

# Explorations of happiness: proposed research

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## Abstract

On the emerging integrative computational view of the mind, happiness plays a central, evolutionarily sanctioned role in human existence. The present document briefly states the background for this conjecture and outlines three related lines of research, based, respectively, on agent-based evolutionary simulation, on behavioral experiments, and on an imaging study, that could substantiate it.

## 1 Background

The computational framework for understanding the brain/mind holds that minds are bundles of computational processes implemented by embodied and physically and socially situated brains (Edelman, 2008). Among its advantages is the possibility of an integrated treatment of cognition, motivation, affect, personality, and evolution — traditionally, the subjects of independent branches of psychology. The present brief report points out the more obvious of the many connections among these topics and outlines some ways in which their synthesis can be pursued empirically.

The synthesis that I envisage rests on two foundations: (i) the centrality of phenomenal experience (loosely termed “consciousness”<sup>1</sup>) in human existence, and (ii) the centrality of evolution in shaping existence (Dobzhansky, 1973). A few of the conceptual links knitting these concepts together are listed below:

- Generally, *emotions* are computational shortcuts, whereby valuation processes motivate decisions and regulate behavior (Minsky, 2006; Rogers, 1963).
- An analysis of the computational account of the mind (Edelman, 2012) suggests that self-valuation and the affective states that arise from it — notably, *happiness*<sup>2</sup> — serve as a key pressure point through which *evolution* acts on the mind (Geary, 2005; Novarese et al., 2009).
- The emergence of *phenomenal awareness* may be due to the evolved role of *motivation* in connecting subjective (phenomenal, or experienced) states to the objective state of affairs in the world (Cleere-mans, 2008; Ginsburg and Jablonka, 2010).

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<sup>1</sup>I distinguish between phenomenal awareness, which is fundamental to experience, and higher-order consciousness (Edelman, 2008, ch.9); cf. (Fekete and Edelman, 2011).

<sup>2</sup>For a review of the psychology of happiness, including the distinction between hedonic and eudaimonic well-being, see (Ryan and Deci, 2001).

- There exist heritable<sup>3</sup> *individual differences* with regard to the role that cognitive, motivational, and affective states and processes play in well-being (Chen et al., 1999; Lyubomirsky, 2001).
- As a *motivation* tool honed by *evolution*, an individual's *happiness*
  - acts by facilitating prospection and future-thinking in the service of *forethought* (Edelman, 2012; see also my “Happiness of Pursuit” blog for some speculations on this topic);
  - is sensitive to physical and social circumstances (see the reading list for a seminar taught in Fall 2013 (Psych 4030) for discussions of happiness in the context of evolution, cognition, morality, socioeconomic inequality, class, and power).
  - is partly socially constructed, in a manner and to an extent that depends on the individual's cultural upbringing (Uchida and Ogihara, 2012).

In the following sections, I outline three studies that use the methods of evolutionary simulation, behavioral experiments, and imaging, respectively, to explore the emergence of happiness and its cognitive dynamics.

## 2 Evolutionary agent-based simulations

The idea here is to use evolutionary simulation methods to seek empirical evidence to the effect that happiness lies in the pursuit, rather than in the achievement itself (Edelman, 2012).

The main points:

- Use agent-based evolutionary simulation (as in, for instance, Rogers, Deshpande, and Feldman, 2011).
- A population of minimally social foragers with sensors that are probabilistically diagnostic of the energy value of espied items.
- Happiness linked to motivation, defined via self-monitoring, on two time scales —
  - a short-term performance average, corresponding to hedonic aspects;
  - a long-term average (including social payoff), corresponding to eudaimonic aspects.
- Occasional changes in the environment, both in the predictive value of the observed cues and also of the spatial distribution of resources.
- **The happiness hypothesis (evolutionary aspect)**  $HH_e$ : perpetually happy agents with weaker motivational drive (a tendency to “rest on their laurels”) should get hit harder by environmental shifts.

Given that the evolutionary value of happiness is posited to be the promotion of *forethought*, the line of reasoning behind  $H_h$  situates it right on the main paradox of predictive models (Clark, 2013) as sources of evaluation (and therefore of happiness).<sup>4</sup> The paradox here is this: the goal of such systems should be either nothing happening at all, or perfect predictability. Indeed, it would seem that for most vertebrates, “happiness” would lie very close to such predictability; little benefit (albeit not none) would derive from enterprise and exploration.

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<sup>3</sup>As always, this should be taken to mean “partially heritable”; cf. (Jablonka and Lamb, 2007).

<sup>4</sup>I am indebted to Barb Finlay for this observation.

The kind of enterprise envisioned here as central to happiness would then seem to be a very high end tweak of creatures of our type, whose success depends on it. But, then our happiness comes down to the nature of the tweak. Thus, the main challenge of the present project is to get the predicted effect without explicitly building its direct precursor(s) into the simulated agents.

Subject to the above constraint, the questions that we may wish to focus on are as follows:

- E1 Investigate the effect of a predisposition to happiness on the proportion in the population of individuals in whom happiness is associated with pursuit (rather than with attainment).
- E2 Investigate the effects of the characteristics of the up- and down-swings in instantaneous (hedonic) well-being on evolutionary performance.  
Some relevant characteristics: (i) the time constants of the rise and fall-off of happiness; (ii) the ratio of peak to trough levels; (iii) the temporal spacing of peaks.
- E3 Investigate the effects of the characteristics of life-evaluation (eudaimonic) happiness on evolutionary performance.  
Some relevant characteristics: (i) susceptibility to positive and negative life events; (ii) the dynamics of coupling with hedonic states.
- E4 Compare the above effects for East Asian (dialectic, interdependent) and for European/American (monotonic, independent) construal models for subjective well-being.

### 3 Behavioral studies

Given the capacity of the pursuit of happiness (or, semi-technically, “approach-motivated fun”; Gable and Poole, 2013) to alter the subjects’ perception of time, we may make the following conjecture:

- **The happiness hypothesis (cognitive aspect)  $HH_c$ :** prospection (forethought) influences the instantaneous hedonic state, making the present happiness fleeting.

From  $HH_c$ , it follows that being primed with the concept of future will diminish present well-being even further. To test this hypothesis, we may resort to methods from the extensive literature on affective habituation (i.e., decreased pleasure over repeated viewings, particularly in homogeneous settings). For instance, Leventhal et al. (2007) found robust habituation to positive visual stimuli (photos of people playing water sports, which are considered to be high-pleasure IAPS stimuli) over 20 repeated presentations, with only very brief pleasure rating periods separating each trial. On the theoretical side, this paper echoes many of the themes mentioned above. For example, the authors conceive of affective habituation as encouraging individuals to seek novel events and experiences rather than bask in the glow of past or even easily accessible, present glories.

### 4 Brain signatures of happiness

Given that, as per the general view adopted here, happiness is central to human nature and human existence, it is not entirely surprising that happiness-related traits are found in human physiology even at the level of the immune system (Fredrickson et al., 2013). This latter finding, in particular, serves as the motivation for the following hypothesis:

- **The happiness hypothesis (brain aspect)  $HH_b$ :** statistical patterns of brain activation carry signatures of the individual's hedonic response and eudaimonic valuation parameters.

To seek such signatures, we may use lexical stimuli for which happiness-related norms have been obtained in the past (Dodds and Danforth, 2010; Dodds et al., 2011) and subject the resulting evoked potential maps or multi-voxel brain activation patterns to exploratory multivariate analysis (Reshef et al., 2011). In particular, brain activity should be recorded under (i) stimulus-driven conditions, and (ii) resting state, then correlated with the standard personality profiles used by Fredrickson et al. (2013), so as to quantify hedonic and eudaimonic parameters and tendencies.

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