observed in an average of all 32 cells. The displacement was evident within a subgroup of the 12 best zoom cells. These cells were chosen based on the average near field enlargement of the two dimensions, with each cell having more than 70% of the enlargement predicted by the zoom model. The eccentric displacement of the near receptive fields of these cells was about $1^1/_2$ times the displacement of the far plane receptive field. The comparative scale factor averaged 0.36 $\pm$ 0.13 s.e.

The zoom effects we measured could not be attributed to optical accomodation. In the first place, accomodation could not account for a simultaneous magnification and minification of the two dimensions of a receptive field. Furthermore, using the Gullstrand schematic eye one can calculate that 3 diopters of accommodation result in only about 1% magnification[13]. All of our recording was done in response to binocular stimulation. It is reasonable to suggest that near field enlargement may result from fixation disparity and the shifting of two monocular receptive fields. This is ruled out as the sole explanation since the majority of receptive fields have changes in the vertical dimension.

It appears that in contradiction to indirect evidence, many cells in the primary visual cortex of the monkey exhibit zoom scaling that may subserve size constancy[14]. Our results support the zoom model predictions for near field enlargement of visual receptive fields. This receptive field zoom mechanism can provide a substrate for size constancy in the visual system[15].

Zusammenfassung. Rezeptive Felder von 32 Zellen im primärvisuellen äusseren Teil des Grosshirns unbetäubter, abgerichteter Affen wurden abgesteckt. Davon zeigten 97% der Zellen Vergrösserung der eckigen Abmessungen auf der nahen Fläche. Diese Grösse-Einstellung unterstützt unsere Vorstellung eines «Zoom-Modells» der Grössen-Konstanz.

J. D. SMITH and E. MARG

School of Optometry, University of California, Berkeley (California 94720, USA), 4 November 1974.

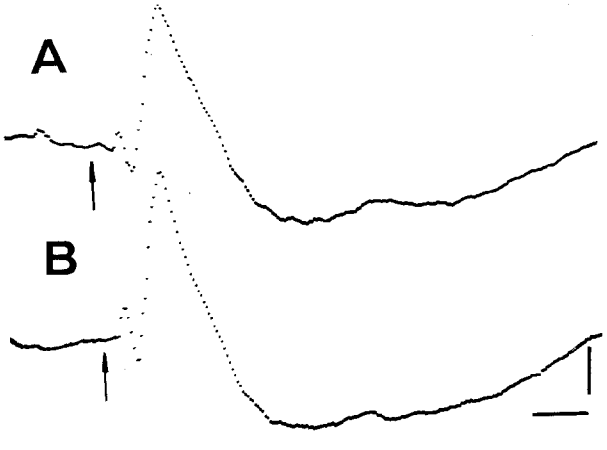
[13] H. H. EMSLEY, *Visual Optics*, 4th edn. (Hatton Press, London 1946), p. 526.

[14] C. BLAKEMORE, E. T. GARNER and J. A. SWEET, Perception *1*, 111 (1972).

[15] This work was supported in part by N. I. H. training grant 5T01 EY00076-02, N. S. F. grants GB 33338, BMS 7500452 and BMS 7201970 and the Committee on Research at the University of California, Berkeley, USA.

Influence of Superior Cervical Ganglion on Electroretinogram of the Rabbit

The present investigation was made to analyze the influence of the superior cervical ganglion on the ERG (electroretinogram) of the rabbit. Only a report deals with such a problem[1], while the effects of electrical stimulation of superior cervical sympathetic trunk or ganglion on the blood circulation in the eye[2,3], on the intraocular pressure, on the intrinsic eye musculature and the relation between autonomic nervous system and retina were investigated in previous works[4,5]. On the other hand, some authors analyzed the influences of variation of the blood circulation, pupillary diameter and intraocular pressure on the ERG[6–11].



Effect of the electrical stimulation of right superior cervical ganglion on the ipsilateral ERG. Each trace represents the average of 16 responses. A) normal ERG. B) ERG after sympathetic stimulation (10 V; 25/sec; 1 msec; train of 30 sec). Parameters: darkness adaptation, 30 min; light stimulation: 200 lux, 50 µsec, 1/sec. Time: 100 msec. Amplitude: 100 µV.

Thirty-five rabbits under Nembutal anaesthesia (33 mg/kg) were put in a stereotaxic apparatus in dorsal position, then were curarized and artificially ventilated. Subsequently the superior cervical ganglion was isolated. The ipsilateral eye was atropinized, the nictitating membrane was cut, an artificial pupil on the cornea limited the light input; however, 5 rabbits underwent iridectomy in order to eliminate any possible variation of the pupil diameter.

The ERG was elicited with a DC Galileo electronic flash. Each single flash lasted 50 µsec, the light intensity ranged from 20 to 800 lux and the flash frequency was 1/sec. The animals were maintained 30 min in darkness before beginning the photostimulation. The ERG was recorded by a Hewlett-Packard 5480 two channel input analyzer, which averaged usually 16 single responses. After numerous normal ERGs were recorded from the right eye, the ipsilateral superior cervical ganglion or the trunk (after proximal section) was electrically stimulated for 30 sec by means of silver bipolar electrodes with the following parameters: 25–100/sec, 8–15 V,

[1] G. G. MASCETTI, Brain Res. *41*, 221 (1972).

[2] M. BEST, S. MASKET and A. Z. RABINOWITZ, Invest. Ophthal. *11*, 211 (1972).

[3] S. DUKE-ELDER, *System of Ophthalmology* (Henry Kimpton, London 1968), vol. 4, p. 68.

[4] J. DUCRET and S. KOGO, Pflügers Arch. ges. Physiol. *227*, 71 (1931).

[5] E. HAFTER, Pflügers Arch. ges. Physiol. *229*, 447 (1932).

[6] J. FUJINO and D. I. HAMASAKI, Arch. Ophthal. *78*, 757 (1967).

[7] G. P. M. HORSTEN and J. E. WINCKELMAN, Acta physiol. pharmac. neerl. *6*, 586 (1957).

[8] G. E. JAYLE, R. L. BOYER and G. B. SARACCO, *L'électrorétinographie* (Masson et Cie., Paris, 1965), vol. 1, p. 77.

[9] K. SHIWA, Acta Soc. Ophthal. Jap. *65*, 1516 (1961).

[10] M. ZEWI and L. VAINIO-MATTILA, Acta ophthal., Copenh. *33*, 53 (1955).

[11] E. MANNI, Boll. Soc. ital. Biol. sper. *31*, 35 (1965).

pulse duration 1 msec. ERGs were recorded during or immediately after the end of electrical sympathetic stimulation with the same flash parameters of the control. In 20 rabbits the comparison between the normal ERG and that obtained during or immediately after electrical stimulation of the superior cervical ganglion or trunk showed an increase in the amplitude of 'a' and 'b' waves (see Figure). The enhancement was of about 15%. This effect was evident also after removal of the cornea and lens and in the iridectomized animals. However, the sympathetic effect on ERG failed to appear when the values of the blood pressure were lower than 70 mm Hg.

In 5 animals the superior cervical ganglion was acutely ablated and the ipsilateral ERG was then recorded: under such experimental conditions, a decrease of the 'a' wave of about 17% and of the 'b' waves of about 34% occurred in comparison with the contralateral ERG. In 3 rabbits, the right superior cervical ganglion was chronically removed under Nembutal anaesthesia and asepsis. 2, 4 and 6 days after the operation, the ipsilateral ERG exhibited a decrease similar to that described after acute ablation. Other rabbits underwent chronic ligature of the right common carotid arteries. Also under such experimental conditions the stimulation of the ganglion was effective. The sympathetic influence was also visible after injection into the femoral vein of the Regitin-Ciba (α-blocking drug, 2 mg/kg), while it disappeared after injection of β-blocking drug, since a striking decrease of blood pressure occurred [12].

The sympathetic activation of ERG 'a' and 'b' waves did not depend upon the concomitant sympathetic influence on the pupil, nictitating membrane and intraocular pressure [6–10]; in particular we observed a modest increase of about 5 mm Hg of endoocular pressure within 3 or 4 sec during sympathetic stimulation. Then a slow decrease occurred followed by a slow return to normal values.

Thus the conclusion can be reached that the superior cervical ganglion can influence the ERG probably through a modification in the activity of the retinal cells. The data obtained from ablation indicate a tonic sympathetic action. This is supported also by the fact that α-blocking drug which removes the vascular sympathetic activity did not suppress the sympathetic enhancement of the 'a' and 'b' waves.

However, a circulatory component must also be taken into account, since the sympathetic effects were not present when the systolic blood pressure was low.

Riassunto. La stimolazione elettrica del ganglio cervicale superiore determina un incremento delle onde «a» e «b» dell'ERG ipsilaterale nel coniglio. L'asportazione acuta o cronica del ganglio cervicale superiore riduce l'ampiezza delle stesse onde. Tali effetti si presentano anche dopo somministrazione di α-bloccanti. Essi non dipendono dalle variazioni indotte dalla stimolazione del simpatico sulla pressione endoculare, sul diametro pupillare e sulla membrana nictitante. Ciò avvalora l'ipotesi di una influenza diretta del simpatico sulla retina.

R. Marini and V. E. Pettorossi [13]

Istituto di Fisiologia Umana dell'Università Cattolica del Sacro Cuore, Via Pineta Sacchetti 644, I-00168 Roma (Italy), 23 September 1974.

[12] L. S. Goodman and A. Gilman, *The pharmacological Basis of Therapeutics* (Macmillan Company, New York, 1970), vol. 26, p. 1794.

[13] This investigation was supported by a grant of CNR.

Histological Changes in the Intestinal Tract of Pregnant Mice Infected with Coxsackievirus B3

Infection with Coxsackievirus B3 in pregnant mice leads to fetal wastage and growth retardation with a maternal pancreatic exocrine insufficiency [1]. The signs of pancreatic damage in these animals included increased fecal nitrogen excretion, a higher rate of food intake but with reduced maternal and fetal growth, and maternal liver changes [2]. These changes resemble those reported in rodents fed low protein-calorie diets [3, 4] and in mice having an autosomal recessive mutation (*epi/epi*) characterized by a degeneration of pancreatic exocrine tissue [5].

Further changes noted in man and animals subject to protein malnutrition due to dietary deprivation or inherent digestive disorders include a degeneration and atrophy of the intestinal mucosa with an ultimate loss of absorptive capacity [6–8].

The present studies were conducted with a view to examining the possibility that protein malnutrition in mice infected with Coxsackievirus B3 may be sufficient to elicit morphological changes in the intestinal tract leading to an impaired absorption of essential nutrients which are important for normal fetal growth, as well as for maintaining good maternal health.

The experimental procedure adopted in the work is identical with that detailed previously [1]. Virus suspension (0.3 ml) was inoculated i.m. The Coxsackieviruses B3 and B4 used here were obtained from the Public Health Laboratory Service (Colindale, London, N.W.9.) and the virus suspensions shown to have a tissue culture infective dose ($TCID_{50}$) of $10^{6,85}$. Control animals were inoculated with virus inactivated by heating on a water bath at 56 °C for 30 min.

Mice were inoculated with live or heat-inactivated virus suspension on the 8th day of pregnancy and killed by cervical dislocation on the 18th day. Representative segments of liver, pancreas, stomach, duodenum, ileum, caecum and colon were fixed in phosphate buffered formalin, for histological examination. Thin sections were stained with haematoxylin and eosin, PAS with alcian blue for mucin and by the PAS technique for basement membranes.

[1] A. B. G. Lansdown and C. R. Coid, Br. J. exp. Path. *55*, 101 (1974).

[2] A. B. G. Lansdown and S. J. Ellaby, Histochemistry *40*, 175 (1974).

[3] C. O. Enwonwu and L. M. Sreenby, Expl molec. Path. *12*, 332 (1970).

[4] C. O. Enwonwu and V. Glover, Am. J. clin. Nutr. *26*, 3 (1973).

[5] O. M. Pivetta and E. L. Green, J. Hered. *64*, 301 (1973).

[6] B. C. Morson and I. P. M. Dawson, in *Gastrointestinal Pathology* (Blackwell Science Publ., London 1972).

[7] M. Shiner, A. O. B. Redmond and J. D. L. Hansen, Expl molec. Path. *19*, 61 (1973).

[8] B. S. Worthington and E. S. Boatman, Am. J. digest. Dis. *19*, 43 (1974).