soon die. This is followed by a piling up and drying of mucus, and permeability of the mucous membrane. In this state the gelatinous mass of mucus constitutes a most hospitable culture medium for bacteria, which may then in large numbers easily pass through the permeable nasal mucosa. The consequences of this are not infrequently lethal.

The hypothesis proposed here is that, in man, weeping established itself as an adaptive trait of considerable value in that it served to counteract the effects of more or less prolonged tearless crying upon the nasal mucosa of the infant. Infants who cried for prolonged periods of time during the early years of their lives without benefit of tears would stand less chance of surviving than those who cried with tears. Dry crying is dangerous because it renders the organism vulnerable to the invasions of harmful bacteria, and probably viruses, through a dried-out mucous membrane the autosterilizing functions of which have been reduced. Crying with tears, on the other hand, serves to keep the mucous membrane wet and to assist in maintaining as well as reinforcing its functions. Alexander Fleming showed (*4*) that tears contain, among other things, an enzyme elaborated by the lacrimal glands in high concentration—namely, lysozyme, which we have already seen is also secreted by the mucous glands of the nasal mucosa. Lysozyme is highly bactericidal. Caselli and Schumacher (*5*) demonstrated antagonism between lysozyme and electronegative viruses, and Orzalesi and Ciuffo (*6*) obtained very satisfactory results in the treatment of herpetic keratitis and inactivation of the virus with lysozyme. More recently, Ferrari *et al.* (*7*) found that lysozyme inactivates the viruses of many infections such as herpes simplex and herpes zoster, warts, vaccinia, and the like, and reported success in the treatment of diseases produced by these infections with lysozyme. Lysozyme, then, seems to hold some promise, as Fleming had originally expected, in the treatment of virus diseases, and the function of lysozyme in the human organism strongly indicates one of the functions of weeping, especially in the infant and child—namely, as a physiologically protective device against the depredations of potentially noxious organisms. In addition, it should be mentioned that tears contain sugar and protein which are nutritious both to the eye and to the paranasal and nasal mucous membranes. Weeping, furthermore, activates the mucosa, increasing the blood supply and causing the mucosal glands to secrete additional lysozyme.

It is suggested, then, that weeping originated as an adaptively valuable trait in a species in which the crying of the young is extended over a much longer period of time than in any other species, as a protective adjustment against damage to the nasal mucous membrane of the young, and the consequent reduction in fitness; that early in the development of man those individuals were naturally selected in the struggle for existence who were able to produce an abundant flow of tears as they cried, as a preventative of mucosal dehydration, while those who were not able to do so would be likely to succumb more frequently at all ages, and leave the perpetuation of the species increasingly to those who could weep.

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Parietal Eye Nerve in the Fence Lizard

Abstract. A nerve from the parietal eye of the western fence lizard, *Sceloporus occidentalis,* is described as leaving inconspicuously from the third-eye and extending caudally under the dura mater and then ventrally along the left anterolateral surface of the epiphysis to the habenular commissure of the brain. The existence of a parietal nerve must be considered in interpreting the effects of parietalectomy.

A parietal or parapineal nerve from the third-eye of the western fence lizard, *Sceloporus occidentalis,* was not noted in a brief anatomical study preliminary to our investigation of the effects of its removal (parietalectomy) upon behavior (*1*). Unlike the parietal nerve of *Sphenodon* (*2*), *Lacerta* (*3*), and *Chalcides* (*4*), that of *Sceloporus* has an inconspicuous route. In a recent and more thorough study of the "eye" of this form, by means that included electron microscopy (*5*), a parietal nerve was traced in serial sections stained either with hematoxylin and eosin or by Pearse's trichrome-PAS technique. The fine nonmedullated fibers which compose the nerve appear to assemble behind the retina, in a manner not yet determined, course medially and posterodorsally *within* the connective tissue capsule of the "eye," and emerge from its margin where it is attached to the dura mater and integument. Thus, the ventral aspect of the "eye" presents no evidence of the nerve, grossly or microscopically. The parietal nerve extends caudally in intimate association with the anterior pineal artery (*2*, *6*) on the under surface of the dura mater, which is closely applied to the skin in the region of the "eye." Observed in cross section, the diameter of the nerve is seen to be about one-half that of the arterial lumen. At the tip of the epiphysis, or pineal sac, the two structures part company, the artery to the right, the nerve to the left. Both may be traced ventrally between the anterior face of the epiphysis and the posterior wall of the dorsal sac. In sagittal-parasagittal series the nerve is easily followed for a short distance below the tip of the dorsal sac. Ventral to this level the fibers of the nerve seem to spread out, and they are traced farther with difficulty. A few transverse and frontal series provide evidence, however, that the fibers proceed to the base of the epiphysis and enter the habenular commissure.

This description agrees with that of Dendy (*2*) for *Sphenodon*, but not with that of Nowikoff (*3*) for *Lacerta* and *Anguis,* in which the parietal nerve is stated to course to the right of the mid-line. On the other hand, we trace the unpaired anterior pineal artery to the right side of the epiphysis, whereas Dendy (*2*) finds it on the left side of *Sphenodon,* as does Steyn (*6*) in *Cordylus* and *Mabuya.* Finally it should be noted that several workers, including most recently Steyn (*7*), have concluded that a parietal nerve is absent in adult lizards.

In connection with a comparative study of the pineal complex in various reptiles, we have identified the parietal nerve in the following: *Callisaurus draconoides, Crotaphytus collaris, Draco volans, Phrynosoma coronatum, P. douglassi, Sauromalus obesus, Uma inornata,* and *Xantusia vigilis.* The nerve in these forms varies somewhat in size, point of departure from the third-eye, and path to the habenular region of the diencephalon. We have not examined an adequate number of specimens to determine right-left relationships. In the zebra-tailed lizard (*Callisaurus draconoides*) and in the chuckwalla (*Sauromalus obesus)* (two specimens and one, respectively), a small

body containing large nuclei is situated on the parietal nerve near the "eye." Could this be a ganglion? Nowikoff (*3*) noted a similar structure in *Anguis*, which he interpreted as an ectopic piece of retina.

We have studied serially sectioned heads of 16 parietalectomized *Sceloporus occidentalis*, a sample from our field study (*1*). The parietal nerve can be identified in specimens sacrificed 7 to 15 months after parietalectomy. Presumably we are observing only sheath cells and perineurium. Nerve stains have not been used. The strand can be traced in association with the anterior pineal artery from the epiphysis to the former site of the parietal eye where the "nerve" frays out on the surface of the artery or in the remnant of the capsule. Parietalectomy involved the destruction of only the retina and lens (*1*). Older specimens, 18 to 21 months after surgery, show progressive degeneration of the "nerve." In some instances remnants can be found in the vicinity of the epiphysis only. In many the strand is intensely pigmented with black granules of various sizes and shapes. Much of the pigment is within large irregular cells which may be macrophages, or melanophores which have migrated from the meninges, or possibly modified sheath cells.

The finding of a parietal nerve from the third-eye of *S. occidentalis* alters the interpretation of the effects of parietalectomy upon the behavior of the lizard. We had postulated (*1*) that these effects might be attributed to the loss of a hormone produced by the "eye." Injury to and degeneration of the neural connection of the parietal eye to the habenular region of the brain must now be considered. The possibility that the eye has an endocrine function, however, is not negated. Further studies are being conducted to elucidate this point (*8*).

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Structural Similarities between Hemoglobins A and F

Abstract. A striking similarity has been found between the composition of peptides obtained from tryptic digestion of normal adult hemoglobin (hemoglobin A) and fetal hemoglobin (hemoglobin F).

Normal adult and fetal hemoglobins have been considered to have entirely different structures because of different physical properties (*1*), different immunological characteristics (*2*, *3*), and significant dissimilarities in amino acid composition (*4*). The synthesis of these two hemoglobins has been considered to be under the control of two separate genes (*5*). It was, therefore, surprising to discover a large degree of similarity between fingerprints of tryptic digestion mixtures of these two hemoglobins, a finding which has been confirmed by qualitative analyses of peptides eluted from the fingerprints.

Samples of hemoglobins A and F were prepared by techniques previously described (*3*). Briefly, purified hemoglobin A was isolated by a modification of Drabkin's technique of fractionation against $(NH_4)_2SO_4$ (*6*). Hemoglobin F was prepared from a specimen of cord blood after preliminary treatment with 0.0833N KOH (*3*). The purified hemoglobins were converted to the CO form and kept as the freeze-dried powder at 20°C until used. Hemoglobin A was

Table 1. Qualitative amino acid analyses of the tryptic peptides from hemoglobins A and F illustrated in Fig. 1. The plus symbol indicates a strongly positive amino acid; *tr* indicates a weakly positive analysis. The results which are marked with an asterisk are those wherein a difference between hemoglobins A and F was detected; no spots corresponding in position to 10A and 19A have been found in hemoglobin F. Abbreviations: *ala*, alanine; *arg*, arginine; *asp*, aspartic or asparagine; *glu*, glutamic or glutamine; *gly*, glycine; *his*, histidine; *ileu*, isoleucine; *leu*, leucine; *lys*, lysine; *met*, methionine; *phe*, phenylalanine; *pro*, proline; *ser*, serine; *thr*, threonine; *tyr*, tyrosine; and *val*, valine.

Peptide	Lys	Arg	His	Asp	Glu	Gly	Ala	Val and Met	Ileu and Leu	Ser	Thr	Tyr	Phe	Pro
1A	+		+			+	tr							
1F	+		+			+	tr							
2A	+		+			+	+							
2F	+		+			+	+							
3A	+													
3F	+													
4A	+							+						
4F	+							+						
5A		+							+					
5F		+							+					
6A	+				+									
6F	+				+									
7A		+			+						+			
7F		+			+						+			
8A	+			+				+			+			
8F	+			+				+			+			
9A	+			+	tr*		+*	+	+	+	+			+
9F	+		+*	+	+*	tr*		+	+	+	+		tr*	+
10A	+*		+*		+*			+*	+*		+*			+*
10F														
11A†		+	+									+		
11F†		+	+									+		
12A	+		+	+		+	+	+*	+					
12F	+		+	+		+	+		+					
13A	tr	+	+	+	+	+	+	+	+			+		
13F	tr	+	+	+	+	+	+	+	+			+		
14A	+		+	+	+	+	+	+	+	+	+*		+	+
14F	+		+	+	+	+	+	+	+	+			+	+
15A	+			+			+	+	+	+				+
15F	+			+			+	+	+	+				+
16A	+					+	+	+*	+	+	+			
16F	+					+	+		+	+	+			
17A		+		+	+	+	+	+	+					
17F		+		+	+	+	+	+	+		+*			
18A	+								+	+	+		+	+
18F	+			+*		+*	+*	+*	+	+	+		+	+
19A	+*			+*	+*	+*	+*	+*	+*	+*	+*		+*	+*
19F														

†These peptides are probably composed of two separate peptides, histidine and arginine-tyrosine.