Table II. Response properties dependent on sub-unit organizations of the receptive field

Response property	No. cells tested	No. cells responding
Center-surround organization	95	5 (5%)
Directional selectivity[a]	92	18 (20%)
Meridional selectivity[a]	90	10 (11%)
Intermittent movement of:		
Dark edge	30	25 (84%)
Light edge	11	7 (64%)
Response to alternation of dark images displaced relative to each other in the receptive field	3	2 (67%)
Surround inhibition	12	7 (58%)
Difference in receptive field size for spatial vs temporal changes in the stimulus	9	8 (89%)
Difference in spectral sensitivity of center vs surround	1	1 (100%)

[a] To dark edge or light edge or both.

Evidence was found for sub-unit organizations of the receptive field for 51 cells of 99 cells tested. The tests and the proportion of cells found by each test to have these field organizations are given in Table II. The mechanisms of directional selectivity and of response to intermittent movements have been modeled in terms of such sub-unit organization[8,9]. Meridonal selectivity can similarly be modeled by sub-unit mechanisms[10].

In an initial sample of 6 retinal ganglion cells all showed a sharp decrease in spectral sensitivity at short wavelengths in correspondence to the high absorption at those wavelengths by the colored oil droplets of this retina[11].

The ganglion cell population of the turtle's retina shows a broad repertoire of discriminations. The ensembles of discriminations shown by each of the ganglion cells graded into each other rather than falling into distinct, mutually exclusive classes. This array of discriminations would seem to provide a retinal mechanism especially suited for visual detection of moving objects and shadows[12].

Zusammenfassung. Die Reaktionscharakteristiken von Ganglienzellen der Netzhaut eines Reptils (*Emys blandings*) wurden untersucht und dabei festgestellt, dass die Ganglienzellen mannigfaltige Detektionscharakteristiken aufweisen.

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Reactivity of Juxtaglomerular Granule Cells to Changes in Sodium and Potassium Intake in the Absence of the Adrenal Bodies

The juxtaglomerular region of the mammalian kidney[1], and probably the granule cells themselves[2], are the source of renin, and the renin-angiotensin system affects the secretion of aldosterone[3] in some species at least, with angiotensin as a direct stimulant of the adrenal cortex[4]. Angiotensin is not, of course, the only stimulus to aldosterone secretion, and even after nephrectomy the latter may be increased by major surgery[5] or haemorrhage[6], for example. The converse relationship, the possible stimulation of juxtaglomerular cells through the mediation of the adrenal cortex, has received less attention. Although aldosterone does not directly stimulate the secretion of renin in dogs[7], exogenous mineralocorticoid can increase juxtaglomerular activity in rats[8].

We have therefore investigated the reaction of juxtaglomerular granule cells in the absence of the adrenals. Our earlier studies[9] showed that the juxtaglomerular granule index[10,11] was not only lowered by increasing the intake of sodium, as expected[12], but was raised when potassium intake was increased, contrary to an earlier report[13]. In order to carry out a similar experiment in the absence of the adrenals, adult rats after adrenalectomy were given sodium or potassium chloride as 2% solutions for drinking, offered ad libitum but without choice of other fluid. A preliminary experiment showed that this potassium loading killed adrenalectomized rats within 24 h. However, such animals survived if they were first given sodium chloride, as will be described.

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The adrenal bodies were removed under ether anaesthesia from adult male Wistar rats (Porton strain) weighing 170–250 g, adjacent fat and fibrous tissue being also taken to ensure complete removal, and care being taken not to burst the organ and scatter endocrine cells in the operation site. No adrenal tissue was found at autopsy. (In more recent studies[14], there was no detectable corticosterone in the plasma of rats after similar adrenalectomy.) Control animals had sham operations. After operation the rats were maintained in individual cages, each with a water-bottle and a basket for pellets of standard rat diet, which was the same for experimental and control animals, and which had been the animals only food previously also.

During the first 4 days the 19 operated animals and the 21 controls were given 2% NaCl solution as their only drinking fluid. From the 5th to the 8th day, inclusive, each group was divided into 3 sub-groups, so that 6 experimental rats and 7 controls continued with the NaCl, 6 experimental and 7 control animals were given water

[14] M. KRAUS, unpublished observations.

Reactivity of JG cells after adrenalectomy

Days of the experiment	Drinking fluid	No. of rats	Mean daily fluid intake ± S.E. (cm³/ 100 g body wt.)	Juxtaglomerular granule index			
				HARTROFT[10]		DUNIHUE[11]	
				Individual values[a]	Mean ± S.E.	Individual values[a]	Mean ± S.E.
After sham operation							
2–4	2% NaCl	21	40.5 ± 3.1[q]	–	–	–	–
5–8	2% NaCl	7	56.0 ± 5.3[rst]	58[b]	36.6 ± 5.5	16[b]	12.9 ± 1.6
				42[b]		14[b]	
				33[b]		12[b]	
				36		12	
				20		8	
				49		20	
				18		8	
	Aqua dest.	7	18.7 ± 1.6[s]	10	25.7 ± 5.9	5	9.3 ± 1.6
				50		14	
				43		15	
				12		5	
				28		11	
				14		6	
				23		9	
	2% KCl	7	23.2 ± 1.9[t]	41[b]	34.4 ± 7.7	11[b]	10.7 ± 2.4
				75[b]		23[b]	
				31		13	
				34		8	
				13		4	
				17		5	
				30		11	
After adrenalectomy							
2–4	2% NaCl	19	16.6 ± 2.7[q]	–	–	–	–
5–8	2% NaCl	6	22.0 ± 1.4[ruv]	91[b]	64.2 ± 9.2[wx]	32[b]	23.5 ± 3.4[yz]
				72[b]		30[b]	
				38[b]		15[b]	
				59		15	
				85		31	
				40		18	
	Aqua dest.	6	12.3 ± 1.3[u]	12	19.7 ± 2.0[w]	7	12.3 ± 1.2[z]
				18		14	
				24		14	
				26		15	
				20		13	
				18		11	
	2% KCl	7	2.5 ± 0.4[v]	14[b]	15.3 ± 3.8[x]	10[b]	9.4 ± 1.5[y]
				36[b]		16[b]	
				5[c]		3[c]	
				9[c]		7[c]	
				12		9	
				18		10	
				13		11	

[a] Individual values to nearest whole number. [b] Killed on 6th day; [c] killed on 7th day; all others killed on 8th day. [qq–yy] Pairs of means with same letter have $p < 0.01$ by t-test. [zz] Pair with $p < 0.05$ by t-test.

instead, and 7 of each then had 2% KCl solution as the sole drinking fluid. Animals were killed on the 6th, 7th or 8th day, as shown in the Table, from which it will be seen that the time of killing is irrelevant to the general conclusions, and further discussion will be based on the pooled results of each of the 3 experimental and 3 control subgroups. Body weight and fluid intake were measured daily. After killing, kidneys were fixed immediately in 10% formol saline (4% formaldehyde and 0.9% NaCl in water) or Helly's solution, and stained with phosphotungstic acid haematoxylin[9] or by Bowie's method[10]. The juxtaglomerular granule (JG) indices were calculated as in our previous study. The method of fixing and staining was found not to affect the indices.

From the Table certain general conclusions may be drawn. (a) Rats without adrenals drank significantly less hypertonic NaCl solution in both periods of the experiment than did the control animals. This differs from the findings of RICHTER[15] who, however, offered a free choice of tap water and 3% NaCl solution. (b) Both the control and experimental animals, whether receiving water or 2% KCl solution, drank significantly less during days 5–8 than did those continuing to received NaCl. (c) Among the adrenalectomized rats, but not the controls, those receiving water or KCl solution during days 5–8 had JG indices significantly lower than had rats continuing to drink the NaCl solution. (None of the control groups is precisely comparable with the adult rats in our earlier experiments[9]. This is not only because of differences in the programme of cation loading and time of killing, but also because the earlier studies did not involve trauma.)

In the interpretation of changes in the JG index, it is to be borne in mind that an increase in the amount of secretory material in a cell may be caused by a recent decrease in the rate of discharge, or by a long-term increase in activity. The converse alternatives are presented by a fall in the content of secretory material. In our previous experiments[9] and in most published studies on JG cells, one is probably dealing with chronic changes in granularity, having the same sense as the changes in activity causing them. In the present studies, however, in which only 4 days elapsed after a change in cation intake, it is not clear whether increased granularity means increased activity, or is the first effect of a decreased rate of discharge.

However, whatever the interpretation of the differences in JGI, when adrenalectomized rats given NaCl in their drinking water are compared with those given KCl or neither, the results permit the clear conclusion that differences in cation intake can lead to differences in the juxtaglomerular granule cell index without the mediation of the adrenal cortex[16].

Résumé. Chez les rats adrénalectomisés, une différence très nette de l'indice de la granularité juxtaglomérulaire est apparue entre les animaux qui avaient bu du 2% NaCl et ceux qui avaient reçu ou de l'eau distillée ou du 2% KCl. Il y a donc une réactivité juxtaglomérulaire, indépendente du cortex surrénal.

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Masticatory Proprioception in Reptilians (*Caiman sclerops*)

The cells of the mesencephalic trigeminal nucleus represent the first-order neurons of the afferents from spindles of masticatory muscles in mammals and birds[1–6]. The mesencephalic nucleus of the fifth cranial nerve of mammals consists of a column of unipolar cells which extends from the trigeminal motor nucleus up to the posterior commissure[7]. In birds the mesencephalic trigeminal nucleus is characterized by cells localized in the thickness of the tectum and in the posterior commissure[7,8]. Quite different is the organization of the mesencephalic nucleus of the trigeminus in reptilians; in fact, there are 2 cellular pools, the former in the thickness of the tectum and the latter located in a paracommissural position[7,9,10]. While the function of the trigeminal mesencephalic nucleus in mammals and birds is well known, no physiological investigations have been performed in reptilians on the possible role of this nucleus in the masticatory proprioception.

Our experiments were carried out in 35 curarized *Caiman sclerops*. The unitary discharge of the mesencephalic nucleus was recorded by means of tungsten microelectrodes using local anaesthesia and artificial respiration. The effects of lowering the jaw or of stretching the isolated masseter muscle were thus investigated in 28 units obtained from 22 localizations of the recording microelectrode tip in the mesencephalic trigeminal nucleus. 19 locations were in the thickness of the tectum and 3 in a paracommissural pool. All the explored units, silent in resting conditions, were selectively activated with a very short latency (2–5 msec) either by lowering the jaw (Figure A) or by a moderate stretching of the ipsilateral masseter muscle (Figure B).

The discharge frequency of the units in the stretching of the masseter was at the beginning of 120/sec; then it

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