detector in generating predictions as to whether color aftereffects will be produced. We have shown that frequency-specific color aftereffects occur only when the inspection gratings presented with the different colors are signaled via relatively nonoverlapping neural channels. The tuning characteristics of length of line and curvature detectors must be considered in examining whether color aftereffects can be induced with these spatial properties. Unfortunately, information of this nature is not at present available from either microelectrode or masking studies.

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8. Because McCollough (*1*) had shown that orientation-specific color aftereffects can persist for a week or longer, each observer viewed the test stimuli in white light at the start of a session to establish whether there was carry-over of aftereffect from the preceding induction period. Intervals of 1 to 3 days were generally sufficient for complete decay to have occurred, but one observer regularly reported a color aftereffect a week or more after induction.
9. In terms of the model developed earlier it should be possible to induce color aftereffects with the use of one grating in the lower periodicity range and the other in the higher range. The same eight observers were tested with gratings of 0.5 cycle/deg displayed in red (green) light and 10 cycle/deg in green (red) light. Test measures were obtained with gratings ranging from 0.5 to 15 cycle/deg shown in white light. The appropriate color response was obtained on 77 percent of trials with the probe stimulus of 0.5 cycle/deg and on 80 percent of trials with the probe grating of 10 cycle/deg. The rate of appropriate color reports diminished as the periodicity of the test grating differed from that of the inducing grating. In addition, judgments were obtained when the inducing gratings displayed vertical lines and test gratings horizontal lines. Color aftereffects could not be generated under these conditions, and this demonstration of orientation-specificity in periodicity processing is in accord with masking and aftereffect measures obtained by Blakemore and Nachmias (*6*) with achromatic stimuli.
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Role of Heterochromatin in Homologous Chromosome Pairing: Evaluation of Evidence

Yunis and Yasmineh in their article (*1*) stated: "A careful appraisal of the information that has accumulated about heterochromatin . . . and on satellite DNA . . . suggests that these entities have vital structural functions: they maintain nuclear organization, protect vital regions of the genome, serve as an early pairing mechanism in meiosis, and aid in speciation." These are interesting ideas worth study, but it can be questioned whether current evidence in support of any of them is compelling. Many references seem to me to have been misinterpreted, mistakenly cited, or not critically evaluated. In particular this comment urges inspection of the evidence that heterochromatin serves a role in chromosome pairing.

Yunis and Yasmineh reported that in certain plants aggregations of heterochromatic regions "result in the grouping of centromeres near one pole of the nucleus and telomeres near the other" [with references to Levan (*2*), Vanderlyn (*3*), and Wagenaar (*4*)] and that in premeiotic interphase or early meiotic prophase such nonhomologous aggregation is exemplified by bouquet formation [references to Swanson (*5*) and White (*6*)]. Further, they considered such aggregations to be universal in germ cells, the aggregations "having been observed even in fungi" [references to Shaw (*7*), White (*6*), Ohno *et al.* (*8*), although not one of these references mentions heterochromatic aggregations in fungi]. Of Levan, Vanderlyn, Wagenaar, Swanson, and White, none directly attributes polar aggregations of centromeres to a tendency for heterochromatin to aggregate, and only White supports such a mechanism at telomeres.

Many organisms show no tendency for polar heterochromatic aggregations in any striking way. The activity of the spindle mechanism at the previous anaphase is generally considered to be related to the collection of centromeres at the pole, and in some organisms also to the appearance of telomeres at the opposite pole at interphase and early prophase, since little rearrangement of chromosomes seems to occur during interphase.

Evidence for initiation of pairing of homologous chromosomes through heterochromatin was seen by Yunis and Yasmineh in reports of pairing of heterochromatic regions at interphase and early meiotic prophase. The references cited in support of this idea should be surveyed. LaCour and Wells (*9*) found homologs paired at zygotene in *Fritillaria lanceolata* plants that had conspicuous proximal heterochromatin and found homologs not obviously paired at leptotene in plants lacking such heterochromatin. But comparisons were not made at the same stage, and in any case pairing at leptotene would be more difficult to identify in chromosomes lacking conspicuous heterochromatin. Further, in the material with conspicuous heterochromatin (the only material where appropriate observations could be made), homologs were thought to be aligned throughout their length, and synaptonemal complex formation was seen earlier in euchromatic than in heterochromatic regions. Maguire (*10*) noted only that homologous heterochromatic regions in *Zea mays* appeared closer together than random expectation predicts at a stage when other regions of the chromosomes could not be meaningfully traced (and therefore might have been more or less closely paired than the heterochromatic portions). Chauhan and Abel (*11*) reported close pairing of heterochromatic regions under similar conditions in *Impatiens balsamina* and *Salvia nemorosa.* Yunis and Yasmineh cited Hyde's work (*12*) as another example of pairing of heterochromatic regions [the text reference (p. 1206, column 1, line 19) was to Shaw (*7*) due to an error by *Science*]. Hyde reported pairing of homologous heterochromatic regions in *Plantago ovata* at a stage he interpreted to be early zygotene where, again, the remainder of the chromosomes could not be traced. Stack and Brown (*13*) (not cited by Yunis and Yasmineh) have reported close pairing of heterochromatic regions at premeiotic interphase in *Plantago ovata,* but did not infer from this that pairing is initiated at these regions. In fact they thought it likely that pairing is initiated in this organism at the chromosome ends, which appear euchromatic, whereas the heterochromatic regions are centric.

The point that should be noted is

that in all the studies of homologous pairing cited it is quite possible that homologs had been previously aligned. Pairing of the heterochromatic regions may be observed simply because these are condensed and therefore conspicuous, and perhaps in some cases also because heterochromatic regions tend to adhere, nonspecifically, when they are near each other.

Chromosome regions that have been translocated away from their accustomed centromeres and telomeres and that are devoid of visible heterochromatin have been reported to synapse as capably as they do in their normal locations (*14*). It seems pointless to hypothesize at this time that heterochromatic regions too small to be visible nevertheless serve a pairing function in these cases. Thus although a tendency (which may be erratic) is widely acknowledged for generalized, nonspecific association of heterochromatic regions, a consistent, direct functional role of heterochromatin in pairing of homologous chromosomes currently lacks sound documentation.

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Relative Consumer Species Diversity with Respect to Producer Diversity and Net Productivity

Hurd *et al.* (*1*) present data which purport to indicate that community stability decreased with successional time, and with species diversity, at the consumer trophic levels, particularly the herbivore level. If their published data regarding species diversity and treatment level for producers, herbivores, and carnivores are examined from the point of view of relating the trophic level diversity to producer diversity, it can be seen that such a *relative* index of species diversity (that is, diversity of consumer per unit of producer diversity), as opposed to the absolute comparison used, does not increase by a greater magnitude in the old than in the young (successional) field. On the contrary, in the absence of appropriate statistical analysis the reverse appears to occur, that is, a greater increase in consumer diversity with respect to producer diversity occurs in the case of the young field in response to fertilization (Table 1). Carnivore relative diversity data for old and young fields appear to be approximately equivalent.

It remains true that relative productivity of the herbivore level is elevated by fertilization in the old field, but, as opposed to interpreting this as indicative of instability, an alternative viewpoint might hold that more effective utilization and partitioning of available energy accrues to the older and more diverse community than to the younger and less diverse association, and that this constitutes expression of a stabilizing mechanism.

Relative diversity of the consumers per unit of net primary productivity fell as the result of fertilization in most categories (Table 2); the negative effect was greater in the case of the new-field inhabitants for the first productivity surge and the reverse was true for the second productivity surge. Again no appropriate statistical analysis can be performed with the data as given. The differences as shown in Table 2 are either significant or not significant and in both cases lead to rejection of the hypothesis that instability—as measured either by increase in trophic-level species diversity relative to primary producer species diversity, or by a reduction in trophic-level species diversity relative to net primary producer pro-

Table 1. Relative diversity of consumers, per unit of producer diversity.

	Producer diversity (original data)		Herbivores				Carnivores			
			Early		Late		Early		Late	
	6-year field	17-year field	6-year field	17-year field	6-year field	17-year field	6-year field	17-year field	6-year field	17-year field
Control	10.25	17.5	0.331	0.208	0.326	0.282	0.180	0.100	0.14	0.142
Treatment	9.5	18.0	.442	.305	.573	.247	.247	.169	.13	.113
Magnitude change			+.111	+.097	+.247	−.035	+.067	+.069	−.01	−.029
Relative change with respect to control			+33%	+46%	+75%	−12%	+37%	+69%	−6.4%	−2.0%

Table 2. Relative diversity of consumers, per unit of producer productivity.

	Producer net productivity (original data)		Herbivores				Carnivores			
			Early		Late		Early		Late	
	6-year field	17-year field	6-year field	17-year field	6-year field	17-year field	6-year field	17-year field	6-year field	17-year field
Control	4.46	2.68	0.76	1.36	0.75	1.84	0.41	0.65	0.34	0.93
Treatment	8.76	4.56	.47	1.20	.62	0.97	.27	.66	.15	.45
Magnitude change			−.29	−0.16	−.13	−.87	−.14	+.01	−.29	−.48
Relative change with respect to control			−37%	−11.7%	−17%	−47.16%	−35%	+2.43%	−56%	−52%