ANALYSING INTRODUCTIONS

1. Introduction: Recombination and Genetic Mapping in *Drosophila*

Recombination is caused by a physical exchange between paired homologous chromosomes (Campbell, Mitchell & Reece, 1997). The frequency of recombination is a measure of linkage between genes on the same chromosome (Snustad, 1997; Levine, 1973). The greater the distance between gene loci, the greater the chance that crossing over will occur in that interval (Rowell, 1999). If the interval is sufficient, two crossovers may occur, resulting in recombination of some intervening loci. Recombination can be observed, and gene loci mapped, in the laboratory using testcross experiments of the fly *Drosophila melanogaster*.

Aim: The aim of this report is to analyse the occurrence of recombinational events on the X-chromosome of *Drosophila melanogaster*, as manifested in the phenotypes of the F2 progeny, and to map the order and distances between these loci.

2. Introduction from: Use of *in situ* ^{15}N-labelling to estimate the total below-ground nitrogen of pasture legumes in intact soil-plant systems."[1]

Current estimates of the below-ground production of N by pasture legumes are scarce and rely mainly on data from harvested macro-roots (Burton 1976; Reeves 1984) with little account taken of fine root material or soluble root N leached by root washing. Sampling to obtain the entire root biomass is extremely difficult (Sauerbeck and Johnen 1977) since many roots, particularly those of pasture species (Ellis and Barnes 1973), are fragile and too fine to be recovered by wet sieving. Furthermore, the interface between the root and the soil is not easy to determine and legume derived N will exist not only as live intact root but in a variety of other forms, often termed rhizodeposits (Whipps 1990). An approach is accordingly required which enables *in situ* labelling of N in the legume root system under undisturbed conditions coupled with subsequent recovery and measurement of that legume N in all of the inter-related below-ground fractions.

Sophisticated techniques exist to label roots with ^{15}N via exposure of shoots to an atmosphere containing labelled NH_3 (Porter *et al*. 1972; Janzen and Burinsma 1989) but such techniques would not be suitable for labelling a pasture legume within a mixed sward. Labelled N_2 atmospheres (Warembourg *et al*. 1982; McNeill *et al*. 1994) have been used

[1] Sample from: Margaret Cargill and Patrick O'Connor, *Writing Scientific Research Articles: Strategy and Steps* (West Sussex: Wiley-Blackwell, 2009), 42-43.

to label specifically the legume component of a mixed sward via N_2 fixation in nodules. However, these techniques require complex and expensive enclosure equipment, which limits replication and cannot be easily applied to field situations; furthermore, non-symbiotic N_2 fixation of label may occur in some soils and complicate the interpretation of fate of below-ground legume N.

The split-root technique has also been used to introduce ^{15}N directly into plants by exposing one isolated portion of the root system to ^{15}N either in solution or soil (Sawatsky and Soper 1991; Jensen 1996), but this necessitates some degree of disturbance of the natural system. Foliar feeding does not disturb the system and has the additional advantage that shoots tolerate higher concentrations of N than roots (Wittwer *et al*. 1963). Spray application of ^{15}N-labelled urea has been successfully used to label legumes *in situ* under field conditions (Zebarth *et al*. 1991) but runoff of ^{15}N-labelled solutions from foliage to the soil will complicate interpretation of root-soil dynamics. Russell and Fillery (1996), using a stem-feeding technique, have shown that *in situ* ^{15}N-labelling of lupin plants growing in soil cores enabled total below-ground N to be estimated under relatively undisturbed conditions, but they indicated that the technique was not adaptable to all plants, particularly pasture species. Feeding of individual leaves with a solution containing ^{15}N is a technique that has been widely used for physiological studies in wheat (Palta *et al*. 1991) and legumes (Oghoghorie and Pate 1972; Pate 1973). The potential of the technique for investigating soil-plant N dynamics was noted as long as 10 years ago by Ledgard *et al*. (1985) following the use of ^{15}N leaf-feeding in a study of N transfer from legume to associated grass. The experiments reported here were designed (*i*) to assess the use of a simple ^{15}N leaf-feeding technique specifically to label *in situ* the roots of subterranean clover and serradella growing in soil, and (*ii*) to obtain quantitative estimates of total below-ground N accretion by these pasture legumes.

ANALYSING DISCUSSIONS

1. Discussion for: The Müller-Lyer illusion: An examination of eye-movement on ratings of distorted perceptions.

The finding that a high occurrence of illusion was displayed by subjects in the Scanning condition but a similar amount of perceptual errors in the Fixation condition, does not appear to support the hypothesis.

The above finding questions the validity of the eye-movement theory in explaining the occurrence of illusions. However it is appropriate to consider other factors, predominantly lack of control of extraneous factors. In particular, subjects could have averted their look from the centre of the figure, as a result of distraction. Subjects may also have tired after the repetitive trials and provided fast, inaccurate answers, thus increasing the degree of illusion. A higher range in the Fixation condition (see Table 1), although not an accurate measure of dispersion, suggests inconsistency in marked errors which could be evidence of extraneous variables.

In conclusion, these problems could serve as an explanation for the lack of support of the eye-movement theory with respect to the Müller-Lyer illusion, as based on the data. To this end, future studies might attempt to replicate the present study under a formal setting, for example in a secured room with voluntary participation, to minimize extraneous variables.

2. Discussion for: Reaction time as a determinant for hemispheric lateralisation.

The present study examined lateralisation of function for a verbal and visuo-spatial task and the measures that could be applied to indicate this hemispheric activation. A significant interaction was found between reaction time and hemispheric activation for both the verbal and visuo-spatial tasks. Reaction time was faster for the hand ipsilateral, rather than the hand contralateral, to the activated hemisphere as hypothesised. This finding indicates not only that hemispheric lateralisation was established in the present study, but also that reaction time is a reliable measure of hemispheric activation. Handedness did not significantly affect the hypothesised relationship. As temperature in the ear ipsilateral to the activated hemisphere was higher after the lateralised tasks, than before it, the theory that tympanic membrane temperature is correlated to hemispheric activation was not supported.

Studies using the Poffenberger paradigm which found the existence of interhemispheric transfer time and the impact that it has on reaction time for contralateral responses (Berlucchi et al., 1995; Berlucchi et al., 1977; Cherbuin & Brinkman, 2006; Poffenberger, 1912) were supported by the results in the present study. Reaction time can indicate

hemispheric lateralisation because when information about a task, as well as motor control of the responding hand, can be processed within the one hemisphere, reaction time will be faster. The Poffenberger paradigm is, however, a very simple reaction time task; whereas the tasks performed in the present study involve more complex cognition. Therefore, future studies will need to be performed to examine the effectiveness of reaction time as a determinant for hemispheric lateralisation for this view to either be supported or contradicted. Reaction time has the potential to provide an inexpensive measure of hemispheric lateralisation, thus more supporting evidence would be beneficial.

Handedness has previously been shown to be correlated with anatomical differences in the corpus callosum (Westerhausen et al., 2004) and lateralisation differences (Thilers, MacDonald, & Herlitz, 2007). However, analysis of the separate data for right-handed and left-handed dyads contradicted these previous findings, failing to show any significant differences between the two groups. Caution, however, must be taken when interpreting these results due to the lack of participants in the left-handed dyad (n = 23). A larger sample would better indicate a tendency that could be generalised to the population. Another problem with the present study was that handedness was established by participants' self-report, which may not have been an accurate measure of handedness.

In a recent study it was demonstrated that tympanic membrane temperature could be used as a reliable measure of hemispheric activation (Cherbuin & Brinkman, 2004), a finding which was not supported in the present study. This, however, is most likely due to an experimental error rather than a contradictor finding of any value. Cherbuin and Brinkman (2004) used infrared temperature probes capable of measuring very small differences in temperature, to 0.01 of a degree Celsius. The thermometers used in the present study did not have this same degree of accuracy and were unable to detect very small changes in temperature that may have been indicative of hemispheric activation. Additionally, there were no resting periods between tasks to allow cortical blood flow to return to normal after increased activation. These factors reduce the validity of the present study and prevent the author from making conclusive inferences about the results for this part of the study. Future researchers must be vigilant about the equipment used to ensure accuracy. Tympanic membrane temperature, like reaction time, provides the possibility of an inexpensive measure of hemispheric lateralisation. However, the relationship between tympanic membrane temperature and hemispheric activation must be replicated for it to be of any value.

The present study has provided insight into measures that can be used to indicate hemispheric activation, particularly to the usefulness of reaction time as a determinant for hemispheric activation, which will assist future researchers interested in the area of hemispheric lateralisation.