metallic Fe-Ni.

The data reported in the literature and the results of the present study indicate that there are essential mineralogical differences between spinel troctolite and anorthosite, which are suggestive of genetic relationships between the two. Such genetic relations may be inferred from a consideration of the system diopside-forsterite-anorthite (*12*), which offers a first approximation to the parent magmas of these rocks. A $MgAl_2O_4$ spinel field is present on the liquidus of the system on and near the forsterite-anorthite join, and certain liquids in this vicinity would crystallize spinel as one of the earliest phases. On cooling, the liquid would move toward the diopside field with spinel reacting with the liquid to form olivine and plagioclase, unless it is removed by settling, or armored by other crystals. Although $MgAl_2O_4$ spinel is thus removed from later liquids in this differentiation process, the presence of some FeO and Cr_2O_3 in the liquid would probably allow spinel rich in $FeCr_2O_4$ to remain in coexistence with the forsterite-anorthite-diopside (anorthosite) assemblage. The higher Fe/Mg ratios of mafics as well as the presence of ilmenite and armalcolite in anorthosites is also indicative of their formation at a lower temperature, compared to spinel troctolite assemblages.

Thus, if the two rock groups formed from the same parent magma type, the spinel troctolite must have formed early in the differentiation sequence as the result of crystal settling in the melt, whereas the anorthosite must have formed as a later cumulate, possibly by flotation. A similar suggestion has also been made by Roedder and Weiblen (*9*). It appears that the parent magma must have been a high-alumina magnesian basalt melt.

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Early Cultivated Beans (Phaseolus vulgaris) from an Intermontane Peruvian Valley

Abstract. *Examples of fully domesticated common beans* (Phaseolus vulgaris) *and lima beans* (Phaseolus lunatus) *were recovered from deposits in Guitarrero Cave (PAn 14-102) in the Callejón de Huaylas, Ancash, Peru. Carbon-14 dates for stratum II, in which the earliest beans were found, range from 7,680 ± 280 to 10,000 ± 300 years before the present.*

Preceramic cultural and skeletal remains from Guitarrero Cave (PAn 14-102) in the Callejón de Huaylas, Ancash, Peru, have been described in their stratigraphic and chronological context (*1*). Partial analysis of the vegetal remains has disclosed the presence of fully domesticated common beans (*Phaseolus vulgaris*) at an early level in the dry deposits.

The vegetation around the cave is a thorn-scrub formation in which the most prominent shrubs are about 2 m tall. Species of Leguminosae and *Dodonaea viscosa* comprise the bulk of the woody vegetation, but the xerophytic nature of the slope is accentuated by scattered specimens of *Trichocereus peruvianus* and *Opuntia maxima*, both tree-like cacti. This species composition is in marked contrast to both the heavily cultivated valley bottom a few hundred meters downslope from the cave and the bright green slopes of the Cordillera Blanca on the other side of the valley. These areas must once have supported a dense, broad-leaved forest which has long since disappeared. On the other hand, the species composition of the vegetation of the dry slopes of the Cordillera Negra, although it is obviously disturbed by grazing animals and firewood gatherers, probably deviates less from its original condition. Since the time of the conquest, many herbaceous plants have been eliminated by the sheep and goats that were introduced and some species, such as *Agave*, have been added. In many ways, the slope of the Cordillera Negra is reminiscent of the habitats for wild beans in Mexico.

The common beans are present in sufficient numbers (approximately 30 specimens) in highly reliable contexts to leave no doubt that they belong with the cultural features of stratum II. Dark red-brown and dark red beans are present. Some are mottled. Some specimens are rounded, and others are flatter, more elongated kidney beans. The more rounded variety is generally darker in color and sometimes mottled. We were most fortunate in recovering five separate rounded beans and two pod fragments, one a stem end with three beans in place, in unit 146 which has been reliably dated 7680 ± 280 years before the present (B.P.). Other examples were recovered nearer the bottom of stratum II, but none was found in the lowest portion which has been dated at more than 10,000 ± 300 years B.P. We are convinced that the cultivation of beans was known in the Callejón de Huaylas by about 6000 B.C. Previously, the oldest record for cultivated common beans was 7000 years B.P. at Tehuacán (*2*) in Mexico and 4700 ± 80 years B.P. (*3*) in South America.

The idea that the beans recovered from Guitarrero Cave were cultivated is beyond doubt. Wild or wild-type beans collected in Mesoamerica (*4*) and South America (*5*) are consistently small in size and are usually tan or gray, often with darker flecking or brindling. The common beans of Guitarrero Cave are fully as large as those recovered in more recent strata. They have thin seed coats, they are dark, and they are within the size range and form of contemporary cultivars; they are sometimes mottled, but they are without trace of the brindling so common in wild populations.

Furthermore, the fragments of pod found in this stratum do not have the heavy, inner fibrous layer characteristic of wild bean pods. This layer, instrumental in twisting the pod valves tightly in opposite directions, has been selected against in cultivation to prevent the loss of beans before or during harvest (*6*). The pod fragment with included beans shows no tendency to separate and curl, although pods of other leguminous species from the same deposit still retain the ability to curl with drying. Common beans were probably cultivated in the valley bottom along the Río Santa rather than on the dry slopes near the cave.

In the same stratum of the Guitarrero Cave deposit, we recovered four specimens of lima beans (*Phaseolus lunatus*). One of these seeds, probably reddish in color, although the color is largely obscured by an incrustation, was found under fairly reliable conditions. The other three seeds, one solid black and two tan with black markings, were found in an area with somewhat looser fill which might be an indication of disturbance. Like the common beans, all of these seeds are similar in size and shape to those recovered in more recent strata in the Guitarrero deposits. They were fully domesticated, cultivated lima beans that are of Peruvian, as distinct from the Mesoamerican, type, and in spite of the less secure circumstances under which they were found, they lend further support to the proposition that the people of Guitarrero Cave practiced cultivation of common and lima beans between 5500 and 8500 B.C.

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Hypothalamic Polypeptide That Inhibits the Secretion of Immunoreactive Pituitary Growth Hormone

Abstract. *A peptide has been isolated from ovine hypothalamus which, at* 1×10^{-9}M, *inhibits secretion in vitro of immunoreactive rat or human growth hormones and is similarly active in vivo in rats. Its structure is*

H-Ala-Gly-Cys-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Phe-Thr-Ser-Cys-OH

The synthetic replicate is biologically active.

Physiological, experimental, and clinical observations (*1*) have led to the concept that the hypothalamus controls and regulates the secretion of pituitary growth hormone (somatotropin). It has been generally accepted that this control would be exerted by a hypothalamic hypophysiotropic releasing factor, as is now proven to be the case for the secretion of thyrotropin (TSH) (*2, 3*) and the gonadotropin, luteinizing hormone (LH) (*4*). The nature of the postulated hypothalamic releasing factor for growth hormone, however, remains elusive, mostly due to the difficulties and ambiguities of the various assay systems used so far in attempts at its characterization [for review see (*5*)].

Searching to demonstrate the presence of this still hypothetical somatotropin releasing factor in the crude hypothalamic extracts used in the isolation of TRF (thyrotropin releasing factor) and LRF (luteinizing hormone releasing factor), we have regularly observed that their addition in minute doses (⩾ .001 of a hypothalamic frag-