Funding science with science (and, admittedly, a lot of math)

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Scientific funding within the academy is an often complicated affair involving disparate and competing interests. Private universities, for instance, are vastly outpacing public institutions in garnering large, prestigious grants. Inequities also extend to the kinds of research funded, with government, corporate, and even military interests privileging certain types of inquiry. This work proposes an innovative type of research fund using cryptocurrencies, a fast growing asset class. Although not a total funding solution, staking coins, specifically, can be strategically invested in to yield compound interest. These coins use central hub technology to collateralise the network and speed transaction pace. Additionally, these staking coins pay dividends to hub holders, so an institution that purchases central hubs could potentially engage in a lucrative form of dividend reinvestment. Using cryptocurrencies as a new funding stream, it is possible that simply garnering large amounts of capital and creating a non-profit “institute” could also be the future of funding scientific research. A perfect example is the Parker Institute for Cancer Immunotherapy, a “sandbox” that doesn’t require specific goals for continual funding. It is no doubt that consortiums for scientific research akin to Parker’s are the future, a future that crypto investment funds can help to bring about.
Funding science with science (and, admittedly, a lot of math)

The funding of scientific research within the United States academy currently operates as an intergovernmental and private equity exercise in which monies from federal organizations, private institutions, businesses, and high-net-worth individuals provide the financial capital for the production of scientific knowledge. The functioning of this system is not altogether straightforward. Scientific funding is an often complicated affair involving disparate business interests competing for the intellectual property that research produces and universities vying to extend their respective funding streams. At this intersection of private and university interests, the opportunities within many higher education settings to sustain the production of scientific knowledge begins to unravel. Ali, Bhattacharyya, and Olejniczak (2010), noting a pattern of social reproduction—a mechanism by which existing hierarchical social structures reproduce themselves, thereby maintaining the status quo—contended that institutional resources profoundly influence the degree to which private universities are vastly outpacing public institutions in garnering National Institutes of Health (NIH) and National Science Foundation (NFS) grants, along with other prestigious, and often generous, research funding. While one may argue that the distribution of such grants merely reflects the greater merit of these private institutions, measured in their ability to attract distinguished faculty, and, via institutional endowments, to support extensive research and accrue intellectual capital, there is no doubt that a more egalitarian playing field in scientific research would yield at least a more diverse range of studies and interpretations. Further, since wealthier private institutions already possess an advantage when it comes to funding, their dominance in scientific research and its lines of inquiry becomes self-sustaining. This self-replication extends beyond the disparities between public and private institutions to the kinds of research that receive funding as well. Often, funding in colleges and universities is tied to corporate and even military interests, which privilege certain types of inquiry over others. A solution to this problem is to generate capital for research wholly independent of the grant system, increasing funding and endowment opportunities for students and faculty at less advantaged institutions without the need for direct competition with more powerful universities, as well as increasing opportunities for avenues of research not typically favored by governmental and commercial backers.

How resources dedicated to scientific inquiry are garnered and spent spotlights a series of complicated problems that extend beyond funding mechanisms. The competition for scientific resources and knowledge is fierce, and problematically, scientific inquiry and funding policies are greatly influenced by policy-makers who often have too little experience or knowledge to properly make such critical decisions (Haller & Gerrie, 2007). Haller and Gerrie noted that supposed experts are frequently commissioned by governmental and business interests to support proposals and funding initiatives that are not, paradoxically, vetted scientifically. Similarly, Greenwood and Levin (2005) discussed the increasing separation of the academic world from the governmental procedures that dictate the very policies to which academic researchers must adhere. Appearing as a counter-narrative to the processes described by Haller and Gerrie’s, McKinley et al. (2017) proposed ‘citizen science’—engaging the public in scientific projects—as a way to more fully examine scientific spending and policies. In proposals that are more theoretical than policy-driven, McKinley et al. presented citizen science as a way to mitigate against the dominance of industry and other powerful stakeholders. Addressing concerns in biological conservation, McKinley et al.’s conception of citizen science is a twofold process that
includes collective domain knowledge building and political action. This distributed model of scientific labor and decision-making provides a useful way to think about disrupting the current concentration of funding and resources in relatively few hands. One mechanism for disruption is to develop financial tools with which to reduce academic reliance on governmental and commercial and commercial interests.

Re-envisioning the Funding of Science

Almost by default, the established process for garnering funding for scientific inquiry, and its deployment into enterprise, has remained relatively unchallenged. A body of literature exists, including McKinley et al. (2017) and Roth and Barton (2004), that proposes an alternative. However, such work may underestimate the political power of higher education institutions and commercial forces to continue to appropriate the power of science. Shore (2011) described this type of appropriation as ‘neo-liberal,’ in that it attempts to privatize public goods—in this instance, science in the academy. As neoliberal educational reform has gained support, there often appears to be little incentive, particularly for the well-funded researcher, to challenge the current system. The result is often either that the current funding system goes underexamined, or, when critiqued, such as by Shore (2008) and Strathern (2000), there seem to be too few ways to redress fundamental, systemic problems.

In contrast, this paper proposes concrete steps towards an alternative path for funding scientific inquiry. Currently, governmental authorities, private grant officers, and other donors act as de facto trustees in the funding of science. Moving away from merely theorizing the dynamics of power within scientific funding, this work outlines a financial tool to fund science without any intermediaries—in other words, without the obligations entailed by accepting NIH, NFS, or other types of external funding from powerful agents. The model for this financial tool was informed by Lincoln and Guba’s (1989) notion of catalytic authenticity, as well as by Christensen’s (2013) conception of technological disruption. In addition, it refines Levi-Strauss’s (1966) understanding of the bricolage, employed in recent years as a methodology by social scientists, such as Denzin and Lincoln (2011) and Kincheloe, McLaren, Steinberg, and Monzó (2017), from a method of inquiry into a force for scientific funding. Fundamentally, bricolage is about reassembling what is at hand into new configurations. In this case, that new configuration involves combining existing cryptocurrencies, digital currencies whose generation is regulated by encryption, and investment strategies into a new way to generate funding for science within the academy.

Underfunded Universities and New Investment Models

Despite governmental efforts, funding directed towards public institutions continues to decline—not just across all areas, but specifically among science research, too—remaining substantively lower than pre-2007 levels (Mortenson, 2012). Mortenson has extensively examined the decline in state funding, detailing yearly reductions in nearly every state since 1976, increasing the importance of competitive grant funding and existing endowments. Goetzmann et al. (2010) underscored how badly traditional educational endowments performed during and following the years of the financial crisis. Further, the Educational Endowment Report (2009) detailed that the average university endowment lost nearly a quarter of its market value between early July and December 2008. Commenting on this trend, Goetzmann et al. asserted that “liquidity problems were a reason for basic changes in strategy and services” (p. 112) and underscored that “endowment managers today, as in the 1930s, must not only calibrate
their risk tolerance, but they must also calibrate their uncertainty tolerance, that is, the extent to which they can commit to an investment strategy with only slim statistical evidence to rely on” (p. 113). This approach to endowment management provides an incredible opportunity, in light of new acceptable risks, to restructure and augment current financial models to be inclusive of more experimental investments, yet broaden the horizons of potential margins. Cryptocurrencies can be foundational to this approach.

Underfunding with grants and endowments is not simply a fiscal issue. Another type of underfunding issue exists insofar as how money is distributed. While some posit that endowment spending dollars fund financial aid, the reality is that “spending from endowment funds is at an all-time low,” which heavily affects areas like research (Miller & Munson, 2008, p. 11). Further, reported payout “includes management and custody fees and actually gives an inflated impression of how much schools are spending on education,” including research (Miller & Munson, 2008, p. 11). Munson explained that only 3.9% endowment payout to “activities related to their mission,” a .3% drop from pre-2007 levels. This means that “colleges and universities are spending less now than they have in decades” (Miller & Munson, 2008, p. 11). Decentralized investment technology offers one path to using more endowment funding for educational purposes and using it more equitably.

Meyer and Zhou (2017) provided a model to which some institutions may aspire. Current financial products exist that synthesize Meyer and Zhou’s appraisal of elite private endowment performance with Christensen’s (2013) and Christensen and Overdorf’s (2000) notion of technology distribution. In particular, cryptocurrencies have been arguably the fastest growing asset class of 2017, producing significant new wealth. Cryptocurrencies, particularly a family of coins adhering to the X11 algorithm, may provide education endowments an alternative asset class for portfolio diversification. At the time of writing, U.S. Treasuries are yielding nearly record lows, casting alternative asset classes as a potential portfolio diversifier for many endowments. Cryptocurrencies have enormous growth potential, and, although cryptocurrencies not a total solution for scientific funding in the academy, they do provide a greater level of diversification and adhere to the nuanced notion of Modern Portfolio Management Theory. As a portfolio diversifier, X11 coins are highly uncorrelated to traditional asset classes, providing a hedge against a more universal risk, as outlined by Goetzmann et al. (2010).

Multi-Disciplinary Funding for Scientific Research

As explained above, one way to circumvent the underfunding of science is to utilize cryptocurrencies. Much of the largest early endowments’ success stemmed from “‘publishing a detailed treasurer’s statement,’” which is no longer the practice (Kimball & Johnson, 2012, p. 241). Placing endowments on the blockchain could bring a new period of such growth. However, it is also possible that simply garnering large amounts of capital and creating a non-profit or institute could be the future of funding scientific research. This approach is best exemplified by a donation of $250 million by Sean Parker to create the Parker Institute for Cancer Immunotherapy. There is no doubt that consortiums for scientific research akin to Parker’s are the future, a future that crypto investment funds can help to bring about. PICI doesn’t necessarily need specific goals for continual funding (contrary to most government grants, which are dependent on hundreds of criteria that the scientist often can’t control); the ethos of the institute is that the best scientific work occurs during exploratory phases that traditional research grants simply are not engineered to support. In some cases, rigorous spending regulations even themselves cause wasteful spending. Parker’s initiative is entirely unique in that rival
universities’ researchers actually work together and can access each other’s aggregated data (Parker Institute, 2017). Were this approach to become the standard, scientific advancements could occur much more quickly.

**How it Works**

This work proposes an innovative type of research fund that operates outside of the traditional banking and investment space. Additionally, this proposal presents an alternative to scientific funding outside of the NSF, NIH, or any other traditional funding streams. In place of these traditional funding mechanisms, science could be funded by science, specifically by the science underlying cryptocurrency. This relatively new form of funding operates at the intersection of technology, cryptography, and computing functions, which remain so far largely on the periphery of mainstream tech conversation.

Cryptocurrencies are purely digital assets, fully backed by the complexity of cryptography and the distributed hashing power used to solve individual blocks in the open ledger. They are prone to highly volatile price extremes, and the landscape in which they exist includes an overwhelming number of different coins. Nonetheless, we maintain that a disciplined indexing approach can yield generous returns. Indexing is already widely used in financial markets, but successful dividend reinvestment in the cryptocurrency ecosystem requires a crypto fund designed specifically for the unique volatility of cryptocurrency and coin-generation mechanisms. An effective crypto-indexing approach must combine index weightings (diversification) and coin rewards (dividends) to create a simple way for institutions to gain total return cryptocurrency exposure.

In theory, if there were infinite computing power, cryptocurrency value would be greatly diminished because blocks could be solved almost instantly on the blockchain. Therefore, this new world of valuation necessitates specific blockchain-based metrics, not the existing metrics of traditional finance. The methodology proposed here re-envisions traditional valuation models by considering an array of factors. For example, it calculates a network effect by examining coin utility and social usage. Additionally, it considers a coin’s scarcity, inflation strategy, and emission rates. A coin’s development activity is another central metric, since it speaks to further functionality of the coin. Lastly, it considers governance and network security as important identifiers of a coin’s success. A crypto index fund, then, would identify target coins by employing the metrics described above and then vet the coin’s metrics by developing a predictive model. After a targeted coin has been fully reviewed, the index fund would determine the coin weightings and portfolio allocations, fully informed by the methodology elucidated above.

**Summary**

The process of funding scientific research within the United States is laden with many intricacies: federal organizations, private institutions, business, and individual donors each contribute monies in a variety of ways, making for a confusing system at best and one purposefully shrouded from public view at worst. Multiple interests are at play when it comes to the backing of scientific research of all kinds. Historically, there has not been much institutionalized opportunity to circumvent these interests. Cryptocurrencies and blockchain technologies, however, offer a reprieve from the staunchly traditional endowment and grant structures (often as limiting methodologically as they are insufficient financially) that have plagued scientific funding since the late nineteenth century and continue to do so well into the
twenty-first. This paper argues that cash-flow generating proprietary algorithms will provide a new structure for scientific funding that will not only be more egalitarian and accessible, but also innovative, as it would free competing universities to share data openly, improving results.
References


