approach in this field is likely to be along fairly empirical lines rather than by deductive procedures for, whereas Munsell's simple rule was derived from his observations as a practicing artist, Moon and Spencer's formula was derived by more purely deductive arguments. This suggestion does not of course mean that Moon and Spencer's formula should be rejected on the basis of this one small-scale preliminary investigation.

In conclusion, it may fairly be claimed that, here as elsewhere in the field of color aesthetics, preferences show a marked degree of independence of purely personal taste and a dependence on objective stimulus properties, which suggests that they may have a fundamental biological basis in the perceptual system.

References

1. LITTLEJOHNS, J. *J. Roy. Soc. Arts*, **81**, 592 (1933).
2. MUNSELL, A. H. In *A Grammar of Color.* Mittineague, Mass.: Strathmore Paper Co. (1921).
3. MOON, P., and SPENCER, D. E. *J. Opt. Soc. Amer.*, **34**, 93 (1944).
4. CLELAND, T. M. In *A Grammar of Color.* Mittineague, Mass.: Strathmore Paper Co. (1921).
5. MOON, P., and SPENCER, D. E. *J. Opt. Soc. Amer.*, **33**, 270 (1943).
6. BELLAMY, B. R., and NEWHALL, S. M. *Ibid.*, **32**, 465 (1942).
7. GRANGER, G. W. An Experimental Study of Colour Preferences. To be published.
8. ———. An Experimental Study of Colour Harmony. To be published.

Manuscript received June 30, 1952.

Adrenal Hypertrophy in the White Leghorn Cockerel after Treatment with Thiouracil and Thyroidectomy

David M. Morris

Biology Department,
North Texas State College, Denton

It has been established by previous investigators (*1*) that administration of thiouracil to the rat results in atrophy and degeneration of the adrenal gland. Recently Zarrow and Zarrow (*2*) have correlated this response with a decreased output of adrenocorticotrophic hormone by the pituitary of thiouracil-treated animals. In view of these data it seemed pertinent to report evidence of adrenal hypertrophy in White Leghorn cockerels similarly treated.

The effect of thiouracil was studied in two series of birds. The first series received 0.1% thiouracil in chicken mash from the 11th to the 19th day and was autopsied on the 20th day of age. The second series received a similar thiouracil diet from the 10th to 39th day and was autopsied on the 40th day of age. Control animals used in each case were fed a standard chicken mash.

The effect of thyroidectomy was studied in a series of 26 birds. Thyroidectomy was performed before the birds were 5 days old, and the animals were then placed on a standard chicken mash diet and otherwise treated in the same manner as 23 control birds received on the same day. The birds were autopsied at 40 and 42 days of age, at which time a careful macroscopic examination was made for thyroid tissue in the operated birds. Only those birds in which no thyroid tissue was found were considered to be totally thyroidectomized; those operated birds in which thyroid tissue was present were placed in a subtotally thyroidectomized series for analysis. In no case was the amount of thyroid tissue in the operated birds equal to that in the control animals.

TABLE 1

EFFECT OF THIOURACIL ON ADRENAL WEIGHTS

Treatment	No. birds	Body wt (g)	Adrenal wt (mg)	Relative adrenal wt (mg/100 g body wt)
Birds 20 days old at autopsy				
Control	9	101	23.63	23.4
0.1% thiouracil 11th–19th day	4	93	25.30	27.2
Birds 40 days old at autopsy				
Control	9	398	52.33	13.4
0.1% thiouracil 10th–39th day	8	239	63.10	26.4*

* Difference from control series significant at the 1% level.

It can be seen from Table 1 that after 9 days of thiouracil treatment the adrenals showed no significant change in weight, although the slight hypertrophy even at this early date is perhaps suggestive. After 29 days of treatment, however, a very marked hypertrophy of the adrenal was evident, the relative weight of the adrenals from the treated birds being nearly twice that of the adrenals from the control birds. The effect of thyroidectomy was even more striking (Table 2). A statistically significant increase in relative adrenal weight was induced by both partial and total thyroidectomy with total ablation being the more effective. In terms of absolute weight of the adrenal, however, no significant difference between the experimental and control birds was observed.

TABLE 2

EFFECT OF THYROIDECTOMY ON ADRENAL WEIGHTS*

Treatment	No. birds	Body wt (g)	Adrenal wt (mg)	Relative adrenal wt (mg/100 g body wt)
Control	23	377	55.08	14.6
Subtotal thyroidectomy	21	270	55.89	20.7†
Total thyroidectomy	5	128	52.76	41.2†, ‡

* Operations performed prior to 5 days of age; autopsied at 40 and 42 days of age.
† Difference from control series significant at 1% level.
‡ Difference from subtotal thyroidectomy series significant at 1% level.

The mechanisms involved are unknown at the present time, but it seems likely that they are different in the birds studied here than in the rat. Zarrow and Zarrow (*2*) have suggested that in the rat the athyroidic condition reduces the adrenocorticotrophic activity of the pituitary which results in the observed adrenal atrophy in this species. The hypertrophy reported here in the chick involves weight studies of the entire gland. It is still possible that the interrenal tissue was atrophied, which would perhaps indicate decreased adrenocorticotrophic activity of the chick pituitary as in the rat. Preliminary histological examination, however, did not reveal any degeneration of the interrenal cells. These studies are being pursued further in an attempt to clarify this aspect of the problem. An attempt to study the activity of adrenals from thyroidectomized and thiouracil-treated birds is being made by an analysis of the ascorbic acid and cholesterol content of such glands. It is also planned to investigate the adrenocorticotrophic activity of the pituitaries from such birds.

References

1. BAUMAN, E. J., and MARINE, D. *Endocrinology*, **36**, 400 (1945).
2. ZARROW, M. X., and ZARROW, I. G. *Proc. Soc. Exptl. Biol. Med.*, **76**, 620 (1951).

Manuscript received July 7, 1952.

Flocculence in Yeast[1]

S. Pomper and D. W. McKee

Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

The yeast *Saccharomyces cerevisiae* has two typical growth habits in liquid shake culture: (*a*) as a homogeneous disperse suspension consisting of single cells or cells with 1–2 buds and (*b*) as a noticeably particulate, nondisperse suspension consisting of clumps of cells of varying number. There is good agreement among the geneticists who have studied this character that it is under genetic control (*1–3*). There seems, however, to be some question as to which type of growth habit is dominant in a heterozygote. Pomper and Burkholder (*1*) reported that the disperse habit was dominant over the nondisperse, under specified conditions. Roman *et al.* (*2*) and Thorne (*3*) have since reported that flocculence is dominant over nonflocculence. It seems desirable, in an effort to resolve this apparent difference, to amplify the statement (*1*) that heterozygous diploids may be flocculent or nonflocculent depending on cultural conditions.

[1] Work performed under Contract No. W-7405-eng-26 for the Atomic Energy Commission.

In our experience with this character, at least three external factors have been found to influence the expression of the "dominant" allele in a heterozygote: (*a*) time when scored, (*b*) carbohydrate used, and (*c*) concentration of the sugar. In the present study, six cultures were used. Three were diploids heterozygous for a single gene pair controlling the character; one was a triploid (*4*) heterozygous for the character (two alleles of disperse to one of nondisperse); the fifth was a diploid homozygous for the disperse allele; and the sixth was a diploid homozygous for the nondisperse (flocculent) allele.

A synthetic medium (*5*) at pH 6.8 was used, employing a standard inoculum (*6*) and rotating the tubes continuously in a 30° C constant-temperature room. The medium was prepared without any carbohydrate source, and tubed at twice the desired final concentration. Filter-sterilized solutions of the sugars were added aseptically to the medium after autoclaving, and the final volume was adjusted to 5 ml. The data obtained with the heterozygous diploids, a triploid, and two homozygous diploids are shown in Table 1. It should be noted that the haploid components of these hybrids show no dependence upon cultural conditions; i.e., a flocculent haploid remains flocculent and a nonflocculent haploid remains nonflocculent under all test conditions examined.

TABLE 1

VARIATION IN YEAST GROWTH HABIT

Carbohydrate (%)		Growth Habit*							
		Heterozygous diploid†		Heterozygous triploid‡		Diploid homozygous for nonflocculence		Diploid homozygous for flocculence	
		1 day	2 days	1 day	2 days	1 day	2 days	1 day	2 days
Glucose	1	nf	nf	nf	nf	nf	nf	f	f
	5	"	f	"	sf	"	"	"	"
Fructose	1	sf	"	"	nf	"	"	"	"
	5	f	"	sf	f	"	"	"	"
Maltose	1	nf	nf	nf	nf	"	"	sf	"
	5	"	f	"	f	"	"	"	"
Sucrose	1	"	nf	"	sf	"	"	f	"
	5	"	f	"	"	"	"	"	"

* nf = nonflocculent—i.e., disperse; f = flocculent; and sf = slightly flocculent (in appearance a mixture of both f and nf).

† Essentially the same results were obtained with the three heterozygous diploids tested. All three cultures segregate 2 : 2 for nf and f types.

‡ The triploid was composed of an f haploid with a homozygous nf diploid.