ture change and the change in firing rate (see latency of the response in figure 1B) this could be compensated for by a shift of one of the time courses. As shown in figure 1C this procedure reveals a phasic response (which is not always as clear as in figure 1A) by a strong hysteresis (see also figure 2).

A further method consisted in the calculation of the rate of temperature change (°C/sec) from successively sampled temperature values and to relate it with the impulse frequency. In figure 1D the time courses of both the rate of temperature change and impulse frequency during the cooling phase of the stimulus are plotted in the same graph. There is a striking similarity between both time courses although the time course of the impulse frequency obviously is lengthened (a multiplication of the time course of the rate of temperature change by a factor of about 3 would yield a curve which would be nearly identical with the impulse frequency curve). This analysis reveals that there is a relationship between firing rate and rate of temperature change but that this relationship is not a linear one.

Figure 2 shows four examples of different dynamic responses of spinal temperature-sensitive neurones. The examples of figures 2A and B represent one type which did not show phasic responses. The impulse frequency changed linearly with temperature both in the cold-sensitive neurone (negative correlation in figure 2A) and in the warm-sensitive neurone (positive correlation in figure 2B). The slopes during cooling and rewarming are different which results in a divergency of both curves. In the long run the impulse frequency returned to its initial level (not included in the evaluation period). As for the different slopes, there is obviously not a dependence on the direction of temperature change but a dependence in that a stimulus which results in an increase of impulse frequency is related to a steeper slope.

The examples of figures 2C and D show one warm-sensitive and one cold-sensitive spinal neurone with phasic responses as shown in figure 1. Again a strong hysteresis can be seen with nonlinear changes in impulse frequency which is in contrast to the response of the neurones in figures 2A and B. Although there is obviously no linear dependence of the firing rate on the rate of temperature change (see figure 1D), in figure 3 correlations of both parameters (imp./sec ~ °C/sec) were done with the neurones shown in figures 2C and D. Despite considerable variations the regression lines calculated both for the rate of cooling (− °C/sec) and the rate of warming (+ °C/sec) reveal a similar behaviour as with the nonphasic neurones in figures 2A and B, namely a steeper slope of the curve during that temperature change that results in an increase in firing rate.

Conclusions. The methods described above make it possible to discriminate clearly between different types of response to dynamic thermal stimulation of temperature-sensitive receptors or neurones. Appropriate correlation techniques revealed functional properties like the relationship between the rate of temperature change and the firing rate during one stimulation period and like the different slopes of the response to cooling or warming, respectively, which otherwise cannot be seen. In this way a more detailed characterization of different types of temperature-sensitive receptors or neurones can be given, which is helpful for a better understanding of the mechanisms underlying the temperature sensitivity of excitable membranes.

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Automatic recognition of squirrel monkey vocalisations by means of a filterbank

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Summary. Up to now the problem of classifying squirrel monkey vocalizations has not been solved satisfactorily. The problem is now approached by a method, which consists of 2 phases. At first the monkey vocalizations are compared with the aid of physical criteria and classified by types. According to the classification of types, the membership of the individual vocalizations is tested.

The social behavior of squirrel monkeys *(Saimiri sciureus)* can be described - among other things - by their visually recognizable behavior, and their vocalizations[1]. We here present a method to recognize squirrel monkey vocalizations. In the 1st phase of the process of recognition, several types of vocalization are defined, while in the 2nd phase individual vocalizations are classified according to these types.

A vocalization is physically depicted through a frequency-time-diagram and thereby characterized. Up to now the vocalization types have been differentiated on the basis of similarities in their physical components (e.g. basic frequency)[2]. In the program presented, the following criteria of similarities will be quantified in such a way that the vocalizations can be objectively defined and automatically recognized.

By a telemetrical system, it was possible to transfer acoustic signals from the transmitter located on the head of the monkey to the tape recorder[3]. From there, the vocalizations were conveyed by means of a filterbank into a digital frequency-time-matrix[4]. This information is then sent through a databreak directly into the memory of a PDP12 computer, where it is held available for further analysis[5].

The frequency-time-matrix embodies the necessary information to classify the vocalizations[6]. It turned out that the following parameters play an essential role in differentiat-

ing the vocal types: 1. Duration and frequency band of the filter, which is mostly addressed (called maximum filter); 2. average information per frequency band; 3. average information per time unit; 4. information of the maximum filter in relation to the average information per frequency band; 5. variation of the frequency units; 6. maximum and minimum values of the sums, if summation is extended over the time and frequency range respectively.

The calculated values for these parameters vary for the individual vocal types. By fixing an interval for each parameter, a vocalization type is defined. An individual vocalization (call) is then assigned to a special vocalization type, assuming that all of its parameter values fall into the corresponding intervals.

In order to specify the bounderies of the intervals, a random set of calls was chosen, designated by an observer as being the same type (say type A). This set was then computerized. The maximum and minimum value gained for each parameter over the whole set of calls was registered. The intervals obtained in this way define the vocal type A (44 cackle-, 94 peep- and 96 trill calls were chosen).

In the 2nd phase (a process of recognition), a large number of vocalizations was tested to establish the category to which they belong. Thereby the following results were obtained: 1. From 885 calls, which a laboratory observer[7] had classified as trill calls, 775 (87.5%) were determined actually to be of this type; 43 calls were not classified and 67 fell into other categories; 2. along the same line from 1020 peep calls, 856 (83.9%) were classified as peep; 108 calls were not classified and 56 fell into other categories; 3. from 740 cackles, 598 (80.8%) were recognized as belonging to this category; 136 calls were not determined and only 6 calls were assigned to other types.

Let us close with the following remark: Several observers can assign one and the same vocalization to different categories. Hence there is no 'correct' or 'true' classification of vocal types. The method presented here is nevertheless objective in the sense that each repetition leads to the same results, if the criteria for the classification have been determined.

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Impaired amylase release from the parotid gland of rats treated with reserpine[1]

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Summary. Using an automated system for the analysis of amylase, the release of this enzyme was compared in superfused parotid gland segments from control and reserpine treated rats. Stimulant-evoked amylase release was delayed and of smaller magnitude in the glands of the treated animals and a reduction of the transmembrane K^+ gradient caused a smaller and short lasting reduction in Ach-evoked release of amylase in the glands from these animals.

The chronic administration of reserpine to rats induces morphological and secretory changes in the salivary glands which resemble those seen in cystic fibrosis, a human hereditary disease which affects the exocrine glands and their secretions[3,4]. In addition to reduced salivary volumes and changes in the composition of saliva secreted in vivo, the in vitro release of K^+ has been found to be significantly increased in submandibular and parotid gland slices from rats treated in a chronic fashion with reserpine[5,6]. Parotid slices of reserpine treated rats also show a significantly decreased release of amylase upon stimulation with epinephrine or with isoprenaline[6]. An automated system for the continuous analysis of amylase release from pancreatic and parotid tissues superfused in vitro has been developed, which provides useful information about the kinetics of enzyme release[7,8]. This method was used in this investigation to compare the release of amylase from superfused parotid slices of normal and reserpine treated rats. The release of amylase induced by cholinergic and adrenergic secretagogues and the effects of ionic substitutions in the perfusion solution on the acetylcholine-induced enzyme release were assessed in the 2 types of parotid gland preparation.

Methods. Female Sprague-Dawley rats weighing between 200 and 290 g were used. The animals had free access to a standard pelleted diet and to water and were divided into 2 groups housed in the same animal quarters: an untreated control and a group of animals that received 7 daily doses of reserpine (0.5 mg/kg b.wt) prior to the day of the experiment, as previously described[3,4]. The animals were

Response to secretagogues*

Secretagogue	Control Amylase release (mU/mg min)	Time to reach maximum (min)	Reserpine Amylase release (mU/mg min)	Time to reach maximum (min)
None (washout)	148.8 ± 13.6	–	215.5 ± 14.6	–
Acetylcholine (10^{-5} M)	85.0 ± 4.7	2.4 ± 0.35	45.5 ± 3.9	5.8 ± 0.61
Phenylephrine (10^{-5} M)	18.0 ± 4.5	5.3 ± 2.20	5.2 ± 1.52	7.2 ± 1.9
Adrenaline (10^{-6} M)	108.0 ± 12.1	12.0 ± 0.90	79.6 ± 7.2	15.8 ± 2.5
Isoprenaline (10^{-6} M)	113.4 ± 11.2	21.0 ± 2.18	88.13 ± 12.25	27.46 ± 1.31

*Mean values ± SEM (n = 8).