# Bibliography and Epitome

VOL. 56 ACTA NEUR. PSYCHIAT. BELG. DECEMBER A Familial Intoxication with Lead. Gousette, R., and Montanini, R	813
Meurice, E.  The EEG of Congo Natives and Racial Differences. Verhaegen, P.  A Psychiatric Centre of New York. Bloch, C.	827 842 853
VOL. 57 JANUARY	, 1957
Magic Thought. de Busscher, J	1
Magic Thought. de Busscher, J	27 <b>6</b> 7
meningiomas of the Lateral Recess. ae Busscher, J., et al	0,
FEBRUARY Myasthenia Gravis in a Girl of Three. Szezepanska, H	91 94
Soille, P	104
Mengioma of the Anterior Tubercle and of the Sella Turcica. Hoffman, G. R., et al Confabulation in Korsakoff's Syndrome of Traumatic Origin. Flament, J	116 119
ACTA PSYCHIAT. NEUR. SCAND., SUPPT.	
The Prognosis in Schizophrenia. Langfeldt, G N	lo. 110
VOL. 12 AM. J. INDIVID. PSYCHOL. Our International Congresses. Rom, P	1956 97
Psychosomatic Approach to Gynaecology and Obstetrics Rigger I	99
Anthropology and Individual Psychology. Mueller, A.  The "Feminine Protest". Ronge, P. H.	106
The "Feminine Protest", Ronge, P. H	112
Survey on Psychopedagogy. Schaffer, H	116
Survey on Psychopedagogy. Schaffer, H	123 128
Sources of Obstacles in the Course of Therapy. Lazarsfeld, S	136
The Application of Individual Psychology in a Criminal Case. Sorge-Boehmke, E	139
The Application of Individual Psychology to Psychosomatic Medicine. Lapisohn, L	143
Enlightening Children. Bruck, M. A	157
A Study of Excessive Dependency in Mother-Son Relationships. Rattner, L	171
VOL. 27 AM. J. ORTHOPSYCHIAT. JANUARY	1957
Capacity and Motivation. Levy, D. M	1
The Evaluation of Rehabilitation in the Individual. Panel, 1955. Seidenfeld, M. A., et al.	
Methods for Community Mental Health Research. Glidewell, J. C., et al	38
Problems in Evaluation of Mental Health Programs. Lemkau, P. V., and Pasamanick, B. The Evolution of a Program of Individual Psychotherapy for Children with Aggressive Acting-Out Disorders in a New Residential Treatment Unit. Gordon, G., and	
Siegel, L	
dential Treatment Setting. Bloch, D. A., and Silber, E	69
The Influence of Unsolved Maternal Oral Conflicts upon Impulsive Acting Out in	
Young Children. Rexford, E. N., and van Amerongen, S. T	75
Internalized Objects in Children. Furer, M., et al	88 96
A Pilot Study of Schizophrenic Children in a Nonresidential School. Abbate, G. M.,	
et al	107
Attitude Organization in Elementary School Classrooms. Henry, J Children's Intelligence Tests as a Measure of Dynamic Personality Functioning.	117
Fromm, E., et al	134
Group Experiences with Medical Students as a Method of Teaching Psychiatry.	
Peltz, W. L., et al.  Normal and Deviant Behavior in a Peasant Community: Montserrat, B.W.I.	145 167
Métraux, R., and Abel, T. M	185
Special Comment. Some Recent Trends in Psychoanalysis. Berman, L., et al	202

VOL. 77 ARCH. NEUR. PSYCHIAT. JAN	UARY.	1957
Permanent Relief of Tic Douloureux by Gasserian Injection of Hot Water. Jae.	ger.R.	1
*Brain Copper-Protein Fractions in the Normal and in Wilson's Disease. Port		- Ω
Incidence of Neurological Complications in Congenital Heart Disease. Tyler,	U D	0
and Clark, D. B	•	17
Long-Term Effects of Phensuximide (Milontin). Rey-Bellet, J., and Lennox, W.	G	23
*Motivational Determinants in Modification of Behavior by Morphine and		
barbital. Hill, H. E., et al		28
Pathogenesis of Trigeminal Neuralgia. List, C. F., and Williams, J. R	• • • • • • • • • • • • • • • • • • • •	36
Jean-Martin Charcot (1825–1893). Tomlinson, J. C., and Haymaker, W.		44
	• •	57
Television Therapy. Tucker, H., et al	• •	
Lead Poisoning in Children. Jenkins, C. D., and Mellins, R. B		70
Psychic Function of Temporal Lobe as Inferred from Seizure Phenomena. Osto	ow. M.	79
*Some Observations on the Use of Tranquillizing Drugs. Szasz, T. S	•	86
The Trouble with Psychiatric Research, Ruesch, J		93
*Frontal Lobe Damage and Flicker Fusion Frequency, Meding, R. F.		108

Brain Copper-Protein Fractions in the Normal and in Wilson's Disease

Brain proteins in hepatolenticular degeneration, like those in normal brain, can be separated into three copper-containing fractions: Fraction I, extracted with 0·1 M acetate buffer pH 4·5 (or with water or with 0·1 M bicarbonate buffer pH 8·2); Fraction II, extracted at pH 3·5 and vanishing ionic strength, and the residual Fraction III.

The greatest absolute amount of pathological brain copper in hepatolenticular degeneration is extracted in Fraction I. Of this Fraction I copper, slightly more than one-half is nondialyzable at pH 4·5 and may or may not be identical with the Fraction I copper of normal brain.

A significant portion of the pathological copper in the brain in hepatolenticular degeneration is present in a form not found in appreciable amounts in normal brain. This abnormal copper-protein combination is similar to normal Fraction I in being soluble both in 0·1 M acetate buffer pH 4·5 and in 0·1 M bicarbonate buffer pH 8·2, but is different from normal Fraction I copper-protein(s) in its failure to retain copper on dialysis at pH 4·5.

The finding that bicarbonate buffer extracts of the fresh tissue do not lose copper on dialysis against bicarbonate buffer indicates that substantially all of the copper in the brain in hepatolenticular degeneration is bound in undialyzable form, presumably to proteins.

(Authors' Abstr.)

Motivational Determinants in Modification of Behavior by Morphine and Pentobarbital

Since the description of drugs as either "stimulant" or "depressant" did not appear to be sufficient to account for their behavioral effects, it was proposed that motivational factors must be considered as partial determinants of such effects. The present experiment, designed to test this hypothesis, was carried out on 182 former narcotic addicts. Visual-manual reaction times were measured on separate groups of subjects after the administration of 15 mg. of morphine sulfate or 250 mg. of pentobarbital sodium, and these were compared with the reaction times of other subjects who received no drug on the test day. Each of these measurements was made under four conditions which differed from each other with respect to the incentive (morphine reward) offered for participation in the experiments.

The results indicate that changing incentives significantly modifies control reaction time, as well as the effects of morphine or pentobarbital thereon. Thus, in comparison with the control, both drugs acted either as "stimulants" (accelerated reaction time) or as "depressants" (slowed reaction time) or had no effect, depending on the particular incentive conditions under which they were administered. The actions of these drugs, however, were "specific" with respect to each other: The effect of pentobarbital changed from "depressant" to "stimulant" when conditions changed from "Low Incentive" to "High Incentive", while the action of morphine changed from "stimulant" to "depressant" when identical changes in incentive level were made. Viewed from another standpoint, the results indicate that sensitivity to changes in incentives is reduced by morphine and enhanced by pentobarbital.

It is postulated that changes in incentive levels, manipulated by the observer, after

It is postulated that changes in incentive levels, manipulated by the observer, alter performance through effects on specific motivations. Hence, from the data presented, it is inferred that performance, as well as the effects of drugs thereon, is determined in part by the particular motivations that obtain when the measurements are made. The "specificity" of the effects of any particular drug will therefore be apparent only if the motivations involved in the behavior studied are controlled.

Furthermore, it is concluded that drugs exert "specific" effects on particular motivations, and that differences in the attractiveness of drugs for different persons may be partly explained on the basis that motivations acceptable to the subject can be enhanced and unacceptable ones suppressed by use of particular chemical agents.

Some Observations on the Use of Tranquillizing Drugs

The purpose of this essay is to inquire into, and call attention to, some sociopsychological aspects of the current vogue of using tranquilizing drugs in psychiatric disorders.

The use of these drugs rests on the premise that psychiatry deals with "mental illness" and that such illness presents a problem essentially analogous to that encountered in medicine (and particularly in infectious disease). There is evidence to suggest that this "medical" model of behavioral disturbance is inadequate and misleading. If such disturbances do not constitute "diseases" which manifest themselves in certain "signs" and "symptoms", then measures based on this concept are likely to be faulty, and probably harmful to patient, physician, or

A brief analysis of this problem is organized around the following three questions: (1) What do we, as physicians and psychiatrists, do when we prescribe tranquillizing drugs?

(2) Whom do we treat? (3) Is this form of treatment justifiable? The generally accepted answers to each of these questions are summarized. They are followed by suggestions for additional possible "answers", the most important of which are (1) that the use of these drugs may represent a new "symptom" of the ancient occupational disease of physicians known as "furor therapeuticus"; (2) that we treat ourselves and the patient's social environment; and (3) that whether we hold the treatment to be justifiable or not will depend on what position we take vis-à-vis the patient's conflict with other persons and society.

In conclusion, the role and significance of defiance of authority and of deviance from social norms in "mental illness" (and in all modes of human life, for that matter) are briefly mentioned. These considerations are emphasized in an effort to substantiate the legitimacy and possible value, of taking a position of caution and criticism with respect to the widespread use of tranquillizing drugs in medical and psychiatric practice.

(Author's Abstr.)

Frontal Lobe Damage and Flicker Fusion Frequency

Matched groups of patients who had sustained bilateral prefrontal lobotomy, hospitalized control patients (non-surgical), and normal control subjects were tested for flicker fusion frequency. Surgery for the operatee group had been performed from eight to nine years prior to testing. Pertinent control criteria were race, age, sex, period to time institutionalized, amount of schooling, and pre-operative diagnosis. The findings of the study are as follows:

1. The frontal lobe damage sustained in prefrontal lobotomy is not reflected in a per-

manently depressed fusion point.

2. There is no indication that lobotomized subjects are objectively more accurate (less variable) in locating their fusion point than are hospitalized control or normal control subjects.

3. A definite linear decrease in fusion frequency level with age is found in patient and in normal subjects.

4. The most pronounced drop in fusion level with age occurs between 45 and 55 years of age.

5. The extent to which a subject varies or deviates from his own fusion point in successive trials does not appear to be dependent on age. There is nothing to indicate that older persons are less variable than young persons.

(Author's Abstr.)

#### **FEBRUARY** Charles in II-adeals - Carrill 4 34

Studies in Headache. Ostfeld, A. M., et al	113
Face-Hand Test Responses of Psychotic and Mentally Defective Patients. White, R. P.	120
*Mental Function and Cerebral Oxygen Consumption in Organic Dementia.	
Lassen, N. A., et al	126
*Flicker Fusion Thresholds in Multiple Sclerosis. Parsons, O. A., and Miller, P. N	134
Trimethadione: Its Dosage and Toxicity. Wells, C. E	140
Itch Sensation and Recovery of Sensation in Spinal Cord Injuries. Arieff, A. J., et al.	156
Anxiety as an Aid in the Prognostication of Impending Death. Beigler, J. S	171
*Common Medical Disorders Rarely Found in Psychotic Patients. Ehrentheil, O. F.	178
Brunswik's Theory of Perception. Imboden, J. B	187
*Studies in the Effects of Lysergic Acid Diethylamide (LSD-25). Liebert, R. S., et al.	193
Psychopharmacotherapeutic Research. Rashkis, H. A., and Smarr, I. R.	202
Perception: Equivalence, Avoidance, and Intrusion in Schizophrenia. Scher, J. M.	210
U.S. Army Psychiatric Training Program. Forrer, G. R., and Grisell, J. L	218
*Diagnostic Testing for Cortical Brain Impairment. Garrett, E. S., et al	223

Mental Function and Cerebral Oxygen Consumption in Organic Dementia

Clinical, neurophysiological, and psychological data were obtained and evaluated individually for 19 subjects. Clinically, 6 were normal; 3 had questionable dementia; and 10, indisputable dementia.

The cerebral metabolic rate of oxygen (CMRO<sub>2</sub>) was measured in cubic centimeters of  $0_2$  per 100 gm. of brain per minute by the Kr<sup>85</sup> method, using bilateral sampling of internal jugular venous blood. The clinically normal group had a CMRO<sub>2</sub> of  $3 \cdot 6 - 3 \cdot 2$ ; the intermediate group, a CMRO<sub>2</sub> of  $3 \cdot 2 - 3 \cdot 0$  and the demented group, a CMRO<sub>2</sub> of  $2 \cdot 8 - 1 \cdot 6$ .

Arguments are advanced that abnormally low CMRO<sub>2</sub> (3·0 or below) in patients without acute cerebral affections indicates cortical atrophy—a conclusion confirmed by air encephalography for the five subjects so examined.

The psychological grouping of the patients was based on the presence or absence of fluctuations during learning and on two criteria derived from a block-pattern test. The four groups thus obtained comprised one without abnormalities, and three of increasing mental dysfunction. These groups correlated well with the CMRO<sub>2</sub> values in all cases.

Observations for the six patients with CMRO<sub>2</sub> values of 3.0 to 2.6 suggest that the

psychological method described offers possibilities for the diagnosis of slight organic dementia.

(Authors' Abstr.)

#### Flicker Fusion Thresholds in Multiple Sclerosis

The central visual flicker-fusion thresholds of 20 male veteran patients with multiple sclerosis and 20 control subjects with no central nervous system disorder, are compared. A markedly impaired flicker discrimination is found in the M.S. group. Only three M.S. patients had evidence of scotomata; however, nine possessed some degree of optic pallor. The pallor group manifests the greatest impairment of flicker discrimination, but the non-pallor M.S. group shows also significantly lower values than the controls. It is suggested that these results are due mainly to optic neuropathy accompanying retrobulbar neuritis. These effects apparently are not revealed by standard visual field examinations but do appear when flickerfusion thresholds are determined.

(Authors' Abstr.)

#### Common Medical Disorders Rarely Found in Psychotic Patients

Hay fever, asthmatic attacks, and the acute stages of rheumatoid arthritis are extremely rare among psychotic patients.

Duodenal ulcer is not rare in psychotics and is probably just as frequent as in the general population.

An attempt is made to apply existing physiological and psychological hypotheses in the explanation of these facts.

(Author's Abstr.)

#### Studies in the Effects of Lysergic Acid Diethylamide (LSD-25)

This study is concerned with the effect on spatial localization of lysergic acid diethylamide (LSD), assumed to be a primitivizing drug. Normals and schizophrenics, with and without LSD, adjusted a luminescent rod in a darkroom to apparent verticality under various conditions of body tilt and different initial setting of the rod (starting position).

With LSD, for normals and schizophrenics, the apparent vertical is displaced in the direction opposite to the side of body tilt. Under LSD this displacement is significantly increased for normals; for schizophrenics there is no evidence that the drug significantly alters the effect of body tilt on perception of verticality.

Without LSD, for schizophrenics and normals, the effect of starting position is that of displacement of the apparent vertical from the plumb line in a direction toward the position in which the rod is placed at the beginning of the trial. For normals as well as for schizophrenics LSD increases the starting position effect; this increase is not significant in normals but highly significant in schizophrenics.

The differential effects of LSD are evaluated with reference to the assumption that LSD

operates as a primitivizing agent.

Additional comparisons between normals and schizophrenics with respect to the effect of body tilt and starting position on apparent verticality without LSD are included. (Authors' Abstr.)

# Diagnostic Testing for Cortical Brain Impairment

By using both the Spiral After-effect Test and the Graham Kendall Test, the diagnosis of cortical brain impairment is greatly facilitated. Cases missed by one are detected by the other test. The two supplement each other and together make a highly valid battery for determination of cortical involvement.

(Authors' Abstr.)

#### MARCH

*The "March" of Temporal Lobe Epilepsy. Stevens, J. R	227
*Asynchronism of Electrical Activity of Frontal Lobes During Sleep. Adams, C. L.,	
et al	237
*Chlorpromazine (Thorazine) Treatment of Disturbed Epileptic Patients. Bonafede, V. I.	243
*The Pattern of Conduction of Amygdaloid Seizure Discharge. Gloor, P	247
*Sites of Origin of Hypoglycemic Seizures in the Rabbit. Tokizane, T., and Sawyer, C. H.	259
Antidiuretic Effect of Lysergic Acid Diethylamide in Humans. Kies, M. W., et al.	267
Why Patients Leave Psychotherapy. Frank, J. D., et al	283
Verbal Behavior Analysis. Gottschalk, L. A., et al	300

#### The "March" of Temporal Lobe Epilepsy

The convulsive attacks of 40 patients with psychosensory or psychomotor epilepsy have been subjected to sequential content analysis. Certain patterns of seizure organization appear from such analysis, suggesting an ordered "march" of seizure manifestations in convulsive attacks originating in the temporal lobes and environs.

The varied subjective manifestations of individual attacks indicate strong relationship of epigastric sensation, subjective fear, and motor behavior of the flight-fight pattern. On the contrary, the small group of patients with cephalic aura experience relatively pleasant anticipatory states, free of fear components. Vertigo and tinnitus are followed by illusory states in three-fourths of the patients studied, and fear was present in only one of the seven patients in this group. The disagreeable odor characteristic of the "uncinate fit" never appeared as a first symptom of attack in the eight patients reporting this sensation, and most commonly succeeded the subjective state of fear. Olfactory aura of pleasant nature, much rarer, was always a first symptom of an attack, and was not followed by fear-flight-fight manifestations but always was succeeded by a sense of intense mental confusion.

Preliminary analysis of the content and sequence of this group of psychosensory and psychomotor attacks appears to offer a doorway into greater understanding of the organization of emotional feeling and expression.

(Author's Abstr.)

328

333

## Asynchronism of Electrical Activity of Frontal Lobes During Sleep

Imprinting and the Establishment of Gender Role. Money, J., et al.

Electroencephalographic studies on 202 patients with frontal lobotomy indicate that the only consistent electroencephalographic finding resulting from this operation is an asynchronism of slow activity in the frontal areas during deep sleep. This abnormality never appears before the 18th post-operative month. It becomes increasingly common and evident thereafter and is found in all cases 36 months or more after operation. This change is permanent and irreversible. The abnormality is restricted to the frontal lobes, and only the slow activity of deep sleep in the frontal lobes is affected. Sleep spindles and all other patterns in the frontal areas and elsewhere remain normal; in other areas the slow activity of deep sleep is undisturbed.

It is assumed that this late-appearing asynchronism of slow activity in the frontal areas during deep sleep results from a delayed degeneration of commissural fibers which link certain nuclei in the left and right thalamus.

(Authors' Abstr.)

## Chlorpromazine (Thorazine) Treatment of Disturbed Epileptic Patients

The majority of emotionally disturbed epileptics show an excellent response to chlorpromazine.

Anticonvulsant medication must never be reduced while the patient is on chlorpromazine therapy.

Potentiation or intensification of barbiturate effect is apparently of little or no clinical

Anticonvulsant drugs should be increased or supplemented at the earliest indication of any seizure increase during chlorpromazine therapy.

Chlorpromazine is well tolerated, without any marked alteration in the seizure frequency in most epileptics.

Maintenance dosage is established by trial and error and may be necessary for prolonged periods.

(Author's Abstr.)

## The Pattern of Conduction of Amygdaloid Seizure Discharge

The conduction of electrical after-discharge induced by electrical stimulation of the amygdaloid nucleus was studied in 19 cats in order to understand the functional anatomy of seizure mechanisms in ictal temporal lobe automatism in man known to be dependent upon epileptic discharge originating in the amygdaloid region. The findings are as follows:

1. The subcortical structures fired by amygdaloid after-discharges extend from the septal area back to the mesencephalon, with inclusion of the whole diencephalon, hypothalamus, and thalamus as well.

2. There is a rather sharp contrast between the diffuse and extensive subcortical conduction of amygdaloid seizure discharge and the restricted conduction to cortical regions.

. The cortical areas fired by amygdaloid after-discharges comprise the hippocampus and those cortical areas of the cat's brain that are homologous to man's anterior temporal and insular cortex. These findings in the cat are in agreement with the topographical distribution of epileptic discharges in patients with ictal automatism due to discharge in the amygdaloid region.

4. Amygdaloid after-discharges are preferentially conducted to subcortical structures. Among these subcortical structures, the most constant firing occurs in the basal diencephalic and mesencephalic tegmental areas, the same regions which, on the basis of previous experiments, are known to represent the direct subcortical projection fields of the amygdala.

The mechanism of propagation of amygdaloid after-discharges to the thalamus may be related to the marked build-up of an excitatory state occurring in response to repetitive amygdaloid firing, which in cases of intense amygdaloid discharge, as in seizure activity, may supposedly become vigorous enough to allow propagation of discharge from the basal diencephalon and the brain stem into the thalamic gray matter.

The conduction to the ipsilateral "temporoinsular" cortex is more labile than that to the

thalamus, and even more labile seems to be that to the contralateral amygdala and the

contralateral temporoinsular cortex.

The preferential conduction of amygdaloid after-discharge into highly integrative formations of the subcortex tends to corroborate Penfield's hypothesis that the phenomena of ictal epileptic automatism may be explained on the basis that seizure discharge originating in the amygdala actively fires into the "centrencephalic system".

The frequent electrographic suppressor onset of temporal lobe seizures originating in the

amygdaloid region was re-duplicated in some of these animal experiments. Its possible relationship with the generalized cortical low-voltage activity, as often produced by amygdaloid stimulation, is discussed.

(Author's Abstr.)

# Sites of Origin of Hypoglycemic Seizures in the Rabbit

An electroencephalographic study has been made of the characteristics, sites of origin, and projection of hypoglycemic seizures in the restrained, non-curarized rabbit. Records were made of the electrical activity of the cerebral cortex and subcortical centers approached by stereotaxic means. The results reveal that insulin-induced hypoglycemic seizures arise in and may be confined to the amygdala and/or the hippocampus. Severer seizures may project to the pre-optic, hypothalamic, and other brain stem regions without reaching the frontal or limbic cortical area. The localized seizures are not accompanied by any apparent somatic motor activity and are detected only by the deep electrodes. Increased secretion of adrenaline following surgery and stereotaxic restraint may counteract the effect of quite massive doses of insulin to the extent that the blood-sugar level is not lowered to the seizure range. The adrenal effect may be counteracted by cutting the splanchnic nerves. It is suggested that the beneficial results of insulin therapy may be related to undetected subcortical seizures

(Authors' Abstr.)

Comparison of Psychological Effects of Certain Centrally Acting Drugs in Man

Ten normal volunteers were given various doses of lysergic acid diethylamide (LSD), meperidine, secobarbital, and chlorpromazine. The order of drug administration was a  $10 \times 10$ 

Latin square, which included two placebos.

All drugs were administered orally, and the "double-blind" technique was employed throughout. Seventy-five minutes after ingesting the drug, subjects were given a variety of psychological tests, which included intellectual, motor, and perceptual tasks.

The following conclusions were drawn from the data:

The effect of drugs on psychological performance in man are due not only to the specific pharmacological activity of the drug, but also to the specific reactivity of the subject and to an interaction of the two.

There is not a significant correlation between the objective and the subjective psychological effects of a given drug. However, the drugs that produce the greater mean objective effect also produce the greater mean subjective effect.

Two hundred milligrams of secobarbital sodium; 100, 200, and 400 mg. of chlorpromazine

hydrochloride, and 50 y and 100 y of lysergic acid diethylamide significantly impair performance on a variety of psychological tests. Meperidine hydrochloride in 50 and 100 mg. doses does not impair performance on the same psychological tests.

LSD had significant effects on intellectual and perceptual tasks but did not cause significant impairment of motor tasks, whereas chlorpromazine and secobarbital affected motor tasks but in general did not cause statistically significant impairment of performance on simple intellectual and perceptual tasks

Iwo hundred milligrams of chlorpromazine does not impair performance significantly less than does 200 mg. of secobarbital sodium.

(Authors' Abstr.)

Relationship Between Effects of a Number of Centrally Acting Drugs and Personality

Ten normal young adults were given various doses of chlorpromazine, meperidine, secobarbital, and lysergic acid diethylamide (LSD). The effects of the drugs were determined

by both objective and subjective psychological tests. The Minnesota Multiphasic Personality inventory was also administered to all the subjects prior to the start of the experiment. Four icales from this test were selected for testing relationships between personality variables and both the objective and the subjective effects of the drugs.

The Depression and Psychoasthenia scales correlated significantly, or almost significantly, with the subjective effects and, to a less extent, with the objective effects of those drugs and

dosages that produced significant effects.

These results support a hypothesis that personality plays a role in determining the extent of drug effect.

(Authors' Abstr.)

Effects of Centrally Acting Drugs on Two Tests of Brain Damage

Effects of Centrally Acting Drugs on Two Tests of Brain Damage

Ten subjects, with a mean age of 20·5 and a mean verbal I.Q. of 110·3, were given low and high doses of one of four drugs or a placebo. Chlorpromazine, LSD-25, meperidine, and secobarbital were administered according to a Latin-square experimental design. The subjects were tested approximately three and a half hours after drug administration on two procedures used for assessing brain damage: the Continuous Performance Test (C.P.T.) and the Wisconsin Card Sorting Test.

None of the measures of performance on the Wisconsin Card Sorting Test show any apparent effect of the drugs. Performance on the C.P.T., however, is significantly poorer under chlorpromazine and becomes even worse as the dose is increased. Although no other drug had a significant effect on C.P.T. performance, it is doubtful if the peak effects of meperidine and secobarbital were measured.

and secobarbital were measured.

VOL. 17		CH. PSICO							19
		UM ON RES	ERPINE .	AND C	HLORPF	ROMAZI	NE		
Hellebore and R	eserpine. <i>Bell</i>	oni, L.							1
The Anatomo-ph	iysiological Ba	asis of Mod	ern Pha	rmacol	ogical T	Γreatm	ent in l	Psychia	try.
~ ``					_				1
Gozzano, M Somatic Effects	of Reservine.	Magrassi, I	F. and S	Scalfi. I					1
Discussion	or recour pinter	2.1206. 0000., 2	.,		• • •				2
Reservine Treatr	nent in Psych	iatry <i>Rener</i>	letti G	••	••	• •	• •	••	2
Reserpine Treatr Results and Cons	siderations on	the Effect	of Decer	nina in	the Tr	 estmer	of Po	vchose	
Results and Cons	siderations on	the Lifect	DI KESCI	pine m	the H	catilici	it OI I s	ychosc	s. 1. 3
Fazio, C Results and Con		ro		_:_:_	T		ć D	b	***
Results and Con	siderations on	the Enect of	oi Keser	pine in	the 1 re	aumen	t of Psy	/cnoses	. 11.
Giberti, F		·. :· _	: .	··· .	∵ .	•• •	• •	• •	3
Reserpine in Cat									3
Reserpine Thera	py in Chronic	: Schizophre	enia. <i>Ca</i>	ırgnello	, <b>D</b> .				3
Reserpine Thera	rpine in State	s of Psychic	: Excite	ment. C	Fararag	lia, G.,	, and $N$	egri, V	. <i>V</i> . 3
Modifications in	the Reservin	e Treatmen	t of Chi	onic Se	chizopł	renia.	Santai	gelo. C	7. 3
Discussion									3
Effects of Reser	nine and of F	Reservine A	ssociate	d with	Psych	otomie	s in S	ome Se	nile
Psychoses	Vegri F	tooorpine				•••••			4
Discussion	vegri, 1	• • • •	• •	• •	• •	• •	• •	• •	2
Psychoses. In Discussion Reserpine in Chi	ild Davidsiator	· Carandadi	ć	1 1/2	Ċ	• •	• •	• •	
Keserpine in Ch	nd Psychiatry	. Saceraon,	G., ana	vegro	, <b>G</b> .			• •	
Discussion	GI		<u>.</u> :.		<del>-</del>				4
The Action of	Chlorpromaz	ine and of	Reserp	ine on	the E				
System. Bal	estrieri, A.     .								4
Discussion The Action of C	••								
The Action of C	hlorpromazin	e and of Re	serpine	on Son	ne Sym	ptomat	tic Mai	nifestat	ions
of Psychone	eurosis. Gomin	rato, G.				• • •			:
Discussion									:
Discussion Modification of	the EEG by I	Reservine T	reatmer	nt. Colo	mhati.	S.			:
Discussion Treatment with	Reservine of	Some Tox	ic Excit	ements	Ronas	ci P	and E	ava D	
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Discussion									(
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Discussion The Profession A Group Reacti	of Psychology	in the Mo	dern W	orld G	omelli	<u>.</u>	• •		
A Group Reacti	on for the D	in the Mo	Acocial	Tanda	onen,	a. Zavalla:	D	• •	
The Drawing				: rirst	Kepr	esentat	ion oi	ingis	LITICE
Disposition	. zecca, G.		-::		.:: ~			٠·٠.	••,
A Contribution	to the Study	of Mental	ratigue	ın Mi	adle S	cnool.	Koser,	O. L.,	and
Nicoletti, I.	••	• • • • • • • • • • • • • • • • • • • •	• •	• •	• •			• •	

The Method of Discriminating Function Applied to the Diagnosis of Mental Deteriora-	
tion. Alberoni. F	769
The Phenomenon of Interference in Shock and its Significance in the Rorschach Test.	
Basaglia, F., and Dalla Barba, G	783
Psychic Determinism and Freedom in the Development of the Personality. Mailloux, N.	853
The Unity of the Image. Ponzo, M	867
	877
Phenomenology of Tridimensional Visual Perception in Relation to the "Trans-	0//
actional Theory". Massucco, Costa A.	905
Psychopathological Considerations of Oneirism. Barison, F., and Massiquan, L	933
Mental Weakness, Pasaui, E	951
Analysis of the Process of Improvement and of Cure during Psychotherapy. Benedetti, G.	971
Acceptance of Alcoholic Drinks in a Group of Mentally Defective Children of Various	
Grades. Zucchi, M., and Santangelo, F	1009
actional Theory". Massucco Costa, A	1023
A Critical Study of the Hypothesis of the Affinity of Instincts and Sympathetic Facial	1023
Expression. Terstenjak, A	1063
Observations and Criticism of the Concept of Schizasthenia. Gastaldi, G	1093
The Structure of Confusional Symptomatology. Gomirato, G	1119
VOL. 18	1957
A Study of the Maze Test of Porteus in Normal Subjects and Mental Patients. Alliani, E.,	.,,,
and Riccio, D	3
The Refusal of the V Picture of the Rorschach Test. Basaglia, F., and Dalla Barba, G.	17
Perseveration in the Infantile Rorschach. Zecca, G	27
Doctrinal and Practical Aspects of Psychosomatic Medicine. Rigotti, S	39
Experiences of "Personalisation of the Eye" in Schizophrenia. Callieri, B	65
VOL. 80 BRAIN MARCH	,
Hemichorea (Hemiballismus) Without Lesions in the Corpus Luysii. Martin, J. P	1
Developmental Abnormalities in the Region of the Foramen Magnum. Spillane, J. D., et al.	11
*Vascular Mechanisms of Birth Injury. Norman, R. M., et al	49
Behçet's Syndrome with Neurological Complications. Wadia, N., and Williams, E	59
*Vivid Day-dreaming: An Unusual Form of Confusion Following Anterior	
Cingulectomy. Whitty, C. W. M., and Lewin, W	72
*The Effects of Some Drugs on the Electrical Activity of the Brain. Bradley, P. B., and	
Elkes, J	77 118
Unine manife of Pain Gooday W	IIX

## Vascular Mechanisms of Birth Injury

A description has been given of the clinical and pathological features of two cases of mental deficiency apparently caused by injury at birth. Both brains showed areas of cortical atrophy in the cerebrum and cerebellum occupying either the boundary zone between two main arterial territories or lying within the fields of supply of individual arteries. These cases illustrate the complex interplay of the vascular mechanisms operative in cerebral birth injury. The boundary zone lesions were considered to be due to a fall below critical level in the systemic blood pressure such as might have occurred in shock associated with birth injury. The second type of lesion was believed to have followed compression of arteries at certain preferential sites caused by the displacement of the brain substance during the process of birth. Such compression would be facilitated by a coincidental lowering of blood pressure and it is significant that in these brains, lesions of both types of distribution occurred together. In the second case, paraventricular softenings of the central white matter and pathological changes in the basal ganglia formed a pattern of cerebral damage attributable to obstruction of the great vein of Galen. In addition, the medial thalamic nucleus contained dense perivascular rings of myelinated fibres which differed from the appearances hitherto reported in état marbré.

(Authors' Abstr.)

Vivid Day-dreaming: An Unusual Form of Confusion Following Anterior Cingulectomy

A transient limited confusional state is described as occurring in 8 out of 10 patients after cingulectomy.

The condition consists essentially of an increased vividness of thoughts, dreams and phantasies, so that there is difficulty in distinguishing between mental events and happenings in the external world.

The possible neurological mechanisms involved are briefly discussed.

The Effects of Some Drugs on the Electrical Activity of the Brain

1. The effect of various drugs on the electrical activity of the brain has been studied (a) in the conscious animal carrying permanently implanted electrodes, (b) in acute preparations sectioned at high spinal or mid-brain level (encéphale and cerveau isolé respectively), (c) in the barbitone anaesthetized preparation.

2. The importance of studying the effects of drugs in conscious chronic preparations (in which changes in electrical activity can be observed simultaneously with behaviour) is

emphasized.

- 3. In the conscious animal, atropine and physostigmine caused a dissociation between electrical activity and behaviour. Atropine induced slow wave activity. This was similar to that seen in sleep; sleep, however, was never observed. Physostigmine led to an electrical pattern similar to that seen in the alert state, without a corresponding alerting of behaviour. The two drugs were mutually antagonistic.
- 4. I-Hyoscyamine produced effects similar to those of atropine. d-Hyoscyamine and neostigmine were ineffective, except when the latter drug was given in high enough doses to induce peripheral symptoms
- 5. Amphetamine and LSD-25 in the conscious animal led to an alerting of the EEG, and behavioural excitement, there being, in the case of these two drugs, close correlation between electrical activity and behaviour. The effects of amphetamine were independent of the environment, and depended on dosage only. The effects of LSD-25 depended on factors in the environment, as well as upon the drug itself.
- 6. In the acute preparations the effects of atropine were similar to those seen in the conscious animal, and were still present when either the upper spinal cord, or mid-brain were transected. Amphetamine caused alerting both of behaviour and electrical activity in the encéphale isolé, but had no effect on the cerveau isolé. LSD-25 had no effect on either of these preparations in the cat, but had some effect on the encephale isolé preparation in the monkey.

7. Atropine, physostigmine and LSD-25 modified the electrocortical patterns seen under barbitone anaesthesia. Amphetamine had no effect on barbitone induced activity. The depth of anaesthesia remained apparently unaffected by these drugs.

8. None of the effects described could be correlated either with changes in respiration,

or changes in systemic blood pressure.

9. The groupings of the drugs in relation to their effects on electrical activity and on behaviour in the conscious animal, and the levels of section in acute experiment, is discussed. An attempt has been made to relate the findings to the known distribution of the reticular activating system, and the physiology of the brain-stem. It is suggested that three types of receptors are present in the brain. The receptors for LSD-25 may be specially related to the medial collaterals of the great afferent pathways.

10. The possible operation of chemical fields within selected areas of the brain is discussed. (Authors' Abstr.)

VOL. 7  BRIT. J. DELINO.  The Juvenile Court and the Child. Younghusband, E	f Germany.	, 1957 181 196 206 228 242
	. Parker, S.	271 285 301 307 309
VOL. 30 BRIT. J. MED. PSYCHOL.  The Other Man's Point of View. Rodger, T. F.  The State of the Ego in Chronic Schizophrenia. Freeman, T., et al.  Screening for What? The Relevant Use of Psychological Tests in Medica  Harrower, M.  Discipline in the Home and Intellectual Development. Kent, N., and Davis	l Education.	9 19
Patterns of Anxiety: the Phobias. Dixon, J. J., et al.  A Note on Leshan and Worthington's "Personality as a Factor in the Pat Cancer". Macmillan, M. B.  Therapy and Social Training for the Feebleminded Youth. Günzburg, H.	hogenesis of	27 34 41 42
VOL. 48  BRIT. J. PSYCHOL.  Determinants of Emotionality in the Rat. I. Situational Factors. Broadhur The Assessment of Anxiety as an Intervening Variable in the Delinquent I M.D. Subjects. Galvanic Skin Response and Leg-persistence Indices.	st, P. L Behaviour of	1

•	
VOL. 9 EEG CLIN. NEUROPHYSIOL. FEBRUARY, 1957	
A Topographical Study of Conditioned EEG Reaction in Man. Gastaut, A., et al.	
The Electrical Responses of the Unanaesthetised Auditory Cortex in the Intact Cat.	
Whitfield, I. $\vec{C}$	
The Action of Anticonvulsant Drugs Tested by Electrical Stimulation of the Cortex,	
Diencephalon and Rhinencephalon in the Unanesthetized Rabbit. Gangloff, H.,	
and Monnier, M 43	
Variations in Arterial Pressure Caused by Epileptic Fits. Morin, G., and Corriol, J 59	
*Studies of Cerebral Circulation in Brain Injury. IV. Ischemia and Hypoxemia of the	
Brain Stem and Respiratory Center, Mever, J. S	
*A Measurable Neurophysiological Factor of Psychiatric Significance. Shagass, C 101	
Electroencephalogram in Narcolepsy. Daly, D. D., and Yoss, R. E 109	
The Ontogenetic Development of Steady Potential Differences in the Cerebral Cortex	
in Animals. Bures, J	
The Relationship of Alpha Amplitude to the Level of Palmar Conductance. Stennet, R. R. 131	
An Electromyographic Study of Induced and Spontaneous Muscle Cramps.	
Norris, F. H., jr., et al	

Studies of Cerebral Circulation in Brain Injury. IV. Ischemia and Hypoxemia of the Brain Stem and Respiratory Center

Concurrent studies of local blood flow, oxygen availability, steady potential (SP) and pH of the respiratory center and carotid body have been made together with continuous recording of blood pressure and respirations. The EPG electrode placed in the wall of the carotid artery records changes in the partial pressure of oxygen of the blood rather than

changes in oxygen saturation.

The first effect of anoxic anoxia is stimulation of respiration by the carotid body reflex, continued anoxic anoxia or ischemic anoxia damages the respiratory center, resulting in various patterns of dysrhythmia such as slowed respiration. Cheyne-Stokes breathing, apneusis, gasping and finally respiratory arrest. Incomplete anoxia of the respiratory center causes respiratory arrest due to a state of reversible anoxic neuronal paralysis. In this state of reversible paralysis the respiratory neurones continue to metabolize oxygen but at a reduced rate. Anoxic damage to the respiratory center is associated with local acidity and hyperemia. whenever respirations fail there is an accompanying injury potential (SP shift) of the respiratory center with respect to the spinal cord white matter.

Seven per cent. CO<sub>2</sub> and oxygen causes hyperpnea which appears to be mediated in the first few seconds by its action on the carotid body and later by its additional action on the

respiratory center.

Occlusion of the carotid arteries causes hyperpnea which is mainly due to resultant hypoxemia of the carotid body. There is an increased blood flow in the collateral circulation from the vertebral, basilar and dorsal spinal arteries. Occlusion of the vertebral arteries causes incomplete ischemic anoxia of the brain stem. Respiration continues because the posterior communicating arteries provide a collateral circulation. Additional occlusion of the carotid arteries causes medullary anoxia and respiratory arrest.

Repeated anoxia lowers the threshold of the respiratory neurones to its paralytic effects. Patterns of periodic breathing, resulting from ischemia or anoxemia of the brain under the conditions of these experiments, do not appear to be mediated by periodic fluctuations of oxygen availability of carotid body and respiratory center or rhythmic fluctuations in pH of the respiratory center. They appear to result from anoxic damage to various levels of the brain

stem and are reversible.

Brief carbon monoxide breathing lowers the oxygen saturation of the blood without reducing the partial pressure of blood oxygen, the oxygen dissolved in the plasma may provide a critical supply sufficient for the metabolic needs of the respiratory center as the normal oxygen carrying capacity of the blood is slowly restored.

## A Measurable Neurophysiological Factor of Psychiatric Significance

1. The sedation threshold is a clinical neurophysiological test, which determines the amount of intravenous amobarbital sodium required to produce certain EEG changes. accompanied by slurred speech. Previous investigations have shown the threshold to be related to several significant psychiatric variables, such as degree of manifest anxiety. The purpose of the present study was to further the aim of defining the neurophysiological factor, measured by the sedation threshold, by testing the hypothesis that the threshold is a function of the rate of depressant action of amobarbital on brain activity.

 An acceptable index of rate of depressant action was required to test the hypothesis.
 Analysis of data from 399 psychiatric patients and 45 non-patient subjects showed that the amplitude of frontal fast frequency activity, produced by amobarbital, could provide such an index. The mean amplitude at the threshold, which represents a particular level of depressant action, was approximately constant for groups of subjects with different thresholds. The rate of increase of mean amplitude, which could be taken as the index of depressant action, was amenable to quantitative expression as the slope of a rectilinear function, when the logarithm of amplitude was used in calculation. In confirmation of the hypothesis, there was a highly

significant inverse correlation between the sedation threshold and this index of rate of depressant action.

3. In contrast to the sedation threshold, fast frequency amplitude as an absolute value, either before the injection or at threshold, was not significantly related to psychiatric diagnosis. Amplitude at threshold was correlated with amplitude before injection, but neither value was significantly correlated with the sedation threshold.

4. From the conclusion that the sedation threshold is a function of rate of depressant action of amobarbital, it was suggested that it measures a time characteristic of neuronal activity, which is probably an important factor influencing cerebral excitability. The extent to which the sedation threshold findings agree with neurophysiological theories of psychiatric disorder derived from behavioral observation was considered. disorder derived from behavioral observation was considered.

VOL. 45 ENCEPH. Clinical Aspects of Recent Meningo-encephalitis of Unknown Origin but Deemed	1956
	1267
	1294
	1300
VOL. 59 FOL. PSYCHIAT. NEUR. NEUROCHIR. NEERL. DECEMBER,	
The Amygdaloid-Nuclear Complex. Magnus, O., and Lammers, H. J.  The Human Ego and Psycho-analysis. Dempsey, P. J. R.	555 583
The Human Ego and Psycho-analysis. Dempsey, P. J. R.  Root Syndromes and "Low Back Pain". Hanraets, P. R. M. J	599
VOL. 55 GENET. PSYCHOL. MONOGR. FEBRUARY, Academic Performance and Personality Adjustments of Highly Intelligent College	1957
Students. Horrall, B. M	3
The Use of the Vineland Social Maturity Scale in the Planning of an Educational Program for Non-Institutionalized Low-grade Mentally Deficient Children.	
Gottsegen, M. G	85
	1956
Studies on the Effects of Enteramine on the Central Nervous System. Ferro Milone, F., and Gomirato, G	449
Manifestations from the Central Nervous System during the Course of Pulmonary Tuberculosis, Encephalomyelitis and Tubercular Encephalitis. Rossini, R., and	
Alvisi, C	467
Calvi, L. A., and Terranova, R	503
Calvi, L. A., and Terranova, R	517
Short Considerations on the Clinical and EEG Aspects in Thirty Cases of Acute	
Infantile Encephalopathy. Corsino, G. M., and Lugaresi, E	569
Clinical and EEG Data in Cases of Infantile Epilepsy. Corsini, G. M., and Lugaresi, E. Chlorpromazine and the Neuro-vegetative System in Epileptics. Donegani, G., and	581
Sapegno, V	595
The Action of Diphenylhydantoin on the Vestibulo-cerebellar System. Vettori, D	621 675
The Syndrome of Ramsay Hunt with Paralysis of Several Cranial Nerves, etc.	695
Turinese, A	707
Neurological Symptoms Following Sympathetic Gangliectomy. Campanini, T., et al.	735
The Analytical Study of the Galvanic Skin Response during Examination with the	
Rorschach Test. Missaglia, A	751
An Experimental Contribution to the Study of Local Anaphylaxis of the Central	027
Nervous System. Andreani, G	827
VOL. 37 INTERNAT. J. PSYCHO-ANAL. NOVDEC., 1	1956
The Development of the Ego Concept in Freud's Work. Hartmann, H	425
Re-evaluation of the Process of Working Through. Greenacre, P	439
On Some Vicissitudes of Insight in Psycho-analysis. Kris, E	445
The Role of Identification in Psycho-analytic Procedure. Lampl-de Groot, J	456
Some Remarks on the Role of Speech in Psycho-analytic Technique. Loewenstein, R. M. The Nature and Function of the Analyst's Communication to the Patient. Rycroft, C.	460 469
	1956
Ideology, Personality, and Institutional Policy in the Mental Hospital. Gilbert, D. C., and Levinson, D. J.	263
Personality Structure and Group Structure: An Interpretative Study of Their Relation-	
ship Through an Event-Structure Hypothesis. Tannenbaum, A. S., and Allport, F. H.	272
Stimulus Generalization as a Function of Clinical Anxiety Rosenbaum G.	281

Scaling Norm Conflicts in the Area of Prejudice and Discrimination. Kogan, N., and	286
Development and Evaluation of a Scale for Measuring Social Acquiescence. Bass, B. M. Pride in Group Performance and Group-Task Motivation. Berkowitz, L., and Levy, B. I.	292 296 300
Effects of Work-Group Structure and Certain Task Variables on Group Performance.  Lanzetta, J. T., and Roby, T. B.	307
Effects of Glutamic Acid and Social Stimulation in Mental Deficiency. Chambers, G. S.,	315
Retention of Affectively Toned Verbal Material by Normals and Neurotics.	321
Reminiscence, Drive, and Personality Theory. Eysenck, H. J	328
	334 338
Relations of Temperament to the Choice of Values. Jones, L. V., and Morris, C	345
	350 356
Performance as a Function of Motive Strength and Expectancy of Goal-Attainment.	
	361 367
The Effects of Emotional Arousal on the Retention of Film Content: A Failure to	
Replicate. Maccoby, E. E., et al.	373
VOL. 54 JANUARY, 1	
Development and Validation of a Projective Measure of Power Motivation. Veroff, J. GSR Reactivity as a Function of Anxiety, Instructions, and Sex. Berry, J. L., and	I
Martin, B	9
The Relationships Among Imaginative, Direct Verbal, and Physiological Measures of Anxiety in an Achievement Situation. Raphelson, A. C	13
Conditioning of a Response Class on a Personality Test. Nuthmann, A. M	19
The Generality of Attitudes Toward Authority and Nonauthority Figures. Burwen, L. S., and Campbell, D. T.	24
Guessing Behavior and Autism. Solley, C. M., et al	32
Accuracy of Interpersonal Prediction as a Function of Judge and Object Characteristics.  Baker, B. O., and Block, J	37
*Differences Between Schizophrenic and Brain-Damaged Groups in Conceptual	
Aspects of Object Sorting. McGaughran, L. S., and Moran, L. J	44 50
The Effects of Group Expectations and Self-Esteem Upon Self-Evaluation. Stotland, E.,	
et al	55 64
Personality, Problem Solving, and the Einstellung Effect. Maher, B. A	70
On the Relation Between the Probability of a Word as an Association and in General Linguistic Usage. Howes, D	75
Looking at Occupations. Grunes, W. F	86
Age Differences in the Perception of Closure. Basowitz, H., and Korchin, S. J.	93 98
A New Look at Vigilance and Defense. Spence, D. P	103
Practice Effects in Reaction-Time Tasks in Brain-Injured Patients. Benton, A. L., and	109
Blackburn, H. L	114
Breadth of Deviate Concepts Used by Schizophrenics. Chapman, L. J., and Taylor, J. A.	118

Difference Between Schizophrenic and Brain-Damaged Groups in Conceptual Aspects of Object

This was a study of difference in object-sorting behavior between schizophrenic and brain-damaged groups with respect to two conceptual variables—amount of social agreement and order of conceptual classification. It was hypothesized that the brain-damaged group shows a significantly lower order of conceptual classification than does the schizophrenic

group.

The variable, social agreement, was scored in terms of the relative publicness-privateness.

The variable, order of classification, was scored in terms. of each conceptual sorting. The second variable, order of classification, was scored in terms of the number of attributes used in the definition. In addition to these two measures, five others were derived from the interaction of the two variables.

An analysis of covariance (controlling for intelligence) indicated that all six measures for which hypotheses were formulated yielded results in the predicted direction and that four of these mean differences were significant at the 01 level, or better. The greatest F ration was for the closed-open variable, in keeping with the major hypothesis. Differences on all of the measures, except public-private, were greatest between the schizophrenic and braindamaged groups with the results of the non-psychiatric group falling in between.

SIDDIOGRAFIT AND ETTOME	
VOL. 13 J. CLIN. PSYCHOL. JANUARY, Therapy with Physically and Mentally Handicapped Children in a Mental Deficiency Hospital. Mundy, L	1957 3
Changes in Adjustment of Institutionalized Female Defectives Following Group	9
Psychotherapy. Wilcox, G. T., and Guthrie, G. M Persuasive Doll Play: A Technique of Directive Psychotherapy for Use with Children.	_
Mann, L	14 20
Role and Status Structure in Therapy Groups. Talland, G. A	27 33
A Survey of "Referral Problems" in Metropolitan Child Guidance Centers. Gilbert, M. G. Some Features of Child Guidance Clinic Practice in the U.S.A. Phillips, E. L	37 42
Correlates of Certain Subjective Attitudes toward Self and Others. Fey, W. F.  The Specificity of the Psychiatric Interview. Hunt, W. A., et al	44 49
A Method of Assessing Capacity in Pre-school Cerebral Palsied Children. Kogan, K. L. Leisure Activities in Relation to Neuropsychiatric Diagnosis and Treatment.  Robertson, J. P. S.	54 56
Prediction of the Response of Chronic Schizophrenics to Drug Therapy. Ellsworth, R. B., and Clark, L. D	59
Individual Variance Score: An Index of the Degree of Differentiation of the Self and the Body Image. Journal, S. M., and Remy, R. M.  A Proposal for "Testing the Limits" with Mental Defectives for Purposes of Subtest	62
Analysis of the WISC Verbal Scale. Volle, F. O	64 68
A Comparison of Four Verbal Subtests on the Wechsler-Bellevue, Form I, and the WAIS. Dana, R. H	70
Preliminary Study of Comparison Between Wechsler Intelligence Scale for Children and Form L of Revised Stanford Binet Scale at Three Age Levels. <i>Harlow, J. E., jr., et al.</i> Popular Responses for the Despert Fables. <i>Peixotto, H. E.</i>	72 73
A Comparison of Rorschach and Howard Tests on a Schizophrenic Population. Scott, E. M., and Douglas, F	79
Some Advances in Interpretation of the Chromatic Phase of the H-T-P. Jolles, I. Rorschach Sex Responses and Overt Deviation. Cutter, F	81 83
Murphy, M. M	87 88 91
Education, Intelligence and Military Recruit Performance. Firestone, R. W A Note on Recall Patterns Using the Bender-Gestalt with Psychotic and Non-Psychotic Patients. Stewart, H. F	93 95
APRIL	
The Uniqueness of Configural Test Item Scores. Horst, P	107 115
Some Patterns of Depression. O'Connor, J. P., et al	122 126
Factor Analysis of a Particular Aspect of Behavioral Control: Impulsivity. Twain, D. C. The Altitude Quotient as a Measurement of Intellectual Potential. Brown, M. H., and Bryan, G. E.	133 137
Reactions of Men Under Stress to a Picture Projective Test. Cline, V. B., et al.  A Criterion Measure of Within-Hospital Change in Psychiatric Illness. Gordon, M. H., et al.	141
A Study of Functional Relationships among Measures of Anxiety, Ego Strength and Adjustment. Ends, E. J., and Page, C. W.	148
Relationship of Cornell Medical Index Responses to Post-surgical Invalidism. Bard, M., and Waxenberg, S. E	151
The Validity of Shoben's Parent Attitude Survey. Gordon, J. E	154 156
Differential Classification of Hebephrenic and Paranoid Schizophrenics from Case Material. Orgel, S. A	159
The Stability of Tree Drawings as Related to Several Rorschach Signs of Rigidity.	162
Relation between MMPI Scores and Musical Projective Test Scores. Sopchak, A. L. The Validity of Interpretive Signs of Aggression in the Drawing of the Human Figure.	165 169
Goldstein, A. P., and Rawn, M. L.  Stimulus-Determinants of Shading Responses. Eckhardt, W.	172
The Sentence Composition Test. Michaux, W. W. Structural Properties of Bender-Gestalt Test Associations. Tolor, A	174 176
Repeated Testing of Four Chronic Schizophrenics on the Bender-Gestalt and Wechsler Block Design Tests. Keehn, J. D.	179

Some Results Obtained by Electrical Stimulation of the Cortex of the Island of Reil in the Brain of the Monkey (Macaca mulatta)

of the Peripheral Vegetative Nervous System. Honjin, R. ...

1. The opercularized island of Reil in the lower primates (monkeys) represents the territory of the anterior Sylvian and anterior ectosylvian gyri of non-primates. In addition, monkeys have a fairly extensive non-opercularized island extending rostrally to the frontoorbital sulcus which apparently is the homologue of the presylvian sulcus of lower forms.

2. The covered insula enlarges through the primate series at the expense of adjacent territory, which includes rostrally that up to the fronto-orbital sulcus, which finally becomes part of the anterior limiting sulcus and the anterior ascending ramus of the lateral fissure in

3. As a result of this growth of the insular territory, the whole covered insula of monkeys lies immediately rostral to the central sulcus of the human island of Reil, probably within the short gyrus nearest the former sulcus, and is, by definition, part of the anterior insula of man, which has almost typical agranular isocortex.

4. Although somatic motor movements of the ipsilateral and contralateral face, and contralateral upper and lower extremities were obtained, in that sequence, by stimulating in rostrocaudal order the strip of island cortex covered by the temporal operculum, these results, obtained only with an inductorium in animals under ether narcosis, are not constant enough

to advocate the presence of a somatic motor field in the above mentioned region.

5. With ether and various barbiturates as anesthesia, use of a square wave stimulator produced responses only from the area which previously yielded upper extremity movements when the inductorium was used. The nature of these movements with the former stimulator was different. It was bilateral and can be best described as shivering, usually preceded by pil-erection over both shoulders and as far down as the upper two-thirds of the arm. Occasionally, arrest of respiration at inspiration and salivation were also observed from the same and adjacent areas.

(Author's Abstr.)

587

## Differential Growth of the Human Brain

1. The growth of the human brain is analysed by the differential growth equation. By this method the ratios of the specific growth rates (gradients of growth) of 14 dimensions of the brain were determined for the period from the end of the second fetal month to the adult

stage.
2. With two exceptions, the ratios of the specific growth rates of these dimensions are

constantly proportional throughout the period.

3. Each of the two exceptions, the corpus callosum and the width of the cerebellum, has two gradients of growth separated by an interphase. The interphase for the cerebellum occurs at the end of the 4th fetal month and for the corpus callosum at the end of the 5th fetal month. The interphase for the corpus callosum apparently coincides with the appearance of its full complement of nerve fibers. No morphological factor is known to be responsible for the cerebellar interphase.

4. Alterations in the shape of the brain during ontogeny result from changes in the relative proportionality of its components and the expression of the integration of these changes is the constant ratio between the specific growth rates of these components of the brain

NOVEMBER
Experimental Degeneration of the Vagus, and Its Relation to the Nerve Supply of the
Lung of the Mouse, with Special Reference to the Crossing Innervation of the
Lung by the Vagi. Honjin, R
Areal Distribution of Axonal and Dendritic Patterns in Inferior Olive. Scheibel, M.,
et al 21
Afferent Connections to the Sensory Trigeminal Nuclei, the Nucleus of the Solitary
Tract and Adjacent Structures. An Experimental Study in the Rat. Torvik, A. 51
Functional Recovery Following Alterations in Nerve-Muscle Connections of Fishes.
Sperry, R. W., and Deupree, N 143
An Oscillographic Study of the Central Pathways of the Vagus Nerve in the Cat.
Anderson, F. D., and Berry, C. M
*Subcortical Projections from the Temporal Neocortex in Macaca mulatta.
Whitlock, D. G., and Nauta, W. J. H
Localization of Brain Stem and Diencephalic Areas Controlling the Micturition Reflex.
Tang. P. C., and Ruch. T. C
Correlations Between the Physiological Changes and the Morphological Changes
Resulting from Axotomy in the Inferior Mesenteric Ganglion of the Cat.
Acheson, G. H., et al

## Subcortical Projections from the Temporal Neocortex in Macaca mulatta

Eight Macaca mulatta brains containing surgical lesions of various parts of the temporal neocortex were studied by the aid of the Nauta-Gygax staining technique for degenerative axons. All of the temporal areas studied were found to project to the ventral part of the putamen and to the pulvinar. Additional projections appeared as follows: the convexity of the superior temporal gyrus projects to the medial geniculate body, superior colliculus, intercollicular nucleus, and lateral region of the rostral midbrain tegmentum. Very sparse projections were traced to the pons and inferior colliculus. Projections from the temporal pole pass to the superior colliculus, zona incerta and adjoining parts of lateral midbrain tegmentum. The middle temporal gyrus projects to the tail of the caudate nucleus, to the pretectal area and superior colliculus, and through the inferior thalamic peduncle to the dorsomedial thalamic nucleus. The inferior temporal gyrus projects to the basolateral amygdaloid nuclei, substantia innominata and dorsomedial thalamic nucleus, and to the tail of the caudate nucleus, with minor projections to the reticular thalamic nucleus and zona incerta. Numerous afferents from the middle and inferior temporal convolutions contribute to the anterior commissure.

VOL. 49 J. COMP. PHYSIOL. PSYCHOL. OCTOBER Dark Adaptation in the Pigeon. Blough, D. S	, 1956 425
During Dark Adaptation in the Human Eye. Forbes, L. M., and Mote, F. A Foveal Luminance Discrimination as a Function of the Duration of the Decrement or	431
Increment in Luminance. Herrick, R. M	437
Manipulatory Motivation in the Infant Rhesus Monkey. Harlow, H. F., et al.	444
Learning Capacities of the Infant Rhesus Monkey. Mason, W. A., et al	449
Behavior Effects in the Offspring of Rats Subjected to Audiogenic Seizure During the	
Gestational Period. Thompson, W. D., jr., and Sontag, L. W	454
An Experimental Investigation of the Role of Psychological Factors in the Production	
of Gastric Ulcers in Rats. Sawrey, W. L., et al	457
The Effect of the Presence of the Mother on Abnormal Behavior in the Rat. Lubow, R. E.	
and Marcuse, F. L	462
The Effect of a Conflict Situation on Learning Ability in Two Strains of Inbred Mice.	
King, J. A., and Mavromatis, A	465
Time Discrimination and Behavioral Interaction in a Free Operant Situation. Murray, S.	469
Speed of Running as a Function of Goal-Box Behavior. Kling, J. W	474
Learning Without Response Under Two Conditions of External Cues. McNamara, H. J.,	
et al	477
Visual Discrimination Learning as a Function of Shock-Fear and Task Difficulty.	401
Hammes, J. A	481
The Relationship Between Training Methods and Reward Variables in Brightness	485
Discrimination Learning. McKelvey, R. K	463
Simple Color Discrimination in Chimpanzees: Effect of Varying Contiguity Between	492
Cue and Incentive. Jarvik, M. E	472
Secondary-Reinforcement Stimulation Throughout a Series of Spontaneous Recoveries.	496
Miles, R. C	
Problem-Solving Behavior of Monkeys as a Function of Work Variables. Davis, R. T. Runway and Maze Behavior Controlled by Basomedial Forebrain Stimulation in the	
Rat. Olds, J	507

Studies in the Neurophysiology of Learning: III. Further Data on the Effect of Brain Stimulation During Black-White Discrimination on Learning Behavior in the White Rat. Gengerelli, J. A., and Mower, R. D	513 516
Riesen, A. H., and Mellinger, J. C	521
The Effects of Cranial X Radiation on Retention of Maze Learning in Rats. Blair, W. C., and Arnold, W. J.	525
DECEMBER Relearning Tests for Interocular Transfer Following Division of Optic Chiasma and	
Corpus Callosum in Cats. Sperry, R. W., et al	529
Effect of a Glaring Light Source on the Human Electroretinogram. Crampton, G. H. Discrimination Reversal Learning in Marmosets. Cotterman, T. E., et al	534 539
Patterning Effect of the Nonreinforcement-Reinforcement Sequence in a Discrimination Situation. Grosslight, J. H., and Radlow, R	542
The Effect of Problem Difficulty on Discrimination Reversal. Hoffman, F. K., et al	547
The Effects of Hunger and Familiarity of Locale on Exploration. Fehrer, E Effects of Drive Level and Experience on the Reward Value of Saccharine Solutions.	549
Smith, M. P., and Capretta, P. J	553
Drive. Chambers. R. M	558
Some Physiological Bases for Reinforcing Properties of Reward Injections.  Chambers, R. M	565
The Relative Acceptability of Sodium Chloride Solutions as a Function of Concentration and Water Need. Young, P. T., and Falk, J. L	569
Effect of Extinction of Dipper-Approaching on Subsequent Extinction of Bar-Pressing	
and Dipper-Approaching. Ratner, S. C	576
Numbers of Reinforcements. Kobrick, J. L	582
Proportional Reinforcement of Irrelevant Stimuli and Transfer Value. Babb, H. Investigations of the Behavior of Paramecium Aurelia: II. Modification of a Response in	586
Successive Generations of Both Mating Types. Gelber, B	590
(Nuclear Reorganization). Gelber, B., and Rasch, E	594
The Effect of Total-Body X Irradiation on Delayed-Response Performance of Dogs. DiMascio, A., et al	600
VOL. 50 FEBRUARY	1957
Thirst-Reducing Effects of Water by Stomach Fistula vs. Water by Mouth Measured by	1
Both a Consummatory and an Instrumental Response. Miller, N. E., et al.  Imprinting: The Interaction of Learned and Innate Behavior: II. The Critical Period.	1
Jaynes, J	6 11
Learning Set in Preschool Children. Shepard, W. O	15
A Discrimination Based upon Repeated Conditioning and Extinction of Avoidance Behavior. Boren, J. J., and Sidman, M.	18
Patterning Effect of the Nonreinforcement-Reinforcement Sequence Involving a Single Nonreinforced Trial. Grosslight, J. H., and Radlow, R.	23
The Behavior of Cats on the Double-Alternation Problem. Stewart, C. N., and	26
An Experimental Comparison of Secondary Inhibition and Secondary Reinforcement.	
Levy, N	29
of Primary Reward Amount. Lawson, R	35
Barnes, G. W., and Kish, G. B	40
An Exploration of Somatic Response Patterns: Stimulus and Sex Differences.  Davis, R. C., and Buchwald, A. M.	44
The Pattern of Somatic Response During a Repetitive Motor Task and Its Modification	53
by Visual Stimuli. Davis, R. C., et al	
et al	61
and Duffy, M	65
Modification of Sexual Behavior of the Male Albino Rat. Hayward, S. C A Comparison of the Effects of Medial and Lateral Cerebral Resections on Conditioned	70
Avoidance Behavior of Monkeys. <i>Pribram, K. H., and Weiskrantz, L.</i> Effects of Prefrontal Lobotomy on Conditioned Fear and Food Responses in Monkeys.	74
	81

1957]	BIBLIOGRAPHY AND EPITOME	883
	and the Human Blink Rate. King, D. C., and Michels, K. M rink, and Tobacco Deprivation on the Conditioning of the Eyeblink	113
Response. From The Effect on Prob		117
	erties of Frustration: III. Relation of Frustration Effect to Antedating	121
Anchor Effects in Stimulus Generali	Amsel, A., and Hancock, W	126 132
Guttman, N. Dynamic Contour	Perception. Smith, W. M., and Gulick, W. L.	139 145
VOL. 89 The Effect of a Se	J. GENET. PSYCHOL. DECEMBER, stries of Electroconvulsive Seizures on Some Measures of Activity in	1956
A Functional App	ino Rat. Stern, J. A	141 153
Beach, F. A., The Relationship Patterns of Aggres		165 183 199
Simpson, A. I. The Structural Asp Age and Suitability	D., jr	213 221 231
Crandell, V. J	Personal-Social Adjustments of a Group of Middle-Class Mothers.	239
Richardson, H	d Status in Reading and Arithmetic of Delinquent Children. I. M., and Surko, E. F	251
	ge. Angelino, H., et al	263
VOL. 56 Perceptual Autism	JANUARY, and Children. Solley, C. M., and Sommer, R	1957 3
Comment Upon T The Development	Three Dimensions of Self-Attitude and Anxiety. Albert, R. S. of a Test of Criminal Cant. Russell, H. E., and Bendig, A. W. Word Variety and Mean Letter Length of Words with Chronological	13 21
Reward vs. Punish	Ages. Smith. M. E	27 45
The Function of the Net Discriminator	he Mosaic Test in Clinical Practice. <i>Johnson</i> , T. F ry Reaction Potential as a Function of Stimulus Separation Along	51
Higher-Order Con	Stimulus Continuum. Passey, G. E. ditioning in the Monkey. Murphy, J. V., and Miller, R. E	59 67
Gruen, A	evaluation of Witkin's Perception and Perception-Personality Work.	73
Schizophrenic	E Emotional Tone of Words Upon the Vocabulary Responses of S. Richman, J	95
	on Response. Adams, J. A	121
VOL. 123	J. NERV. MENT. DIS. MAY, of Psychoanalysis to the Medical Study of Behavior. Rado, S	1956 421
Prognosis in Head	Injuries in Children. Fabian, A. A	428 432
Korsakoff and We	ernicke Syndromes: History and Treatment. Sikes, Z. S	448
	Hemiplegia and Athetosis. Stanley-Jones, D. d. Mental Disease Among Negroes in New York State. Malzberg, B.	452 457
Borderline States.		466 473
*Chlorpromazine	(Thorazine) and Reserpine in Residential Treatment of Neuro- isorders in Children, Miksztal, M. W	477
Seasonal Variation	n in Military Neuropsychiatric Admissions. Chambers, W. N. nal Reflexes Can be Formed to Pain but Not to Acetylcholine.	480
Teitelbaum, H	I. A., et al	484 491
	Thorazine) and Reserpine in Residential Treatment of Neuropsych	
Disorder in		

In this study of the 74 children treated with reserpine or Thorazine, marked or moderate improvement has occurred in 65 to 81 per cent. of the cases, depending upon type of diagnostic group and the particular drug. It can be concluded that chemotherapy seems to be of definite value as an adjunct in the treatment of schizophrenic children. Although by its action, the

drugs do not alter the schizophrenic process, they can eliminate or reduce to a great extent the intensity of emotional tension and anxiety which makes the patient more amenable to other types of therapy, including psychotherapy. The tranquilizing action of these drugs in the group of other functional-and-personality disorders produced positive changes in behavior patterns. The use of any form of physical restraints has been eliminated completely as well as sedatives; there is no need or indication for electric shock at the present time.

(Author's Abstr.)

JUNE	
Current Pathway and Neurophysiologic Effects of Electrically Induced Convulsions.	
Aird, R. B., et al	505
Mental Danger, Stress and Fear. Meerloo, J. A. M	513
The Complex of Frustration. Bull, N., and Strongin, E	531
Investigation of Relationships Between "Psychometric" and "Biological" Intelligence.	
	536
*Studies on Mescaline. V. Electroencephalographic Evidence for the Antagonism	
Between Mescaline and Chlorpromazine Hydrochloride. Merlis, S., and	
Denber, H. C. B	542
Goals of Short-Term Group Psychotherapy. Kotkov, B	546
Promazine Hydrochloride in the Treatment of Chronic Catatonic Schizophrenics.	
	553
Manager C W and Walk W W	553
*Mangun, C. W., and Webb, W. W.  *Further Studies of the Psychological Effects of Frenquel and a Critical Review of	553 557
Mangun, C. W., and Webb, W. W	
Mangun, C. W., and Webb, W. W.  *Further Studies of the Psychological Effects of Frenquel and a Critical Review of Previous Reports. Clark, L. D  The Effects of Cortisone on LSD-25 Intoxication in Schizophrenic Patients. Clark, L. D.,	
*Further Studies of the Psychological Effects of Frenquel and a Critical Review of Previous Reports. Clark, L. D	557
Mangun, C. W., and Webb, W. W.  *Further Studies of the Psychological Effects of Frenquel and a Critical Review of Previous Reports. Clark, L. D.  The Effects of Cortisone on LSD-25 Intoxication in Schizophrenic Patients. Clark, L. D., and L. S.  Carbon Dioxide Therapy. Frank, J. A., and McGraw, R. B.  Mothers of Schizophrenics. Galvin, J.	557 561 563 568
Mangun, C. W., and Webb, W. W.  *Further Studies of the Psychological Effects of Frenquel and a Critical Review of Previous Reports. Clark, L. D.  The Effects of Cortisone on LSD-25 Intoxication in Schizophrenic Patients. Clark, L. D., and L. S.  Carbon Dioxide Therapy. Frank, J. A., and McGraw, R. B.  Mothers of Schizophrenics. Galvin, J.	557 561 563
Mangun, C. W., and Webb, W. W.  *Further Studies of the Psychological Effects of Frenquel and a Critical Review of Previous Reports. Clark, L. D.  The Effects of Cortisone on LSD-25 Intoxication in Schizophrenic Patients. Clark, L. D., and L. S.  Carbon Dioxide Therapy. Frank, J. A., and McGraw, R. B.  Mothers of Schizophrenics. Galvin, J.  Psychosis Following Lumbar Puncture. Weiland, I. H., and Trosman, H.	557 561 563 568

Studies on Mescaline. V. Electroencephalographic Evidence for the Antagonism Between Mescaline and Chlorpromazine Hydrochloride

1. In a group of 21 epileptics the injection of chlorpromazine hydrochloride served to

potentiate the abnormality of the brainwave patterns.

2. Chlorpromazine hydrochloride in 25 schizophrenic patients serves to antagonize the clinical and electroencephalographic effects of mescaline sulfate.

3. Evidence is submitted to suggest the hypothesis that chlorpromazine hydrochloride by its depressant effects on the reticular masses serves to produce an accentuation of paroxysmal and dysrhythmic activity by the removal of the inhibitory activity of the reticular substance.

(Authors' Abstr.)

Further Studies of the Psychological Effects of Frenquel and a Critical Review of Previous

Treatment of schizophrenic patients with oral and intravenous Frenquel failed to confirm claims that this drug has "anti-delusional" or "anti-hallucinatory" effects on such cases. The drug was of no therapeutic value in the patients treated. Even large doses did not modify

their behavior or mental symptoms in any consistent way.

A small series of patients with toxic delirium was treated with intravenous Frenquel.

No evidence was obtained that the drug has predictable or consistent effects upon the

hallucinations or other mental abnormalities associated with such mental disturbances. Studies on the effects of Frenquel on LSD-25 intoxication in experimental subjects failed to confirm reports that premedication with this drug "blocks" LSD-25 intoxication or that it exerts a specific suppressive effect when given intravenously at the height of the intoxication. In self-experiments with mescaline sulfate, the author found no subjective evidence that premedication with Frenquel modifies the nature or duration of mescaline intoxication. (Author's Abstr.)

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VOL. 20
                                        J. NEUROPHYSIOL.
                                                                                    JANUARY, 1957
Corticifugal Influences on Intrinsic Brainstem Conduction in Cat and Monkey.
Adey, W. R., et al.

A Servoanalytic Study of Consensual Pupil Reflex to Light. Stark, L., and Sherman, P. M. Electric Potentials Occurring Around a Neurone During its Antidromic Activation.
                                                                                                       17
Sequence of Events in Synaptic Activation of a Motoneurone. Fatt, P.
                                                                                                       61
Circus Movements and Excitation of Striatal and Mesodiencephalic Centers in Rabbits.
     White, R. P., and Himwich, H. E.
*Shivering as a Result of Brain Stimulation. Birzis, L., and Hemingway, A.
                                                                                                       91
Influence of Stimulation of Some Subcortical Areas on Electrocardiogram.

Korteweg, G. C. J., et al.
                                                                                                     100
                                                                                                     108
Role of Auditory Cortex in Discrimination of Changes in Frequency. Butler, R. A., et al.
```

Shivering as a Result of Brain Stimulation

Electrical stimulation at 21 sites in the brain stem of five cats under light barbiturate anesthesia caused tremor having the characteristics of natural shivering. The positive stimulation sites lay within the lesion-determined "shivering pathway" in the midbrain and pons. The positive hypothalamic stimulation site was located in the medial part of the tuberal hypothalamus, between the mammillothalamic tract and the fornix.

(Authors' Abstr.)

MARCH	
*Studies on Amygdaloid Nucleus of Cat. Shealy, C. N., and Peele, T. L	12:
Activity of Anterior Suprasylvian Gyrus in Response to Transcallosal Afferent Volleys	
Peacock, S. M., jr	140
Efferent Brain Discharge During Shivering. Birzis, L., and Hemingway, A	15
Antidromic Action Potentials in Lateral Geniculate Body. Vastola, E. F	16
Receptor Potential of Vertebrate Retina. Motokawa, K., et al	18
*Identification of Neurones Giving Burst Response in Isolated Cerebral Cortex.	
Burns, B. D., et al	20

Studies on Amygdaloid Nucleus of Cat

- 1. Stimulations of the amygdala in the unanesthetized cat have been carried out. The responses observed have been autonomic, somatic, and behavioral, this last combining the former two. Electrolytic destruction of the amygdala has been attempted.
- 2. Pupillary dilatation, salivation, increased gastric acidity and peristalsis, micturition, and defecation have been produced.
- 3. Ovulation, increase in uterine contractions, and initiation of labor in the pregnant cat, have been observed. Erection and ejaculation were produced in one animal.
- 4. Somatic activities observed have included turning of the head, facial movements, jaw movements, and tongue movements.
- 5. Behavioral responses elicited have been a state of alert attention, a reaction of fear, or one of undirected rage.
- 6. Complete circumscribed destruction of the amygdala was not obtained in any animal.

  Almost complete and circumscribed, bilateral destructions, however, did not result in illtempered animals or in hypersexed animals in any instance.
- 7. The amygdala has anatomical and functional relations with the hypothalamus which may or may not be the exclusive channel for the expression of amygdala effects. Specific, isolated functional localizations in the amygdala probably do not exist. Patterns of behavioral activity are probably co-ordinated in the amygdala.

(Authors' Abstr.)

Identification of Neurones Giving Burst Response in Isolated Cerebral Cortex

- 1. An attempt has been made to identify histologically type-B cells (7) of the cat's neurologically isolated cerebral cortex.
- 2. Cells were detected with the tip of a metal microelectrode pushed slowly through the

- Cells were detected with the tip of a metal microelectrode pushed slowly through the cortical grey matter, and type-B cells were located by physiological tests.
   Marks for histological identification were then made in the vicinity of these cells.
   The results show that the largest type-B cells have their somata in layer V although there are some cells of this type throughout layers II, III, IV and the upper part of VI.
   The somata of type-B cells are among the largest cell bodies in any layer.
   Although the connections of the primary type-B cell network appear to lie in layers IV and V, the largest pyramidal cells of layer V are not part of this primary network. Their main function apparently is to convey excitation received from the primary type-B cells out of the cortex. of the cortex.

VOL. 20	J. NEUR. NE	UROSURG. P	SYCHIAT.	FEBRUARY.	1957
Abnormal Immunolog	gical Reactions in I	Disseminated So	clerosis. Smith, I	H. V., et al	1
Loss of Recent Mem	orv after Bilateral	Hippocampal	Lesions. Scovil	le. W. B., and	
					11
The Recurrence of In	tracranial Meningic	mas after Surg	rical Treatment.	Simpson, D.	22
A Variety of Paramyo	otonia Congenita. F	rench, E. B., a	nd Kilpatrick, R.	• • • • • • • • • • • • • • • • • • • •	40
A Simplified Neurosu	rgical Technique fo	r Approaching	and Damaging	the Region of	
	lus in Parkinson's I				47
An Unusual Form of					
					50
Some Relationships I	Between Peripheral	Vasomotor ar	nd EEG Change	s. Ackner. B.,	
	G				58
Conduct Disorders in	Epileptic Children	Grunberg, F.,	and Pond, D. A.	• • • • •	65
		,	,		_
					Ωn

886	BIBLIOGRAPHY ANI	D EPITOME	į'	Oct.
VOL. 16	J. NEUROPATH. E	EX. NEUR.	JANUARY,	1957
Editorial—Neuropatholog X-ray Induced Pyknosis of	y in Western Europe. We	ril, A		1
by Barbiturate Anesth Neurological Structure a	esia. Alvord, E. C., jr., and Relationships as Re	nd Brace, K. C. evealed by Electron	Microscopy.	3
Farquhar, M. G., and Histochemical Studies on	Hartmann, J. F			18
Following Electric She Histogenesis of Compoun	ock. Shimizu, N., and Kul	bo. Z		40
and a Note on the Int The Induction of Exacerba	luence of Cortisone. Field	d, E. J		48
and Clark, G Diffuse-Disseminated Scler Tremor on Stimulation			eration of the	57 61
	ım. Wycis, H. T., et al.			79
	s. Allam, M. W., et al.			85
Reske-Nielsen, E.			<b>.</b>	89
The Relative Participation Spasms. Hagamen, W	. D., and Beals, R. L.			95
Alterations in Čell Struc Chason, J. L., et al.		Increase in Intracra	inial Pressure.	102
VOL. 43 Symbolic Mediation and	J. PSYCHO Organization of Though		JANUARY, Approach by	1957
Means of the Line Sc Behavior in a Free Choic	hematization Technique.	Werner, H., and Kap	olan, B	3
Brown, C. R Differentiation Between In				27
With Other Methods. Vitamin Deficiencies in M	Wysocki, B. A			41 47
Emotional Associations W Two Methods for Generat	ith Air and Rail Transpo	rtation. <i>Bennett</i> , E. I	M., et al	65
and Lawrence, D. H. Lethal Interaction of Chlorida.	roromazine and Electroco			77 101
The Young East German and Audiogenic Seizures and t	and Soviet Defector: A R	eport on Similarities	. London, I. D.	103 111
Contributions to a Learni A Further Test of the R	ng Theory Account of Cl ole of Drive Reduction	hildhood Autism. <i>Ph</i>	ilips, E. L	117
Zeaman, D., and Weg Efficient Retention and Tr	ner, N		zus, R. H., and	125
Schwartz, R. J A Methodological Discuss	ion of Nonverbal Behavi	or. Ekman, P.		135 141
A Normative Study of the Dallek, J. I.		ference Schedule. All	en, R. M., and	151
The Effect of Repetition U			H. K	155
VOL. 2 A Study of Intestinal F	J. PSYCHOM. Repercussions of Emotion		MARCH, igmoidography.	1957
Quarti, C., et al Somatotypes and Psychos	omatic Diseases Branwer			1 23
Peptic Ulcer and Alcoholi	sm. <i>Hagnell, O., and Wre</i>	etmark, G		35
Clinical Psychiatric Studie The Influence of Stress on				45 56
The Menstrual Cycle and	its Disorders in Psychiati	ric Patients. Gregory,	B. A. J. C	61
VOL. 45	J. SOC. PSYC	CHOL.	FEBRUARY,	
Complementary Theories A Variational Approach t	of Safety Psychology. Ke o Empathy. Luchins. A. S	rr, w S		3 11
Theoretical Implications  Ballmann, C	for a Psychology of the	he Ludicrous. Lucil	le, S. A., and	19
Some Variables in Buzz S	essions. Vinacke, W. E.			25
Brothers Under the Skin:	A Validity Test of the F-S	Scale. <i>Wells. W. D.</i>	et al	35
The "Source" Dimension The Effect of Intelligence:				41
Calvin, A. D., et al. The Validity of Clinical	-	-	-	61
Parole. Miles, D. W. Consistency Test of Psy				75
Behavior. Bilkey. W.		mvorveu in Consun	er emenasing	81

1737]	DIDLIOGRAFHI AND EFITOME	007
A Scale to Measure V Authoritarianism and Reliability, Validity,	tion as an Index of Group Tension. Grace, H. A., and Tandy, M. J. World-Minded Attitudes. Sampson, D. L., and Smith, H. P Attitudes Toward Children. Gallagher, J. J	93 99 107 111
VOI 22	J. SPEECH HEAR. DIS. MARCH,	1057
	mpression Upon the Comprehension of Connected Speech.	10
Auditory Comprehen	al	20
Auditory Compreher	rbanks, G., et al	23
Obsessive-Compulsive	Reactions in Stutterers. Bloodstein, O., and Schreiber, L. R.	33
	Stutterers' Reactions to Speech Situations. Trotter, W. D., and	,,,
Reramann M F	ratterers reactions to specen situations. Trotter, W. D., unu	40
Effect of Speech on M	etabolism: A Comparison Between Stutterers and Non-Stutterers.	40
McCroskey, R. L	ir	46
Social and Emotional	, jr	53
Hearing Loss in Aph	isia. Street. B. S.	60
Home Teaching of	asia. Street, B. S	•
Bennett, D. M. N		68
Survey of Families	Enrolled in the John Tracy Clinic Correspondence Course.	
		75
Recognition of Intelli	al	87
Recruitment in Ears V	ith Abrupt Loss of Acuity for High Frequencies. Hedgecock, L. D.	91
	Defects Among the Institutionalized Mentally Retarded.	
		98
Graduate Theses in S	and Gottsleben, R. H	104
VOL. 7	NEUROL. JANUARY.	1957
	'emporal Lobe' Epilepsy. de Jong, R. N	i
*Face and law Mov	ements During Epileptiform Discharge in Temporal Regions.	•
		15
*Laughter in Enilensy	l	26
Palatal Myoclopus H	Termann, C., et al	37
Further Observations	fermann, C., et al	52
Cingulate Gyrus Seizi	ares. Andy, O. J., and Chinn, R. Mc	56
Cingman Office Demi		

DIDITIOCDADUV AND EDITOME

# Face and Jaw Movements During Epileptiform Discharge in Temporal Regions

In certain primates, repetitive stimulation of one mesial temporal region is followed by ipsilateral facial movements. This intense electrical stimulation induces an after-discharge which can be recorded from the opposite mesial temporal structures. The further electrographic effects of the after-discharge can also be recorded from temporal, parietal, and frontal cortex. It can be established easily at low voltages, and once established it continues for a time. During this period consciousness is altered, the face, jaw, head, and contralateral upper extremity move, and the animal may salivate or lacrimate. Occasionally the ipsilateral grimace occurs before consciousness is altered. There is usually a concomitant tachycardia and an initial inspiratory arrest.

In certain patients, focal epileptiform activity is followed by ipsilateral facial movements. This has been observed in six cases in which the epileptogenic lesion was localized in the mesial temporal region. These ipsilateral movements occurred as initial phenomena in the habitual ictal sequence of these patients. However, facial movements which occur in the ictal progression of a temporal lobe sequence are more commonly bilateral. When the initial movements of the face are one-sided, they may occur on the same side as the significant epileptogenic lesion which lies deep within the mesial temporal region.

(Authors' Abstr.)

007

# Laughter in Epilepsy

10571

Eleven patients with laughter as an epileptiform manifestation have been described. The laughter varied from violent prolonged laughter lasting two minutes or so to giggling and even grinning. The epileptic origin of the laughter was indicated by the lack of any external precipitant, by the nature of the laughter, by concomitant manifestations of epilepsy, and by response to anticonvulsant medication. The clinical and the electroencephalographic picture of these patients showed much variation, but in general indicated the probability of an organic lesion of the brain as the causative factor. The possible role of the hypothalamus in the production of this seizure manifestation has been discussed.

# **FEBRUARY**

I EDICOMI	
*Neurologic Guides to Prognosis in Asphyxia and Anoxia. Tarlov, I. M., and Brace, D.	75
Spontaneous Subarachnoid Hemorrhage. Rowley, J. F., et al	86
Determination of Retinal Artery Pressures in Diagnosis of Carotid Artery Occlusion.	
Heyman, A., et al	97
Seizure States and Pregnancy. Suter, C., and Klingman, W. O	105
Effect of Diamox on C.S.F. Pressure of Cat and Monkey. Knopp, L. M., et al.	119
Collateral Regeneration from Residual Motor Nerve Fibres in Amyotrophic Lateral	
Sclerosis. Wohlfart, G	124

#### Neurologic Guides to Prognosis in Asphyxia and Anoxia

Neurologic examination of patients who have suffered from respiratory arrest or obstruction occurring during or immediately after operation may provide important clues to prognosis. The authors' own experience with such cases has led to the following conclusions, which would appear to apply to patients suffering from cardiac arrest or anoxia from other causes.

would appear to apply to patients suffering from cardiac arrest or anoxia from other causes.

1. The occurrence of fixed and dilated pupils and generalized extensor rigidity indicates a severe irrecoverable degree of neuronal damage at the brainstem level, and is, in the authors' experience, incompatible with survival. The appearance of either fixed and dilated pupils or marked generalized extensor rigidity alone is of very grave prognostic significance. Such patients may survive, but serious sequelae may appear.

2. Delayed awakening from anesthesia or asphyxia without abnormal neurologic signs other than mental confusion or impaired memory indicate mild reversible damage at a

superficial cortical level and full recovery may be expected.

3. Prognosis is less certain in the intermediate group of patients who show abnormal motor or sensory signs. Survival usually occurs in these patients, and, although there may be recovery which may continue for months, serious sequelae, such as impaired mentality or vision, ataxia, motor or sensory abnormalities, may persist. However, coma that is prolonged more than two or three days is of very serious significance and is often followed by death or serious neurologic after-effects.

(Authors' Abstr.)

VOL. 30	PSYCHIAT.	<b>QUAR</b>	T.			осто	BER,	1956
Sigmund Freud: 1856-1956. Brace		-						561
Reactions to Untimely Death. Leh								564
Psychotherapeutic Evolution and I	ts Implication	s. Kolb.	L. C.	• •				579
Yurok Shell Money and "Pains":	A Freudian I	nterpret	ation. 1	Posinsk	y, S.	Н.		598
*Preliminary Evaluation of a New	Phenothiazir	ie Deriv	ative-	NP207	i. Mai	litz, S.,	and	
Hoch, P. H								633
*The Management of Side Effects	of Chlorprom	azine aı	nd Rese	erpine.	Sainz	, A. A.		647
Intent. Mettler, F. A	·							654
Resistance to Lysergic Acid in Sch	izophrenic Pa	tients. (	Cline, F	I. S., a	nd Fre	eeman,	Н.	676
Community Responsibility for Me	ental Health i	in Brita	in, the	Nethe	rlands	and I	New	
York State. Hunt, R. C				••	••	••	••	684

Preliminary Evaluation of a New Phenothiazine Derivative—NP207

1. NP207 appears to have definite beneficial effects in the reduction of tension. It seems to diminish anxiety with fewer side effects than chlorpromazine.

2. Although an insufficient number of patients received both drugs to make a direct comparison, it is the writers' impression that chlorpromazine in equivalent doses is somewhat more effective in reducing anxiety and tension than NP207

more effective in reducing anxiety and tension than NP207.

3. NP207 and BOL 148 combined did not show a superior action in the reduction of tension over NP207 alone. Higher doses and a larger series with a different patient group might give better results however.

4. Because of the development with this drug of symptoms resembling retinitis pigmentosa, further research should be undertaken only with extreme caution.

(Authors' Abstr.)

## The Management of Side Effects of Chlorpromazine and Reserpine

In the writer's experience, a great number of patients fail to show improvement with either chlorpromazine or reserpine because the dosage is insufficient, or too little is given when side effects appear, or therapy is discontinued because of the side effects. About 50 per cent of such patients can receive proper dosages when the side effects are counterbalanced symptomatically; and such patients have shown marked improvement or have recovered. It is strongly, felt, therefore, that great attention should be placed on the neutralization or palliation of side effects, through ancillary medication and nursing techniques—rather than abandon therapy or reduce dosage below therapeutic levels. This is particularly in view of the fact that—save in few and far-between instances—the side effects are merely bothersome, not injurious, and severe complications are few.

It is recognized that side effects cannot be overcome in every instance. Yet the writer's experience has shown that in general they can be mitigated, at least to the point of making them bearable. By this means, more patients may expect relief from their psychiatric problems

and the drugs may be used more effectively and economically. The implications of this are of extraordinary importance, not only for intramurally-treated patients, but for those under-

extraordinary importance, not only for intramurally-treated patients, but for those undergoing ambulatory and outpatient treatment.

No attempt has been made here to cover all the known side effects of the tranquillizing drugs, but the more general or significant ones have been described and their handling outlined. Other solutions of these problems are, of course, possible and conceivable, and depend only on the ingenuity exercised by the individual physician. The dosages given are only illustrative, both those of the drugs and of the corrective medication. It must be emphasized that dosage depends principally on the individual response and not on the medication per se.

(Author's Abstr.)

(Author's Abstr.)
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phosphorylation from respiration as a common mechanism of action of anesthetic and hypnotic agents.

5. Acetaldehyde produces a limited degree of uncoupling, but does so in concentrations approximating those occurring in vivo both normally and following the disulfiram-alcohol

6. The implications of these findings for the mechanism of the neuropharmacologic actions of alcohol and acetaldehyde are discussed.

VOL. 18  MARCH, 19  Effects of Alcoholic Beverages on Skin Conductance. An Exploratory Study.	)57
Carpenter, J. A	1
Individual Differences in Behavior and Alcohol Consumption in the Rat. Tobach, E.	19
The Effect of Alcohol on Urethritis. Tyler, D. E	30
A Study of the Process of Affiliation with Alcoholics Anonymous. Trice, H. M.	39
Drinking Among Andean Indians. Mangin, W	55
Characteristics of Male Alcoholics Admitted to the Medical Ward of a General	
Hospital. Falkey, D. B., and Schneyer, S	67
A Follow-Up of Alcoholics Committed to a State Hospital. Selzer, M. L., and	
Holloway, W. H	98
	121

The Use of Gangioplegics in High Dosage in Neuropsychiatry. Manganzani, L.

1375

1957] BIBLIOGRAPHY AND EPITOME	891
VOL. 4 REV. ALCOOL. Symposium on the Ambulatory Treatment of Alcoholism	1956 93
The Organisation of the Normal and Pathological EEG. Lairy, G. C	, 1956 749 04–904
NOT OF THE V	1056
VOL. 95 The Respiratory Form of Acute Porphyria. Bonduelle, M., and Mollaret, P Nodular Encephalitis of Subacute Type Associated with Anatomoclinical Signs of	1956
Polyneuritis. Alajouanine, T., et al	20 37
On a Congenital Pigmentary Syndrome. Dockx, L., et al	48
AUGUST	
Considerations on Intracranial Metastases After 107 Cases Verified Histologically.  Petit-Dutaillis D., et al	89
Remarks on a New Observation of Acute Necrosing Encephalitis with Inclusions.	07
Recordier, M., et al	116
Absence of Senile Plaques and Angioarchitectomic Conditions in the Allocortical Cerebral Cortex HD of Von Economo. Wildi, E., and Gregoretti, L	137
Familial Tetanus and the Pseudo-parathyroid Syndrome of Albright. Behague, P., and	
Some Factors Supporting the Allergic Conception of Multiple Sclerosis and of Certain	150
Cases of Myelitis. Patrikios, J. S	162
GERTEL AND	
SEPTEMBER Schilder's Disease and Subacute Sclerosing Leucoencephalitis. van Bogaert, L., et al.	185
A Contribution to the Study of Cicatricial Areas of Elective Parenchymatus Necrosis	
in the Occipital and Prefrontal Cortex. Gregoretti, L	207 218
Circulatory Repercussions of Experimental Epilepsy in the Dog. Benelli, C., et al Familial Forms of Amyotrophic Lateral Sclerosis. Boudin, G., and Barbizet, J	229
Acute Haemorrhagic Encephalitis. Posthumus Meyjis, F. E	246
OCTORER	
OCTOBER  Prevention of Accidents After Intervention on the Bulbar Region. Tardieu, C., et al.	284
Myoclonic Cerebellar Dyssynergia of Ramsay Hunt. Christophe, J., and Gruner, J.	297
A Special Form of Syringomyelia. Osetowska-Wieckowska, E	310
NOVEMBER	
Quadriplegia, Hypoalkemia and Hyperchloremic Acidosis after Bilateral Uretero-	
sigmoidostomy. Mollaret, P., et al	345 357
Table plants with 2 Melone 1 version of the white matter. Majoranne, 1., or an	55.
VOL. 77 RIV. PAT. NERV. MENT.	1956
Spontaneous Intracerebral Haematoma. Corsino, G. M., and Lugaresi, E	1 8
The Histopathological Picture of the Sequelae of Post-vaccinial Encephalitis.	
Terzian, H., and Pessina, G	21 38
The Parietal Syndrome. de Risio, C. The Mechanism of E.C.T. Giacomo, C. G	48
Cerebral Thrombophlebitis in the Puerperium. de Risio, C., and Saginario, M.	59
Adie's Syndrome. Montanari, M., and Fratoni, A	71 85
Histochemical Study on 2-deoxyribonucleic Acid Contained in the Cell Fluid in	l
Normal and Some Pathological Conditions. Bettinazzi, N., and Biondi, L. Clinical and Technical Importance of Artificial Sleep in Psychiatry. Ruju, L. and P.	207 223
Preliminary Observations on the Action of Extract of Rauwolfia Serpentina in Excited	
and Anxious Mental Cases. Palazzuoli, M Statistical Study of Alcoholism in Some Italian Provinces. Imberciadori, E., and	, 251
Manganaro, D	255
A Histopathological Study of the Suprarenal in Subjects Dying during Confusion	
Chiaramonti, E., and Marabini, B	282 311
The Problem of Malignancy in Neurinomata. Zander, E., et al	323
A Contribution to Knowledge of the Cerebello-myoclono-epileptic Syndrome Chiaramonti, E., and Sperlazzo, R.	345
The Histopathology of Neurofibromata. Barontini. F.	372
Study of Systematic Delirium by the Rorschach Test, Ferria, L., and Besusso, P. C.	397

# BIBLIOGRAPHY AND EPITOME

The Utility of the Rapid Histological Method for the Diagnosis During Op	eration	
Cerebral Tumours. Barontini, F., and Zander, E.	•: .	406
Research on the Localisation of l-tyroxine in the Brain. Alleva, P. M., and Mo		
A Case of Diffuse Cerebral Sclerosis with Globoid Cellules. Luthy, F., and Ba	rontini,	F. 459
Oxidative-reductive Processes and Other Phenomena in Progressive	Muscu	lar
Dystrophy. Calvi, L. A		657
Fibrinolysis After Acetylcholine and Other Shock Therapies. Fabbri, W.		671
Polyradiculoneuritis in Cerebral Tumors. Chiaramonti, E		689
Considerations on "Folie à Deux". Piazzesi, W		705
EEG Reports in Postinfective Pseudo-encephalitis, etc. Masciocchi, A.		727
Neuro-psychiatric Sequelae of Epidemic Encephalitis. Magri, R., and Gianne		737
An Anatomo-clinical Study of a Case of Cerebral Actinomycosis. Pietra, G.	et al.	749
Diabetes Insipidus of Traumatic Origin. Luzzatto, A., and Zambianchi, A.		759
Senile Plaques-Staining by a New Method. Schiffer, D		784
Reflex Epileptic Crises. Turinese, A		788
Cavernous Cerebral Angioma. Barontini, F		831
A Case of Senile Paranoia. Saraval, A		843
The Histopathology of the Guillain-Barré-Strohl Syndrome. Barontini, F.		869
The Anatomic Basis of the Thalamic System and its Diffuse Projection. M	lacchi,	
et al		895