

## Innateness Explanations Handout

1. A gene  $g$  for metric phenotype  $p$  is a map from environments to values of  $p$ .
2. If  $o$ 's metric phenotypes are  $p_1, \dots, p_n$ , its genotype  $G$  maps an environment  $e$  to  $\langle p_1(e), \dots, p_n(e) \rangle$ .  $\pi_i \bullet G$  maps environments to values of  $p_i$ , where  $\pi_i(x_1, \dots, x_n) = x_i$  projects  $i$ th coordinates.  $\pi_i \bullet G$  is a gene  $g_i$  for phenotype  $p_i$ .
3.  $p$  is ontogenetically fixed if each genotype  $g_i(e)$  for  $p$  is constant over the environments in which the organism  $o$  can reach maturity:  $dg_i(e)/de = 0$  at all  $e$ .
4.  $p$  is *strongly* ontogenetically fixed iff there is only one  $g$  for  $p$ , and  $dg(e)/de = 0$ .
5.  $p$  is almost fixed if  $dg(e)/de \approx 0$ .
6. " $p$  is innate in the ensemble of environments  $E$ " iff " $p$  is [strongly] fixed in  $E$ ."
7.  $p$  is "genetic" (also) means: environment causally explains little or none of the difference  $\Delta p$  in phenotypic expressions of  $p$ .
8. A difference  $\Delta p(A, B)$  between A and B is attributable to their genes iff  $\sim[\Delta p(A, B) = g(e_A) - g(e_B)]$ .
9. Calling a difference genetic often means:  $\Delta p(A, B) = g_A(e) - g_B(e)$ ,  $e$  the environment shared by A and B.
10. Partitioning of individual phenotypes into genetic and environmental components: A man is obese "because of my genes" when he outweighs members of the reference group who eat as much and exercise no more than he does.
11.  $\Delta p$  is wholly genetic in origin, without reference to environments or individuals, may mean:  $\Delta p$  is due to genes in all environments: for all A, B and  $e$ ,  $p(A) - p(B) = g_A(e) - g_B(e)$ , although  $g_A(e)$  and  $g_B(e)$  may vary with  $e$
12.  $\Delta p(A, B)$  is due entirely to genes may mean A and B would differ by  $\Delta p$  in any common environment; or that  $\Delta p(A, B)$  would have the same sign in any shared environment; or that  $\Delta p(A, B)$  would be non-null in any shared environment.
13. That  $\Delta p(A, B)$  is due entirely to genes might mean that  $\Delta p(A, B)$  would be constant, have the same sign, or exist in any pair of environments;
14. The paradigm innateness explanation is the explanation of a difference  $\Delta p(A, B)$  in an ontogenetically fixed trait  $p$  as the expression of distinct genotypes  $g_A$  and  $g_B$  for  $p$  in a common environment  $e$ .

15. Let the expressions of  $g_A$  and  $g_B$  vary with  $e$ ; A and B differ with respect of  $p$  because of a genetic difference without reference to that variation. Explaining  $\Delta p(A, B)$  as  $g_A(e) - g_B(e)$  is consistent with there being  $e'$  in which  $g_A(e') < g_B(e')$ , and environments  $e'$  and  $e''$  with respect which  $g_A(e')$  and  $g_B(e'')$  stand in numerical relation whatever.
16. Let  $g_A$  and  $g_B$  fix their expressions at  $p_A$  and  $p_B$  throughout  $E_A$  and  $E_B$ . Let A be in an environment in  $E_A$  and B in one an environments in  $E_B$ . Phenotypic values  $p_A$  and  $p_B$ , and thus  $p_A - p_B$  may be genetic in origin despite ignorance about the values of  $g_A$  and  $g_B$  elsewhere.  $g_A$  and  $g_B$  may vary in unknown ways over environments, but  $\Delta p(A, B)$  be explainable as  $g_A(e) - g_B(e)$