

Towards a scientific cooperative on the ethics of synthetic biology: a united bioethical government

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Abstract In this brief Letter, we aim to charge the Foundation with new interest towards a cooperative focused on the contemporary ethical issues of recent advances in synthetic biology, particularly regarding new insights on galvanic reanimation for the development of artificial life. Such a colloquium exists at a moderated scale, for instance, through a small group of ours at the Friedrich N. Schwarz Research Station. LMS Munich has already benefitted greatly from the discussions that this group has held, and other institutes are progressing in similar directions. It is to this end we implore that the Foundation as a leading agency of science move to facilitate such discourse on an interinstitutional and ideally global scale.

Introduction

Thou art a symbol and a sign
To Mortals of their fate and force;
Like thee, Man is in part divine,
A troubled stream from a pure source;
And Man in portions can foresee
His own funereal destiny;
His wretchedness, and his resistance,
And his sad unallied existence:
To which his Spirit may oppose
Itself—and equal to all woes,
And a firm will, and a deep sense,
Which even in torture can descry
Its own concenter'd recompense,
Triumphant where it dares defy,
And making Death a Victory.

Lord Byron, "Prometheus"

Recent advances in the life sciences comprise a rapidly evolving state of affairs in matters of synthetic biology: most pressingly, from an ethical standpoint, the cultivation of artificial life via galvanism. It appears

increasingly inevitable, even, that we see the emergence of a modern Prometheus, and it is to this end our scientific efforts must be increasingly directed towards ethics. For scientists, as Sir John Herschel famously argued, may only benefit by a "sense of common interest, of mutual assistance, and a feeling of sympathy in a common pursuit." Knowledge, by the same notion, may only be advanced if "it is diffused as widely and as rapidly as possible" (Herschel, 2009). It is by this measure that Herschel and others like him, such as Hull in his treatment (Hull, 1990), present the pursuit of knowledge as an essentially social endeavor.

Following growing interest in the topic of bioethical governance (Zhou et al., 2019; Gao, 2019; Evans et al., 2020), we urge the Foundation move towards the consideration of a unified *bioethical government*. Central subjects in this discourse concern the codevelopment of new synthetic-biological technology with local stakeholders and communities, so as to attenuate the asymmetry between researchers and those outside academia. Key questions include with

whom to conduct engagement and how to define community acceptance, develop capacity-building activities, and regulate this technology; numerous authors have suggested that global frameworks, standards, and guidelines be developed to direct research in clearly addressing these questions (Bakanidze et al., 2010; Dickmann et al., 2015; Khan et al., 2016). In light of meteoric progress in galvanic reanimation, we motion that the Foundation itself must give shape to a new cooperative of scientists, policymakers, and citizens so that the discovery which occurs in this field may happen specifically within a context protected by the social armor of ethically-bound community.

Preliminary considerations

For solitude sometimes is best society,
And short retirement urges sweet return.
But other doubt possesses me, lest harm
Befall thee, severed from me; for thou know'st
What hath been warned us—what malicious foe,
Envyng our happiness, and of his own
Despairing, seeks to work us woove and shame
By sly assault and somewhere nigh at hand
Watches, no doubt, with greedy hope to find
His wish and best advantage, us asunders,
Hopeless to circumvent us joined, where each
To other speedy aid might lend at need.

John Milton, *Paradise Lost*

To borrow an image from Gothic literature, we remind the Foundation of that two-faced scientist, who from the guzzling of his grotesque elixir is turned a monster through the consequences of unmoderated, unnurtured discovery. Through a fostering, ethically-inclined community may we approach the certain on-slaught of discovery that is to come surrounding the creation of life itself, and steer the gales of discovery and invention away from such travesty.

Indeed, one ever-present conundrum in this issue has been that the bulk of ethical conversations occur with virtually no input from society outside academia, which will just as much be forced to reckon with the coming advances in artificial life. However, following the concerns of Kormos et al. (Kormos et al., 2022), we must ask ourselves: Whose groups should

be included in discussions and decisions surrounding the scientific ethics of artificial life? At what point can meaningful codevelopment happen, and how will the voices of low-income countries in particular be helped? These questions remain various sources of controversy, and in this brief Letter do we not intend to properly address them, but in so much as posing them may we persuade the Foundation that the time for a measured collaboration has never been more dire.

On the most basic level, we must understand how dangerous is the acquirement of knowledge collected by the scientist on their lonesome; rather than resign ourselves to believing our native town to be the world, that we *together* aspire to greatness through the mindful collaboration that nature may allow. Too often do the capably scientific-minded declare their superior minds to be the law, and their innate impulses the fiats of intellectual creation. No heroism may emerge from this catastrophic egoism, but in the most extreme of such cases only great tragedy. What might be conjured in the imagination concerning these talented, but naïve researchers working in isolation, is some frightful image of an overzealous madman having taken to stealing haphazardly from graveyards. Current procedures in galvanic animation, including work done by one of the authors (Frankenstein, 2018), everything but forbid this possibility.

As previously mentioned, we believe strongly in science as a process, and so is it our ethical obligation to engage with scientific discovery as something capable of great and rapid mutation. With the rapid pace at which new advances in the discipline are arriving, it is only sensible to strengthen our communal readiness in confronting what repercussions these advances pose. In a remarkably short time, we have progressed from the galvanic exploration of unicellular species to even small carp (Clerval, 2019), and so we soon anticipate the galvanic creation of entire humans. It is via small colloquia, however, that our institute and others have begun to explore these issues, and to some success in developing a community understanding of them.

Current work

Beyond the shadow of the ship,
I watched the water-snakes:
They moved in tracks of shining white,
And when they reared, the elfish light
Fell off in hoary flakes.

Within the shadow of the ship
I watched their rich attire:
Blue, glossy green, and velvet black,
They coiled and swam; and every track
Was a flash of golden fire.

O happy living things! no tongue
Their beauty might declare:
A spring of love gushed from my heart,
And I blessed them unaware:
Sure my kind saint took pity on me,
And I blessed them unaware.

Samuel Coleridge, "The Rime of the Ancient
Mariner"

It is at our LMS Munich, among other institutes, that in effect a microcosm of the bioethical government we aspire towards has been demonstrated. Pedagogy regarding the galvanic development of artificial microorganisms—particularly based on species across the *Achromatium* and *Thiomargarita* genera—have been conducted around the Friedrich N. Schwarz Research Station, in close correspondence with the facilities of the Foundation. Alongside public demonstrations of these experiments are conversations of current galvanic research held with the audience, comprised of not only LMS Munich staff, faculty, and students, but also an appreciable number of individuals unaffiliated with the university. These discussions have asserted time and again the incessant value of navigating the ethical complexities of artificial life (1) in an accommodating, social context and (2) with profound empathy for, among other things, what it means to exist as intelligent life.

Projects on a larger scale, such as those encompassing the complexities of an entire human, remain in the horizon—remote but yet approaching. Even our smaller-scale work maintains a meticulous attention to an extensive collection of guidelines, which

have grown considerably since its outset; an analogous collection for work on an artificial *human* seems much too diffuse to envision. Still, our bioethical colloquium, has grown somewhat since its inception, now beginning to confer with other research groups in the region. However, we understand that the future of bioethics demands a far larger organization be placed at the helm: hence our interest in relevant action taken by the Foundation. What our early discussion has convinced us is that not only preeminent individuals in the discipline of artificial life, but even well-established institutes have devoted far too little thought to what social, ethical, and scientific infrastructures are demanded by research on artificial humanity.

Closing remarks

It is a woe too "deep for tears," when all
Is left at once, when some surpassing Spirit,
Whose light adorned the world around it, leaves
Those who remain behind, not sobs or groans,
The passionate tumult of a clinging hope;
But pale despair and cold tranquillity,
Nature's vast frame, the web of human things,
Birth and the grave, that are not as they were.

Percy Shelley, "Alastor; or the Spirit of Solitude"

The needs for such a cooperative are innumerable, and the conditions for one do, as have discussed on other occasions with the Foundation, appear achievable—at least in theory. Current initiatives that exist are limited, although small ones do exist: among others, a bioethical colloquium is in its early stages here at LMS Munich. One key idea bears repeating: that scientific discoveries of such grave significance as artificial life may never be performed in solitude, with little regard ascribed to its larger repercussions. We may point not only to Gothic literature, but even the ancient ways of alchemists such as Heinrich Cornelius Agrippa that nature is not something to pervert with our own selfish interests: whether that perversion produces the "infernal Ghosts" of Agrippa's writings or a mistreated artificial humanity with unexpected capacity for malevolence (Agrippa von Nettesheim, 1951). As the magic of our

imagination quickly mutates into our scientific reality, so we must face such a future with tact, a meditated sense of urgency, and as a community. To speak in extremes, the oncoming breakthroughs in the creation of life through galvanism need not be some dark labyrinth of shadowy ruin, but a sublime landscape of luminous promise—should we proceed, collectively, with caution.

Acknowledgements

Earth has not any thing to show more fair:
Dull would he be of soul who could pass by
A sight so touching in its majesty:
This City now doth, like a garment, wear
The beauty of the morning; silent, bare,
Ships, towers, domes, theatres, and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

William Wordsworth, "Westminster Bridge"

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