

I've had a chance to read the revised version of Crema and Lake's paper. This version is significantly stronger than the first. It appears they have fixed the equation that was problematic in the first version and they have mainly steered clear of the confusion between effective population size and size of the sample pool. The figures are better described and easier to understand. This version of the paper does a better job of making most of the same basic points as the first paper. I list a few thoughts and comments below. The authors may wish to address these, but I do not think that there are any very serious changes that simply must be made before publication. Most of the things I mention below can be dealt with rather quickly.

Line-by-line comments/thoughts

Pages 1-15 are strong for the most part. I think this is a pretty helpful review for people new to the topic. I learned a lot as well.

Page 16

"Henrich assumed that social learning is mostly imperfect, but occasionally gives rise to improvements"

Wording: isn't it true that the improvements are also the result of imperfect social learning. Imperfect does not necessarily mean deleterious in this context.

Page 18

"there is a positive correlation between increasing population size and the rate at which payoff / success-biased social learning can drive cultural evolution"

It seems to me that the correlation is between D , density, and cultural evolution. For instance, one could increase population size and world size and not see the effect because D would remain the same.

Page 27

"so in all cases $N = k + 1$."

I think it is clearer to state it as " $k = N - 1$ " instead.

"In other words, the sample pool is simply the entire population minus the focal individual, and thus by altering k we are effectively altering the population size. In this way the results can be compared with those obtained by Shennan (2001) and Henrich (2004)"

What they are doing sounds similar to these studies, but I'm not sure it can be directly compared to them. You see, Shennan varies $N/4$ but he keeps $k=5$ in all cases. Their study is much closer to Henrich's. In that he varies the number of social learners, N , but assumes that they all learn from the same individual. So in his case, he does not vary k at all, it is always equal to the size of the previous generation, which is also the size of the learner generation.

Page 30

The authors use the “looses” when they mean “loses”. This occurs a couple of other times later in the paper.

“because the probability of any one of the $N=k-1$ individuals who are not the innovator copying trait B is $1-z/k$.”

2 things here: First, I think it should be $k=N-1$ rather than $N=k-1$ here.

Second, I think there is an error/typo. The probability that each of the non-innovators WILL copy trait B is not $1-z/k$, as stated here. It is z/k . $1-z/k$ is the probability that each of the non-innovators will NOT copy trait B. The equation is correct, they just need to insert “not” between innovator and copying at the end of the sentence.

Page 31

$$P(\text{loss of } B) = z(1-z/k + c-cz/k)^k$$

I do not think it will really impact there results, but is there also a non-zero chance that the innovator who learns from someone else will happen to acquire the best variant that the non-innovator came up with due to convergence? So the first z term might be modified to something like $(z-c)$ or $(z-cz/k)$...I haven't thought this through all the way, so those might not be correct.

Page 34

“low k promotes the retention of beneficial innovations, but decreases the probability of such innovations occurring; high k increases the probability of erroneously selecting suboptimal traits present at higher frequencies, but also increases the probability that a beneficial innovation occurs (and is thus available to be copied) within the social clique.”

I get the point here, but the first time through the word “occurs” threw me off a bit because it seemed to imply that k has something to do with increasing the innovation rate. I might use “is present in the social clique” in both places in the sentence rather than “occurs” to avoid that confusion.

Page 35-37

I do not know if this is helpful or not, but I would summarize these results in terms of the strength of cultural selection: Increasing payoff uncertainty decreases the strength of cultural selection more severely in the case of copy the best than it does in the case of copy if better.

Page 39

“Here we comment on the implications of our results for existing understanding.”
Awkward sentence. Reword.

Page

“Our most striking result is that smaller, but not too small, social cliques can — perhaps counter-intuitively — promote the survival and spread of beneficial variants with copy-the-best learning strategies.”

I think one should really add “when payoff uncertainty is relatively high” to the end of this sentence. The sentence is not true when $\sigma=0$.

Page 42

“we note Henrich’s (2004) finding that it is harder-to-copy and/or harder-to-innovate traits that are most dependent on larger population sizes for their maintenance and/or further evolution.”

So, is this to imply that more complex traits are less likely to be hit upon by convergence? It seems logical, but I’m not sure it is true. It would be an interesting empirical research question to look into (though not in this paper, of course).

Page 43

“an even higher rate of evolution by reducing the population size and reducing the sample pool size”

Should this be “or” rather than “and”?

Page 44

“but we would expect the effect of survivorship bias to become stronger, and the advantage of a social learning strategy restricted to the identification of few successful individuals to greatly decrease relative to alternative social learning strategies.”

I have to admit that I was confused by this very last part. I thought you just showed that decreasing the size of the sample pool is a good thing under conditions in which payoff uncertainty is high. Are you talking about other conditions here? Perhaps this can be reworded, because at first glance it seems to contradict one of the more interesting findings of the study. Maybe I just missed the point.

In any case, job well done on strengthening the paper. I think people are going to find it interesting. I wish to waive my anonymity.

Luke Premo