only imperfect dilation; opacity of lens on both sides: lamellar cataract could not be determined because of the contraction of the pupils; fundus oculi was normal on both sides; acuteness of vision not greatly diminished so that any considerable disturbance owing to deep-lying disease in the opticus could not be assumed. Wassermann in blood and spinal fluid were negative. No certain case of bilateral loss of pupillary reflexes due to trauma is known. The case seems to be an inexplicable rarity unless a bilateral benumbing of the reflexes be assumed, due to a neuritis of the opticus of unknown etiology, and this, from the manner in which the pupillary disturbance developed, seems improbable.

Krueger, Hermann. UNILATERAL LOSS OF PUPILLARY REFLEXES. [*Neurol. Centralbl.*, April 16, 1918, No. 8, Vol. 37.]

In contrast with the bilateral loss of pupillary reflexes, frequently encountered and, almost without exception, the expression of syphilitic disease of the central nervous system, unilateral loss of pupillary reflex to light is relatively rare, and when met with, in tabes, paralysis or brain syphilis, is usually only a transient phenomenon. Still more rare are observations of permanent unilateral rigidity to light accompanied by no other symptoms than disturbance of the oculomotorius, or as the sole symptom of neuropathic disease, though Bumke states there is no longer any doubt that disturbances in the centrifugal branch of the pupillary reflex arc may, in exceptional cases, produce unilateral rigidity to light. All cases of this nature, however, which have hitherto been published have been of traumatic peripheral genesis connected with disease processes of other sorts in the innervation region of the oculomotorius, in many instances being the residue of a cured or greatly improved extensive paralysis of the third brain nerve. Thus, in an observation of Axenfeld's, there was after a head trauma, a contraction of the right pupil, and only very slight direct or consensual reaction to light with good convergence reaction; a paralysis of the rectus oculi superior pointed to a peripheral localization of the disturbance. Abelsdorff, as explanation, referred to the fact that where muscles have once been paralyzed those which act synergically are likely to react more readily to stimuli than others, and for this reason the muscles would more easily respond in convergence, being in physiological association with the muscles of the unaffected eye, while the reflex to light might fail to be elicited. The author gives three observations of unilateral loss of pupillary reflexes with essentially normal reaction in convergence. In one it was possible to assume the disturbance due to a disease localized in the region of the oculomotorius nucleus, or of the sensory trigeminus nucleus or its roots, but in the other two the localization of the disease process was obscure. In these there was rigidity of the pupil on the right side with some mydriasis and with only negligible reduction of reaction in convergence. In both cases and all nervous disturbances that

result therefrom could be excluded. From the fact that in the affected eye the direct and consensual light reflexes were absent and in the other eye were prompt and adequate, disease of the centripetal sensory branch of the reflex arc must be excluded, and it must be assumed that there is a lesion of the centrifugal motor branch, *i.e.*, of the oculomotorius, of the ciliary ganglion or of the ciliary nerve; or disease of the sphincter nucleus, or destruction of the conductivity of the terminals of the centripetal reflex fibers in the neighborhood of the sphincter nucleus. There was nothing in these two cases to indicate a disease of the oculomotor nerve or of its intraorbital terminations due to trauma of the orbit or of the separate motor fibers innervating the external eye muscles. There remains as a probable localization of the disturbance only the nucleus region of the sphincter pupillæ itself or of the region immediately surrounding it; for the author thinks he is justified in rejecting the unproved theory that pupillary rigidity may result from lesions of the cervical cord or of the medulla oblongata. Disturbances in the musculus sphincter pupillæ and in the ciliary nerve terminations innervating this muscle, must also be excluded because of the prompt effect produced by pilocarpine dropped into the eye. The author refers to theories which might be adduced to account for the unilateral loss of reflex to light with intact reflex in convergence. According to experiences in other diseases, especially in polioencephalitis hemorrhagica the conclusion has been reached (Wernicke) that the central gray matter is a substratum with slight resistance to disease and that the innervation centers of the sphincter pupillæ itself is especially lacking in resistance, may be assumed. According to this supposition the region on which the convergence depends might have greater resistance than the paths controlling the reflexes to light. Another theory is the Abelsdorff hypothesis of more ready response of the reflexes in synergic action. The author, however, thinks it more probable that the phenomenon is due to different localizations of the paths of the reflexes, the disease process being situated where the reflex arc of the light reaction is still separate from the paths controlling the convergence reflex, probably in the terminals of the centripetal reflex fibers around the sphincter nucleus—the localization Bumke assumes for isolated rigidity of pupils to light. The author's three cases show that unilateral rigidity to light may occur in individuals without luetic infections, localized in the centrifugal branch of the reflex arc, being independent of peripheral disturbances of the oculomotorius or its terminations, and, therefore, centrally conditioned. It is probably a disease process localized in the immediate vicinity of the sphincter nucleus, which prevents the conduction of the sensory stimulus to this nucleus. These cases furnish an interesting contribution to the localization theory of pupillary reflexes and especially to the study of the Argyll-Robertson phenomenon.