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# Aviation Medicine Translations: ANNOTATED BIBLIOGRAPHY OF RECENTLY TRANSLATED MATERIAL. III.

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# AVIATION MEDICINE TRANSLATIONS: ANNOTATED BIBLIOGRAPHY OF RECENTLY TRANSLATED MATERIAL. III.

**Abderhalden, Emil, and Grigorescu, L.** ***Weitere Untersuchungen über das Verhalten des Blutserums gegenüber Rohrzucker vor und nach erfolgter parenteraler Zufuhr dieses Disaccharids.*** (Further investigations on the behavior of blood serum towards sucrose before and after parenteral administration of this disaccharide [dogs were used as experimental animals].) *Zeitschrift für physiologische Chemie, 1914,* **90**, *419-436.*

Results of an experiment designed to investigate the ability of blood serum to decompose sucrose into its component parts are presented. The disaccharide was administered parenterally to a small group of adult dogs. Data obtained in the study are not uniform, as the presence of invertase was not always indicated after sucrose administration. Presence of invertase also varied from animal to animal with the amount of sucrose administered and with the length of the administration period.

The results of the present investigation are discussed in the light of previous studies, and an explanation of observed variability of behavior toward parenterally administered sucrose is offered in terms of individual differences in diet.

Observed physiological measures are given for individual animals in a series of experiments.

**Abderhalden, Emil, and Wildermuth, F.** ***Weitere Untersuchungen über das Verhalten des Blutserums gegenüber Rohrzucker vor und nach erfolgter parenteraler Zufuhr dieses Disaccharids.*** Versuche an Kaninchen. (Further studies on the behavior of blood serum toward sucrose before and after parenteral supply of this disaccharide. Experiments with rabbits.) *Zeitschrift für physiologische Chemie, 1914,* **90**, *388-418.*

An investigation was carried out to determine the behavior of the blood serum of rabbits toward sucrose.

The serum of normally-fed rabbits was not found to decompose sucrose, whereas hydrolysis of the disaccharide took place regularly when it was administered parenterally.

Also examined were the ability of rabbit serum to decompose lactose, dextrose, and other sugars, and the possibility of reactivation of inactivated sucrose. Data obtained in the present study are discussed in view of results reported by other experimenters.

Obtained values are reported individually for all experimental animals.

**Aschoff, Jürgen.** ***Tierische Periodik unter dem Einfluss von Zeitgebern.*** (Animal periodicity under the influence of time-setters.) *Zeitschrift für Tierpsychologie, 1958,* **15**, *1-30.*

Selection pressure favors organisms capable of adapting their functions to the periodicity of their surroundings and of taking advantage of the latter. Primarily this process of adaptation is elicited by favorable or unfavorable circumstantial factors. Adaption becomes fully effective when the animal has "learned" to prepare for less favorable periods. Baker was the first to make a distinction between those circumstantial factors ("ultimate causes") which originally release the process of adaptation and those factors ("proximate causes") which keep the adapted organism in conformity with the periodicity of its surroundings. These "proximate causes" necessarily must affect the course of events before the "ultimate causes" do if adaptation is to take effect advantageously – a fact which has already been brought to attention in respect to the yearly periodicity. The same applies to processes of higher frequency (for instance daily periodicity) in which the event to be controlled is not preceded by an unusually long chain of causes, as it is in the case of yearly periodicity. The process of adaptation "sets" the organism so that it responds to a "signal" which procures for it a periodical environment before the occurrence of those biologically relevant events with which it has to cope. Thus the causes ("ultimate causes") are replaced by time-setters.

For this reason A. L. Thomson 1950 avoided the term "causes" and defined as follows: "Ultimate factors . . . which give a survival value to the adaptation of the bird's cycle to that of the environment . . . proximate (or "immediate") factors which provide that actual timing that brings the adaptation into play."

These considerations apply quite generally to every process of adaptation to periodical surroundings (see Cullen 1954). It is only in rare cases that the external factor which originally caused adaptation, for instance the relation between hunter and prey, will take over the function of a time-setter, too. In some cases a succession of several time-setters may guarantee the controlled series of events. This particularly applies to the yearly periodicity. It is quite possible that in the animal's environment one time-setter more or less merges into the next in much the same manner in which, within the organism, in the anoestrous cycle of organs, one state of endocrine functions merges into the next and as one behavior pattern is replaced by the following one. In animals breeding in spring the growth of gonads is controlled by the increasing duration of the daily period of light, the anoestrous period by the shortened day-length of winter. It is hard to decide at what times the endogenous factor and at what times the time-setter is more effective in this interaction.

The better the endogenous factor is developed the greater is its influence, under normal conditions, on the cause of events and the more, correspondingly, the time-setter tends to function as a mere synchronizer (Halberg 1953), determining the phases without using up much energy. Under these conditions the time-setter may be likened to what is called a *Steuerfrequenz* (pilot frequency; the term is given in German in the English summary) in technical terms. If the time-setter is altered – in the sense of a shifting of phases, or a change of form or of frequency – an interaction develops between that pair of forces, the endogenous periodicity and the timegiver; in this case the behavior of the animal is, within the limits of its plasticity, the resultant of these two forces.

Time-setters, in the sense of the definition used in this paper, are always situated outside the organism. In experiments their effects resemble in many ways the phenomenon which von Holst 1939 termed relative coordination of central nervous functions. Data, however, do not suffice to achieve complete comparison. (English summary.)

**Aschoff, Jürgen.** ***Exogene und endogene Komponente der 24-Stunden-Periodik bei Tier und Mensch.*** (Exogenic and endogenic components of the 24-hour periodic cycle in animals and human beings.) *Die Naturwissenchaften, 1955,* **42,** *569-575.*

The 24-hour cycle in animals and man is based on an inborn endogenic component which in the exclusion of all external control factors is demonstrable as "individual frequency" of a different cyclical duration. The frequency depends on the kind of animal (diurnal, nocturnal) and the chosen constant environmental condi-

tions (constant light, constant darkness). The inborn endogenic component prescribes a certain form of periodicity (bigeminal pulse), which cannot be changed from without at will and which also limits the possibility of a passive frequency modulation.

The phase relation of the *animal* 24-hour cycle is determined exclusively by known environmental stimuli — the physical-chemical and sociological time indicators. Through appropriate manipulation of these time indicators any desired phase delay can be produced. With a sudden delay of the time indicator by 180° (inversion experiment) the animal phase follows slowly; complete synchronization is reached on the average after eight days. If the known time indicators are excluded, the frequency of the animal periodicity changes. The assumption of an unknown earthly or "cosmic" factor which links the phase to the local time is unfounded.

Man does not react basically differently from animals to physical - chemical environmental forces. If in spite of this the inversion of his cycle in the experiment is not at all or only incompletely achieved, it has the following causes: 1. The reversal of the time indicator is more or less incomplete. 2. The importance of the sociological-psychological time indicators is not recognized; they can only with considerable effort be excluded or reversed. 3. The knowledge of the true time of day suffices to make inversion difficult even with quite complete fulfillment of condition 1. Points 2 and 3, which are based on processes of consciousness, are the cause of the fact that man in contrast to all animals appears in particular measure to be bound to local time. The assumption of an unknown control factor is not necessary for the explanation of this peculiarity. If in the future still more entities should be discovered in addition to the more than 40 known diurnal periodic meterological factors, they would merely as additional time indicators join the others, of which the light-darkness alternation has by far the greatest importance. (Translated summary.)

**Aschoff, Jürgen.** ***Aktivitätsperiodik bei Gimpeln unter natürlichen und künstlichen Beleuchtungsverhältnissen.*** (Periodic cycle of activity in bullfinches under natural and artificial conditions of illumination.) *Zeitschrift für vergleichende Physiologie, 1953,* **35,** *159-166.*

1. The 24-hour periodicity of activity of diurnally active birds (bullfinch) with a main maximum in the morning and a smaller maximum in the evening can be observed also during artificial change of illumination with abrupt turning on and off of light. When the light phase of the artificial day is kept short in proportion to the natural conditions, the evening restlessness is suppressed.

2. The periodicity of activity remains unchanged under completely constant environmental conditions — as long as they are bearable for the birds. The changes of frequency which are observed are opposite those found in nocturnally active animals. Continuous illumination causes from the first day on a shortening of the duration of periodicity (e.g., 22 instead of 24 hours); during continuous darkness the time at which restlessness sets in is later every day by an approximately equal amount. (Translated summary.)

**Aschoff, Jürgen.** ***Zeitgeber der tierischen Tagesperiodik.*** (Time signals in the daily periodic cycle of animals.) *Die Naturwissenschaften, 1954,* **41,** *49-56.*

The frequency consistency of all daily periodic biological processes and the absence of a statistical distribution of the phases throughout the day presumes synchronization. The synchronizing factors are called time signals. Time signals for animal 24-hour periodicity are all those periodic environmental processes of a continuous or discontinuous nature, coupled to earth's rotation, which have a stimulating effect on animals.

Time signal properties are not confined to meteorological elements, but may also be part of the animated environment of the animal (ecological, sociological periodic events.) Under natural conditions several time signals are active simultaneously of which mostly one determines the predominating phase of the animal periodicity; however, a conflict among different time signals may occur.

The coordination of a periodicity with the time signal is not always equally consistent. Changes in stimulus sensitivity of the animal leave room for substantial changes in the mating effect. Variations in the animal daily periodicity with regard to periodic form and phase situation can in part be explained in this manner.

For all daily periodic biological processes with endogenic components, the time signal is only conditionally of a determinant nature. Phase shifts of the time signals follow biological periodicity without any difficulty; frequency modulation is subject to relatively narrow limits.

Knowledge of time signals and their effect is the necessary prerequisite for good results in the investigation of 24-hour periodicity. (Translated summary.)

**Aschoff, J., and Wever, R.** ***Resynchronisation der Tagesperiodik von Vögeln nach Phasensprung des Zeitgebers.*** (Resynchronization of the daily cycle in birds after a phase shift in the time signal.) *Zeitschrift für vergleichende Physiologie, 1963,* **46,** *321-335.*

The periodic jump activity of finches (Fringilla coelebs L.) is easily synchronized with an artificial illumination - darkness change of a 12-hour illumination period (250 lux) and a 12-hour dark period (0.5 lux), which acts as time signal. The activity of the birds begins at the time "light on" or for varying time periods prior to this time (= more or less strongly negative phase angle difference). After a phase shift of the time signal by a single shortening or lengthening of the illumination period or the dark period, several periods are usually required until the bird has restored its original phase position relative to the time signal. During this resynchronization, the overall activity in each period is decreased.

Phase shifts of 6 hours in the time signal are compensated by the bird at varying rates depending on the direction of the shifts: for a single lengthening of an illumination period, or a dark period, by 6 hours, resynchronization takes 4-5 days; for a corresponding shortening of the time signal period, resynchronization takes only half as long.

The rate at which the bird displaces its phase after a phase shift in the time signal depends also on the original phase angle difference: a bird with a strongly negative phase angle difference adjusts more slowly to a phase shift by +6 hours than a bird with a phase angle difference of zero. These results are also expected theoretically because the phase angle difference is a measure of the characteristic frequency of the system; a more negative phase angle difference corresponds to a higher characteristic frequency.

After a 12-hour phase shift, by doubling of an illumination period or of a dark period, the finches behave similarly as in the case of a +6-hour phase shift. They displace the phase in both cases by several extensions of the period. Individual cases for which after a doubled illumination period two very short periods seem to arise at first, may be explained, under consideration of masking effects of the illumination on the activity, in the same way as the uniform results of the experiments involving a doubling of the dark period.

In agreement with data of other authors, the mean rate of the phase displacement after a retarding phase shift amounts to 1.0-2.0 hour/day. The phase is displaced at twice this rate after a phase shift involving shortening of the time signal period. (Translated summary.)

**Benedict, F. G., and Snell, J. F.** ***Körpertemperatur-Schwankungen mit besonderer Rücksicht auf den Einfluss, welchen die Umkehrung der täglichen Lebensgewohnheit beim Menschen ausübt.*** (Fluctuations in body temperature with particular regard to the effect which inversion in daily routine has for human beings.) *Pflügers Archiv für die gesamte Physiologie, 1902,* **90,** *33-72.*

I. The normal curves of the different individuals tested show the ordinary rhythm of the temperature curves.

II. The curve for the axillary temperature on the whole is parallel to that of rectal temperature; however, deviations of between −0.06 and +0.38° C were found between the rectal and the axillary temperature.

III. Muscular activity increases body temperature rapidly. The temperature rise continues as long as work continues. Work of the same intensity causes the same rise in temperature. The end of work is soon followed by a marked, long-lasting drop in temperature.

During the nights following hard muscular work the temperature was lower than during nights after a day of rest.

IV. The main effect of fasting consists in decreasing the extent of the fluctuations of the curve. Fasting after hard work caused a lowering of the daily fluctuation to about 0.6° C, with long periods of almost constant temperature. The average temperature of a day of fasting after a rest period was not noticeably different from the normal daily temperature. On days of fasting after hard work the average level of the temperature was lower by almost 1° C.

V. After ten successive days during which work was performed at night and sleep and rest were taken in the daytime no tendency for an inversion of the temperature curve could be observed.

*Note of Translator*: The basis for the temperature degrees referred to in this paper was always melting sodium sulfate (see *Pflüger's Archiv*, vol. 88, p. 497); however, the temperature of 32.484° C stated therein refers to a mercury thermometer and not the international hydrogen thermometer; when using the latter we ought to substitute for the above figure that of 32.379° C. When this is done here, all figures in the present paper are 0.1° C too high. Since all thermometers used today are based on hydrogen it follows that in clinical use etc. all data presented here must be reduced by 0.1° C. (Translated summary.)

**ter Braak, J. W. G.** ***Untersuchungen ueber Optokinetischen Nystagmus.*** (Research on optokinetic nystagmus.) *Archives Néerlandaises de Physiologie de l'Homme et des Animaux, 1936*, **21**, *309-375.*

Two types of optokinetic nystagmus are to be distinguished from each other: "stare" nystagmus and "look" nystagmus.

A. "Stare" nystagmus is characterized by the fact that its occurrence is entirely determined by the physical-optical conditions in the field of vision.

The excitatory stimulus is the displacement of retinal images. Stare-nystagmus is exclusively conditioned by this displacement; other factors (e.g. attention) are not necessary for its excitation.

Stare-nystagmus has been observed by us in man and also in monkeys, dogs, cats, and rabbits. The mechanism of stare-nystagmus is simplest to study in the rabbit. Observations on that animal have shown the following:

I. Stare-nystagmus is excited only when all or at least the majority of the contrasts situated in the field of vision move in the same direction.

II. Stationary objects (contrasts) in the field of vision prevent its excitation, for the reason that their images move in the opposite direction as soon as the eyes follow the moving objects and thus constitute an opposite stimulus.

III. If there are no stationary contrasts (e.g. in the dark) the motion of a single point of light in the field of vision suffices for excitation of nystagmus (both the slow and the fast phase).

IV. It is immaterial what part of the retina is stimulated by the various retinal images.

V. A shift of the retinal images that conditions an *increase* in excitation in the receptors of the retina (e.g. when a white stripe on a black ground *broadens* on one side) constitutes a *strong* stimulus, a shift which occasions *decrease* in excitation (e.g. when a white stripe on a black ground *narrows* on one side) a weak stimulus.

VI. Shift of the retinal images toward the temple (i.e. in the rabbit to the rear) constitutes a strong stimulus, shift toward the nose a weak stimulus.

VII. If one eye is fixed immovably with clamps and a shift of contrasts takes place in the field of vision of this eye, nystagmus of the other eye is induced, provided no stationary contrasts are present in the field of vision of that eye, e.g. when it is blindfolded.

VIII. Stationary contrasts in the field of vision of the immobilized eye in that case exert

no inhibiting influence, since their images can no longer move over the retina.

IX. The maximum angular velocity of contrasts at which "stare" nystagmus can be excited is for the rabbit about 70°/sec.

X. No minimum angular velocity for excitation of "stare" nystagmus could be established. At an angular velocity of 6″/sec. (i.e. one revolution of the striped cylinder in 60 hours) a definite nystagmus was observed; at that velocity the movement of the contrasts is no longer detected by the human eye.

XI. Experiments on the immobilized eye showed that movement of the contrasts at 10 to 50′/sec constitute the strongest optokinetic stimulus.

XII. The slow and the fast phase of nystagmus are excited by the same optical stimulus. Whether the nystagmus begins with a slow or with a fast phase is primarily dependent on the original position of the eye. Whether this phenomenon is conditioned by proprioceptive impulses of the muscles of the eye or by a purely central automatic mechanism could not be established. When the eye is deflected a rapid phase can also be induced by acoustic and tactile stimuli.

XIII. The angular velocity of the slow phase can be used as a quantitative measure of "stare" nystagmus.

XIV. Study of the quantitative relationships between the optokinetic stimulus and the nystagmus excited by it has shown that the central apparatus exhibits an "inertia" and that "equilibrium" between stimulus and nystagmus sets in only after some time.

While at first the velocity of the slow phase gradually increases, it finally attains a constant value. This constant angular velocity can be used as a quantitative measure of the strength of the optokinetic stimulus.

XV. With stimulation of the immobilized eye, at "optimal" velocity of contrasts (10-50′/sec.) the velocity of the slow phase is maximal and several times as great as the velocity of the contrasts.

XVI. In stimulation of the freely movable eye the velocity of the slow phase is generally a little less than that of the contrasts. The shift of the retinal images is thus compensated for as far as possible and the reflection of the outside world fixed on the retina as far as possible. This "fixation" of the outside world is achieved by a "self-regulating mechanism." The slow phase cannot be faster in the freely movable eye, because the stimulus immediately ceases when the velocity of the ocular movement and that of the contrasts has become the same.

XVII. At the beginning of a constant optokinetic stimulus the velocity of the slow phase increases approximately *uniformly*. Therefore the *acceleration* of the slow phase at the beginning of the stimulation can also be used as a quantitative measure of the optokinetic stimulus.

XVIII. After cessation of the optokinetic stimulation nystagmus persists for some time (optokinetic *post-nystagmus*). During this post-nystagmus the velocity of the slow phase gradually declines (to zero).

The retardation of the slow phase immediately after cessation of the stimulus can be used as a quantitative measure of the central *resistance*.

XIX. There are close connections between "stare" nystagmus and labyrinthine rotational nystagmus. The conditions for excitation of "stare" nystagmus, under physiological conditions, are usually not created by a movement of the environment, but by a movement of the animal, so that there is also stimulation of the labyrinth.

Probably optokinetic and labyrinthine stimuli affect a common center. Labyrinthine stimulus generally produces a much greater acceleration of the slow phase than optokinetic stimulus.

At the beginning of a rotation it is chiefly the labyrinthine stimulus that sets nystagmus *in motion*, while the optokinetic stimulus *keeps* nystagmus *constant* during the continued uniform rotation. Upon cessation of rotation labyrinthine stimulus is capable of neutralizing the central excitation set up by central stimulation.

Under physiological conditions (rotation of the animal with eyes open) there is neither optokinetic post-nystagmus nor labyrinthine rotation nystagmus.

B. *In rabbits, dogs, and monkeys, stare-nystagmus can still be excited after complete extirpation of the cerebrum; it is therefore a subcortical reflex.*

After one-sided cerebrum extirpation the "stare" nystagmus in the dog becomes permanently asymmetrical, while in the rabbit and in the monkey no lasting differences in comparison to the intact animal have been proved.

C. *"Look" nystagmus* occurs only when objects that catch the attention move within the field of vision. These objects need only constitute a quite small part of the total contrasts of the field of vision; this nystagmus is not suppressed by stationary contrasts.

The slow phase of "look" nystagmus is identical with a "following movement;" the fast phase on the other hand is not identical with a "focusing movement." Although in "look" nystagmus the tendency exists to reflect "preferred" objects on the fovea, the periphery of the retina is not without significance in its excitation.

Apart from man, where it is best studied, "look" nystagmus is found in dogs and monkeys. On the other hand it is always lacking in the rabbit.

No indication is found of a central "inertia" (post-nystagmus, etc.).

D. *After extirpation of the cerebrum, "look" nystagmus is permanently lacking in the monkey and in the dog, as also after extirpation of the two centers of vision (area striata).* On the other hand it is retained (in the dog) after extirpation of the sensorimotor cortex. "Look" nystagmus is thus a cortical reflex which comes about by way of the visual cortex. (Translated summary.)

**Bugard, P., and Henry, M.** ***Quelques aspects de la fatigue l'aviation de transport.*** (Some aspects of fatigue in aviation transportation.) *La Presse Médicale, 1961,* **69,** *1903-1906.*

The findings are summarized in the following manner: Humoral manifestations were observed in the crews of the jets and especially in the plane captains. Hyperaldosternism due to heat (there is a miniature tropical climate in the plane), through emotional tension (piloting), through muscular fatigue (commercial personnel). A drop in the 17-CS in the men (because of fatigue), with a slight rise during rest (irregularity of the basic rythm due to the upsetting of the physiological timing as a result of too rapid passage through different time zones). Slight rise in the 17-CS in the hostesses remaining in service for too long an interval and who manifest, in this traveling occupation, a "kind of rejection of their femininity." Rise in the 17-OH of both sexes, but also in the creatinine, as the jet flight requires the suprarenal cortex to be in an "aroused state" that generates a feeling of alarm, as opposed to the "cruising state" of conventional aircraft. Lastly, the elevation of the chronaxies before the jet flight shows that the crew is poorly rested from the previous flight. Of course, a satisfactory physical state is a primary condition for safety. (Translated abstract.)

**Eckel, Walter.** ***Elektrophysiologische und histologische Untersuchungen im Vestibulariskerngebiet bei Drehreizen.*** (Electrophysiological and histological studies of rotatory excitation in the nuclear region in the vestibule of the ear.) *Archiv für Ohren-, Nasen-, und Kehlkopfheilkunde und Zentralblatt für Hals-, Nasen-, und Ohrenheilkunde sowie deren Grenzgebiete, 1954,* **164,** *487-513.*

After exposure of the medula oblongata in the rabbit, the excitation effect of horizontal short and long rotations on the individual neurons of the vestibular centers was recorded by means of microelectrodes, and the localization of the investigated brain sites was histologically determined by means of iron coloration. The following results were obtained:

1. As was the case in Gernandt's vestibular nerve groundings, three different types of responses to *short rotations* (rotations by approximately ⅛ of the circumference within one to two seconds) arose:

Approximately ⅛ of the recorded neurons reacted toward homolateral acceleration with

an increase in the rest activity observed prior to the rotation; in the case of contralateral acceleration, the rest activity decreased. With retardation excitation, a decrease in the rest activity occurred for homolateral rotation, and an increase in the rest activity was observed with contralateral rotation (type I).

Approximately ¼ of the neurons showed an increase in activity with homolateral, as well as with contralateral acceleration, and with retardation, a decrease in the impulse frequency was observed (type II).

In one experiment, a distinct short-lived activity inhibition was observed with accelerations toward both sides; with retardation, the impulses returned (type III).

The response types found in the vestibular nerve are also observed in the vestibular centers.

2. In a comparison of the short rotatory excitation consisting of acceleration and retardation, of the occurring frequency fluctuations in the electrical activity, and of the cupula movements to be expected from Steinhausen's cupula theory, an activating effect was assigned to the utriculopetal displacement of the cupula in the horizontal semicircular canal, and a retardation effect was assigned to the utriculofugal displacement in case of the type I response. The activity changes at the end of rotations, which so far have been called "after-effects", were therefore not considered to be postexcitatoric phenomena, but they were considered to be direct reactions to certain cupula displacements.

3. The postrotatory course of the excitations exhibited a rhythmic zig-zag pattern in which short, steeper and longer, more level parts of the curve could be distinguished. The duration of such an upward and downward movement amounts to little more than one second. The significance of this observation has been discussed.

4. The different activity states of the left and right vestibular center during the same rotatory excitation were studied: immediately after termination of the long rotation, a change in activity could be detected by simultaneous derivation from both vestibular centers: when the activity of one side of a nucleus was enhanced in the first postrotatory phase, a distinct decrease in activity occurred in a second postrotatory phase, whereas a nucleus which was inhibited in its activity during the first postrotatory phase, underwent a distinct increase in discharge frequency in the second postrotatory phase. This reversal in the activity has been related to peripherous processes.

5. The position of the electrode tip, which had been marked by the iron reaction, was accurately determined by histological studies, and the relation to the vestibular centers was established. It was found that vestibular rotatory responses (in the horizontal plane) of types I and II can be found in the nucleus triangularis, as well as in nucleus Deiters. The position for response type III could not be determined.

6. The combination of the electrophysiological experiments with histological checking of the grounding site has been found to be a suitable method for additional research on the physiological functioning of the individual vestibular centers. (Translated summary.)

**Evrard, E.** ***L'emploi du test de Bourdon-Wiersma dans la sélection des aviateurs.*** (Use of the Bourdon-Wiersma test in the selection of pilots.) *Revue de Médecine Aéronautique, 1962,* 1, *42-44.*

Results of an experiment attempting to evaluate the Bourdon-Wiersma test for detection of latent epilepsy and fluctuation in the level of consciousness are presented. The experimental group consisted of 651 pilot candidates of the Belgian Air Force.

As regards the predictive value of the test in the selection of pilots, the author concludes that the test is of limited worth, as it does not provide a clear-enough differentiation concerning prediction of success in training to allow for its substitution for a battery of tests, but merely for its incorporation into such a battery.

As a diagnostic tool in the psychological examination of pilot candidates, however, it is concluded that the test provides valuable information, as it undeniably contributes to the detection of epileptics and hysterics.

A review of other evaluative studies of the Bourdon-Wiersma test is also presented.

**Fischer, H.** ***Beitrag zur Frage der Fettembolie bei tödlicher Druckfallkrankheit.*** (Contribution to the question of fat embolism in fatal decompression sickness.) *Monatsschrift für Unfallheitkunde und Versicherungs-Medizin, 1963,* **66,** *318-322.*

An examination of the role of fat and gas embolism in decompression sickness was undertaken through the study of several fatalities occurring in the German Luftwaffe. Anatomicopathological findings are reported, and several hypotheses are advanced; however, results of the study provide no conclusive answer to the question under investigation.

**Geisler, Marianne.** ***Untersuchungen zur Tagesperiodik des Mistkafers Geotrupes silvaticus Panz.*** (Studies of the diurnal periodicity of the dung beetle geotrupes silvaticus Panz.) *Zeitschrift für Tierpsychologie, 1961,* 18, *389-420.*

I. Periodicity of Activity

1. Under the conditions of a natural change of day and night and an artificial 12/12 hour day the diurnal rhythmical activity of the mainly day-active dung beetle *Geotrupes silvaticus Panz.* is diphasic and has two maxima of activity, one in the morning and one in the evening. This periodicity of activity is subject to seasonal influences; the morning maximum depends on the time of sunrise, whereas the time of evening activity seems to be fixed.

2. The rhythm of activity is mainly endogenous. It adjusts only after some delay to a sudden change in the rhythm of light and darkness, or to a 12-hour shift in the light and dark phases; adjustment takes about a fortnight. Under constant lighting conditions (permanent light or darkness) the periodicity is maintained for weeks, but shows only one maximum of activity per day. In constant darkness a period of 24 hours is maintained, but in constant light of 15 lx the rhythm period is 24.7 hours.

II. Rythmical Orientation in Polarized Light

1. In natural polarized light the dung beetle controls its courses with the right eye before and the left eye after noon. The preference angles of 0°, 45°, and 90° respectively to the position of the sun can be used "optionally;" in the forenoon the beetle increases its angle on the right side from 0° to 45° to 90°, and in the afternoon it decreases its angle on the left from 90° to 45° to 0°. The optional use of these time-dependent preference angles makes east the preferred direction in the morning and west in the afternoon.

2. Animals from different biotopes (southern Germany and Sudharz) behaved alike.

3. Animals blindfolded on one side maintained courses different from those maintained by two-eyed animals at the same time of day.

4. In artificial light polarized by a foil the beetle also adjusts to preference angles of 0°, 45°, and 90° to the direction of oscillation. These three angles are chosen with a relative frequency of 2 : 3 : 5. There was no relation between the preference and the time of day; probably polarized artificial light cannot substitute for natural daylight.

5. The spontaneous diurnal rhythmicity of menotactic orientation can be interpreted as a consequence of a link between the taxis mechanism and the endogenous periodicity (internal clock). The rhythmical processes in activity and in orientation coincide.

6. An attempt is made to establish, in arthropods, a sequence of phyletic development from single angle-retentiveness of menotaxis to compass-time orientation.

III. Rhythm of Turning Tendencies

1. In orientation in artificial polarized light and in the odor field the sense of rotation in the first oriented turning depends on the time of day. This rhythm may also be adjusted to an inverted day. In both cases the beetles, in a normal day, turn more frequently to the left before and to the right after noon.

2. On the other hand spontaneous turning occurring in diffuse light and in the dark or caused by application of shadows is arhythmical. Turnings in both directions occur with equal frequency throughout the day. (English summary.)

**Grandjean, E., Abelin, T., and Rhiner, A.** ***Eine Apparatur zur Messung der Gleichgewichtsbewegungen.*** (A new apparatus for the quantitative measurement of equilibrium movements.) *Schweizerische Medizinische Wochenschrift, 1963, No. 33, 1028-1030.*

A new apparatus for the quantitative measurement of equilibrium movements in the standing subject is described. The body movements are transmitted to a plate with contact points in high density, and the number of contacts is recorded by an electronic counter.

An initial series of experiments in 27 subjects was conducted to determine the range of variation of the measurements under nonstandardized conditions. (Translated summary.)

**Kappey, F., and Albers, C.** ***Der Einfluss der relativen Feuchte auf die Auslösung des Hechelns beim wachen Hund.*** (Influence of relative humidity on tachypnea in the dog.) *Pflügers Archives, 1963,* 278, *262-272.*

1. The influence of gradual increase and decrease of ambient temperature, at three different values for relative humidity, on body temperature and respiratory rate was investigated by the authors in 5 non-anesthesized dogs.

2. At the same ambient temperature, the respiratory rate rose proportionately to relative humidity. Body temperatures were also higher at a high relative humidity than at low relative humidity.

3. During the return of temperature to normal, the respiratory rate remained at a high level longer than the skin temperature and the brain temperature. The relations between rectal temperature and respiratory rate did not differ significantly during temperature increase or decrease as well as at all three degrees of humidity.

4. The findings justify the assumption that the temperature of the mucosa in the upper respiratory tract participates in triggering tachypnea. The authors discuss the factors by which the temperature of the mucosa can be influenced. (Translated summary.)

**Kappey, F., Thiele, P., and Albers, C.** ***Der Einfluss der Warmetachypnoe des Hundes auf die alveolar-arterielle $0_2$-Spannungsdifferenz (AaD).*** (Influence on thermotachypnea in the dog on alveolar-arterial oxygen tension differential [AaD].) *Pflügers Archives, 1963,* 278, *251-261.*

1. Alveolar-arterial $0_2$-tension differential was tested during three stages of oxygen intake on 12 dogs with weights from 17 to 31 kg under chloralose narcosis during normal respiration and during thermotachypnea.

2. When breathing air, the normal alveolar-arterial differential (respiratory rate 15/min) amounted to 8.1 Torr and during tachypnea (respiratory rate 170/min) 5.6 Torr. The difference was not significant.

3. Under hyperoxia (alveolar $0_2$-pressure 233 Torr), the normal alveolar-arterial differential (respiratory rate 15/min) amounted to 43.0 Torr and during tachypnea (respiratory rate 146/min) 39.7 Torr. From this was calculated a short-circuit blood flow of 2.0 and/or 1.3% of the cardiac volume per minute. This difference was not significant.

4. Under hypoxia (alveolar $0_2$-pressure 45 and/or 52 Torr), the normal alveolar-arterial differential (respiratory rate 31/min) amounted to 1.7 Torr and during tachypnea (respiratory rate 138/min) 3.7 Torr. From this was calculated an $0_2$-diffusion factor of 1.32 and/or 1.22 ml $min^{-1}$ $Torr^{-1}$ $kg^{-1}$. This difference was not significant.

5. The authors concluded from the findings that thermotachypnea does not reinforce the functional inhomogeneities of the lung. (Translated summary.)

**Lavernhe, J., Lafontaine, E., and Laplane, R.** ***Le transport aérien supersonique: Aspects médico-physiologiques.*** (Supersonic air

transport: Medico-physiological aspects.) *La Presse Médicale, 1962,* **70,** *1689-1691.*

The next decade will probably see the advent of supersonic airliners flying at two or three times the speed of sound. That will be the greatest step forward in commercial aviation since its birth. There are still immense problems to be solved before this step can be taken.

The predicted flight altitudes (15 to 25 km) necessitate a cabin rigorously secured against any failure, since any lesser means of protection is inadequate against the lightning-quick death that awaits man in the stratosphere. The ozone of high altitudes, because of its toxicity, must be eliminated from the air of the cabins. The speed of flow of the air will generate an intense heat, so that a system of refrigeration will be necessary. The high sound level of aerodynamic noises will call for extreme soundproofing. Several tons of equipment will have to be included in the weight estimates solely to insure the comfort and safety of the occupants.

These planes can be put into service only after months and probably years of experimentation and training. They will have to be better adapted to man, but that will not relieve the crews of the necessity of a difficult reconversion of their methods of work and their reflexes.

Much remains to be done before the first supersonic commercial plane flies, and especially before it can dethrone the present subsonic jets by offering the same regularity and safety. It will get there, we cannot doubt, thanks to the universal law of man in progress. No doubt the utility of this progress will not be apparent to all, when so much remains to be done in other fields. (Translated summary and conclusions.)

**Mercier, A.** ***La vision dans l'aviation d'aujourd'hui.*** (Vision in aviation today.) *In Mercier, A. (Ed.), Visual Problems in Aviation Medicine, N. Y.: Pergamon Press, 1962, pp. 1-16.*

It appears that the new flying conditions created by the utilization of jet aircraft, the performances of which are each year higher and higher, may bring about more marked visual effects.

Though considerable importance should be granted to psychotechnical tests permitting the evaluation of the rapidity and completeness of sensory-psychomotor reaction times, it must be admited that, as machines have now exceeded human possibilities, electronic devices will be more and more called upon to supply the deficiencies of some physiological functions.

Pilots' psycho-physiological balance should also be subjected to check-ups at regular intervals, in order to prevent the appearance of sensorial illusions and combat the emotive shock resulting from lonely flight in an empty sky.

Varifying a 10/10 visual acuity and emmetropia at the initial examination no longer assures the safety of vision in all circumstances because of space myopia appearing in an empty visual field.

Eye protection against dazzle raises a problem more and more urgent as the altitude increases. Goggles, visors and tinted glass canopies should have at least a 75 per cent absorption coefficient.

Higher landing speeds and the ever more frequent use of helicopters give a new importance to oculo-motor equilibrium and stereoscopic vision.

Either in the case of aircraft in which aircrews are subjected to wearing constantly an oxygen-breathing apparatus, or in the case of pressurized cockpit planes, the supply of oxygen must be given considerable care, as the first effect of anoxia is a disturbance of vision.

Night and twilight vision control and training should be effected periodically so as to ensure the maintenance of one of the most important visual functions in flight. (Translated summary.)

**Mercier, A., and Perdriel, G.** ***L'entrainement de la vision nocturne.*** (Training for night flying.) *In Mercier, A. (Ed.), Visual Problems in Aviation Medicine, N. Y.: Pergamon Press, 1962, pp. 84-88.*

The importance, for combatants in general, and more particularly for aviators, to acquire

and maintain a good night vision, has for a long time stimulated research towards improving it.

Studies on the value of the morphoscopic night vision threshold, that is to say on the perception of shapes under reduced conditions of illumination, which seems to constitute the best standard for testing the practical value of an aviator's night vision, have revealed that this threshold improves with the number of night flight hours.

It was therefore logical to try to simulate the conditions of night flight in order to obtain such an improvement of night vision as a great number of night flight hours achieves, similarly to pilot training accomplished on the ground with a Link-Trainer.

The Rose and Flack device, modified and improved by Perdriel, has been used systematically for this purpose, according to a technique making it possible to achieve the successive stages of mesopic and scotopic vision and to demonstrate the possibilities as well as the limitations of night vision, and the means to avoid them.

An improvement by 18 per cent of the value of the morphoscopic vision threshold after eight training sessions has established the efficiency of this technique which permits checking, maintaining and recovering a satisfactory night vision without resorting to the expensive and sometimes dangerous method of frequent night flights. (Translated summary.)

**Mercier, A., and Perdriel, G.** ***Les problèmes visuels dans le vol à basse altitude.*** (The problem of vision in flight at low altitudes.) *In Mercier, A. (Ed.), Visual Problems in Aviation Medicine, N. Y.: Pergamon Press, 1962, pp. 78-83.*

Flying at low altitude and high speed requires an increased attention which produces a nervous tension. Turbulences and accelerations in the proximity of the ground may be factors of vision impairment.

Increased speeds and reduced altitudes make the detection of ground targets more difficult because visual acuity depends essentially upon the sensory-psycho-motor chronology. Meteorological conditions, the nature of the region flown over and the time of the flight have an effect upon the detection of targets. Training can improve flying under these conditions.

Variations in lighting inside and outside the cockpit also affect vision. At low altitudes, the detection of another aircraft becomes more difficult. Heat, vibration, twilight or night flying are also the causes of visual disturbances. (Translated summary.)

**Mercier, A., and Perdriel, G.** ***Les problèmes opthalmologiques posés par l'utilisation des hélicoptères et des appareils à décollage et atterrissage vértigaux.*** (Opthalmological problems posed by the use of helicopters and vertical take-off and landing planes.) *In Mercier, A. (Ed.), Visual Problems in Aviation Medicine, N. Y.: Pergamon Press, 1962, pp. 89-94.*

Helicopter pilots must have a perfect stereoscopic sense because they must be able to determine vertically the altitude, relief, and slope of the ground. Therefore, the correction of refractive defects, mainly myopia and myopic astigmatism, is necessary.

Piloting a helicopter requires a constant visual effort, more sustained than on any other kind of aircraft.

During certain missions, atmospheric turbulences at low altitude increase visual fatigue; sound vibrations have a similar effect.

The stroboscopic effect of the rotor blades has been responsible for some cases of photogenic epilepsy. Predisposition to this condition must be detected by means of an EEG with make-and-break photic stimulation.

Great accelerations in the speed at which the objects seem to pass by, and hovering flights at higher altitudes sometimes cause a feeling of vertigo.

Atmospheric conditions sometimes render the evaluation of distances difficult.

Take-off and landing of VTOL aircraft may raise a dense cloud of dust which impairs the outside visibility during the most critical time.

Protection of the pilot's eyes is also considered in relation to the required missions. (Translated summary.)

**Nicolas, M., and Robion, J.** ***Diabete sucre et personnel navigant.*** (Sugar diabetes and navigation personnel.) *Reprint of work from Centre Principal d'Expertise Médicale du Personnel Navigant de l'Aéronautique de Paris. 24 pages.*

The importance of the methods presently recommended for the early detection of disorders of glucidic metabolism needs no longer to be stressed. They are of great value in the medical examination of civilian and military flying personnel.

On the basis of 54 observations of diabetics and prediabetics, collected at the Medical Inspection Center for Flying Personnel at Paris from 1959 to 1963, among military and civilian personnel, the authors examined the means for improving detection both at the initial medical examination as well as during the routine checks. Obesity appears to be the most frequent diabetogenic factor among the foregoing cases. Systematic utilization of a simplified test for provoking hyperglycemia is urged during medical examination of any individual whose weight exceeds the normal weight by more than 10%. The same procedure is obviously recommended whenever a latent diabetes is suspected (diabetic heredity, staphylococcia, accumulations of fat).

Subsequently, the authors define the criteria of medical supervision necessary for certain diabetics authorized to continue their activity. They conclude, after consideration of some special aspects of the medical and legal problems involved, by stating that the number of decisions grounding personnel for diabetes, closely related to the efficacity of detection, should become more and more limited in the future.

Diabetes mellitus continues to be a problem in overall morbidity because there are still nearly a million diabetics in France. From the social point of view, its consequences vary with age. In the child or the adolescent, its diagnosis generally involves a corollary problem of vocational guidance. In the adult, matters are not as simple as that. Frequently, a change of activity is necessary and this is the case all the more when safety plays an important role in the activity previously exercised. This latter situation presents itself to a marked degree in military and civilian flying personnel. Among the latter, carefully selected during the initial medical examination, a genuine diabetes mellitus is discovered not infrequently during later routine medical checks. In such cases, regulations force the examiner to ground the individual. Depending on the degree of the disorder, on the competence, on the function aboard the plane, and on the seniority of the individual in his activity, an exception to the rule is sometimes suggested. Based on the above elements, a more or less retricted permission to continue in flying service is not too infrequently issued by the last instance, the Commission for Approval of Flying Status in the case of military personnel, or the Medical Council of Civil Aviation in the case of civilian flying personnel. However, this always presents numerous difficulties.

Now that prophylaxis of diabetes is possible, now that early detection makes treatment possible at the reversible stage, and now that the cure of certain types of diabetes seems possible, it may be pertinent to review the methods of detection and medical expertise presently being practiced in medical examination centers for flying personnel.

This is the purpose of this report which would not have been possible without access to the files of the Medical Expertise Center for Flying Personnel at Paris (CPEMPN).

A succinct analysis of the information appears to suggest a new concept of expertise and further highlights some particular aspects of the medico-legal problems. (Translated summary.)

**Popovic, M., Milovanovic, D., and Volf, N. and Psychologists Dragioevic, C. Vlajnic M., and Berger J.** НЕКИ АСПЕКТИ НЕУРОЗА КОД РАДИОТЕЛЕГРАФИСТА И КОНТРОЛОРА ЛЕТЕЊА (Some aspects of neuroses among wireless and flight control operators.) *Medicinski Glasnik, 1963,* **17,** *193-198.*

A working team composed of neuropsychiatrists, psychologists, and social workers examined 95 wireless and flight control operators

employed by the Civil Aviation Administration in 1960 and 1961.

This examination found 31 neuroses (32.5 percent), mostly light. In another institution (Institution X), 32 wireless operators were examined and 18 cases of neurosis found (56 percent).

The smaller number of neuroses among the employees of the Civil Aviation Administration can be explained primarily in terms of a good selection process. These employees were positively motivated toward their occupation in most cases, their general and specialized training was better than in Institution X, and they tended to regard their jobs as temporary solutions in fewer cases than in Institution X. The quality of the selection procedure in civil aviation is evident in the fact that 27 persons underwent psychiatric examinations twice over a period of several years without any change in the incidence and severity of neurosis in their group. The lesser incidence of neurosis in the Civil Aviation Administration is also due to the concern there with the further specialized training of their employees, to better interpersonal relations on the job, and to the opportunities for advancement.

This is to suggest that factors not directly associated with work are of great importance in the origins of neuroses among those undergoing examination.

We found among the employees examined that unfavorable conditions for development in childhood predispose the person to develop a neurosis.

In endeavoring to improve the selection procedure, we adapted the Minnesota Personality Inventory for use in the Serbocroatian language and found somewhat more introverted personalities than extroverted ones among the employees of the Civil Aviation Administration, confirming to an extent our presupposition that introverted personalities are more suited to this type of work.

We found that success on the job is markedly poorer in the case of severe neurosis.

We note that there are more compulsive neuroses among wireless operators than among the general population. Of 31 neurotic patients, two were suffering from coordinational occupational neuroses.

Working conditions, particularly the great emotional strain generated by the responsibility of the job, had caused fatigue among 14 of the 95 civil aviation employees examined.

The unique phenomenon called by us "being glued to letters" was observed among wireless operators in the sense of constant errors with a particular letter in 21.6 percent. This sign of fatigue occurred more often in the neurotics. We hypothesized dissociation or compulsive phenomena.

To reduce the incidence of neurosis in wireless and flight control services in the future, the selection procedure for choosing candidates for appointment to such positions ought to utilize the experience gained in the course of this work. (Translated conclusion.)

**Schmidt-Koenig, Klaus.** ***Experimentelle Einflussnahme auf die 24-Stunden-Periodik bei Brieftauben und deren Auswirkungen unter besonderer Berücksichtigung des Heimfindenvermögens.*** (Experimental influence on 24-hour periodicity in pigeons and its effect with special reference to homing capability.) *Zeitschrift für Tierpsychologie, 1958,* **15,** *301-331.*

Pigeons were subjected to different conditions of artificial light (shifted phase, change of frequency, constant illumination) in lightproof rooms. The influence on the endogenous time mechanism was investigated with reference to three criteria: (A) relief times during incubation; (B) direction-finding of pigeons trained to a compass direction; (C) homing orientation of shifted pigeons.

A. The incubation relief schedule readily follows the shift in light-dark rhythm. The rhythm loses its hold under constant illumination and shows irregularities even under reduced amplitude of illumination (twilight instead of darkness). The adaptation to 10-hour "night" and 10-hour "day" alternation is only incompletely achieved. The rhythm depends mainly on the light-dark cycle. There is a slight but noticeable dependence on the endogenous diurnal periodicity of approximately 24 hours.

B. Pigeons were trained to a compass direction within a certain circumscribed period (20 to 40 min. each day). Most of them maintained a constant angle to the sun when they were tested outside the training time. Only one of 7 pigeons failed to orient to the actual position of the sun, but rather to the compass direction derived from it. If the training times are spread throughout the day, all pigeons allow for the sun's motion and choose the right compass direction.

Under constant illumination the endogenous rhythm used for the sun-azimuth compass runs autonomously. Nevertheless, if the phase of the light-dark alternation is shifted by six hours, coincidence of the internal rhythm with the artificial day-night alternation is attained within 3-4 days. Shifting back to the original phase requires 2-3 days under artificial light; under the conditions of the natural day (in an aviary) less time is necessary.

Overcast sky does not prevent pigeons from choosing the training direction, but they show less accuracy than under a clear sky. They are able to locate the sun even when the human eye fails to do so. During the night pigeons do not allow for solar movement.

C. Pigeons subjected to the shifting procedure were released at distances varying from 100 to 5.5 miles. The distribution of the observed departures is wider in the shifted birds than in the controls. Shifting 6 hours in advance gave an average deviation of 66° to the left regardless of the direction of displacement. The deviation of the experimental group remains constant in relation to the bearing of the control pigeons for each release point. Direction of departure (in relation to the true home direction) and success of homing are positively correlated. Shifted pigeons tend to be reported from those directions in which they departed. An average deviation of 85° to the left (in relation to the median direction of departures of the controls) was found.

Many shifted pigeons must define their final course within a range of not more than 1.2 miles from the release point, others correct later on the way.

Under moderate overcast the homing capability remains effective; shifted pigeons still show the deviation to the left.

The effect of shifting is considered in relation to the recent hypotheses concerning orientation and the possible interpretations of the findings are discussed. (Translated summary.)

**Völker, Hans.** ***Über die tagesperiodischen Schwankunken einiger Lebensvorgänge des Menschen.*** (On the daily periodic fluctuations of some life processes in human beings.) *Pflügers Archiv für die gesamte Physiologie, 1927,* **215**, *43-77.*

1. The observations with trained subjects in Hamburg and Akureyri (Northern Iceland) showed that there is a circadiane fluctuation not only for the body temperature but that the same behavior can be observed in all life processes investigated (pulse, blood pressure, gas metabolism, basal metabolism, kidney secretion). On the basis of this we can conclude that there is a daily periodicity of life processes in general.

2. The experiments, which were conducted under a wide variety of conditions, and in which maximum clarity was aimed at through the elimination of as many sources of disturbance as possible, revealed increasingly normal curves, as the arrangement was made increasingly simple. Fasting experiments give a clearer picture than experiments involving food intake; experiments involving bed rest gave a clearer and more definite picture than experiments involving light laboratory work.

3. The effect of these factors on periodicity consists in a shift, primarily of the minimums; the values are shifted further and further away from the normal (standard) point the greater the sum of the opposite forces here — until an excessively large quantity finally conceals it (them). This was clearly proved in a series of experiments with an increased effect from new factors which could always be measured. All reports about a successful inversion of periodicity could thus be easily explained.

4. The circadiane periodicity is fixed on the basis of local time; it does not depend on the

position of the sun (midnight sun) or on sunrise or sunset.

5. The same periodicity can be established in the life processes of plants.

6. In addition to this periodicity of animals and plants, there is a periodicity of the electrical conductivity of air, which is likewise dependent on the time of day and the local time; it is however not the sole cause for the rhythm of living things (see our monograph); instead, all three of these periodicities are subject to a cosmic principle which is as yet unknown. (Translated summary.)