ResearchCoin: A Cryptographic Incentive Designed to Accelerate the Pace of Scientific Research

https://www.researchhub.com/

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Overview

ResearchCoin (RSC) is the incentive within the ResearchHub network designed to encourage open participation in the scientific community.

The scientific record is too important to be hidden behind paywalls and in ivory towers. Science should be open: not only for reading, but also for reusing. ResearchCoin, and by extension ResearchHub, are designed to accelerate the pace of scientific research by encouraging academics to interact in a fully open and collaborative manner.

This paper will describe ResearchCoin, the ResearchHub network, the impetus for the creation of both, and the intended impact on the scientific community.

ResearchCoin

ResearchHub allows scholars to upload, summarize, discuss, and prioritize research within dedicated focus areas ("Hubs"). Researchers are rewarded for their contributions to the community in a newly created cryptocurrency token, ResearchCoin (RSC).

Primarily, RSC is "scientific karma". Users receive RSC for positive contributions to ResearchHub, like posting, curating, summarizing, or discussing. RSC will be granted in proportion to how valuable the community perceived their actions to be - as measured by upvotes. Upon launch this will be a one-for-one correlation, where each upvote received is compensated with one ResearchCoin. Over time, ResearchHub aims to implement community-based voting (and commensurate ResearchCoin rewards) across an increasing number of dimensions such as originality, reproducibility, and commercial viability to allow for a more in-depth and complex peer assessment.

Rather than relying on citations and bibliometrics, reputation within the ResearchHub system is linked to ResearchCoin earnings. Reputation acts similarly to aggregated Reddit karma in that it acts as a peer-determined measure of prestige. This allows researchers, particularly those early in their research career, to cultivate recognition and demonstrate expertise that is entirely attributable to the researcher, rather than an entire lab or a principal investigator. Reputation is linked to privileges within the forum. Notably, reputation is slightly different than the initial "karma" allocation as it is impacted by downvotes--thus providing a moderation mechanism for the community to revoke influence from bad actors.

Combined, ResearchCoin and the associated reputation serve to incentivize researchers to openly share and interact with content in a scientific culture where a dearth of such incentives currently exist. An incentive structure with a similar aim, the Center for Open Science's badging program, has been noted as the only evidence-based incentive program that is associated with increased data sharing. A 2016 review of this badging found that "badges are simple, effective signals to promote open practices..."[1]. ResearchHub seeks to expand on the idea that publicly signalled recognition of contribution to the open science community will lead to a continued increase in the adoption of such practices.

Importantly, RSC also provides all holders of the coin with representation in the ResearchHub Decentralized Autonomous Organization, or DAO, which is described in greater detail later in this document.

In addition to serving as an incentive for contribution, users are rewarded in RSC for flagging copyright infringements on the platform. A ResearchHub page can be created for any paper (paywalled or not), however due to copyright only certain papers are eligible for full PDF upload. At launch, articles eligible for full text upload are those that have been released under CC0 (no copyright reserved) or CC BY (attribution required) licenses. If an article is flagged and found to be in violation of this guideline, it will be removed and the user that flagged it will be compensated with 10 RSC. In recognition of the limitations this presents, and in the promotion of open scientific communication, all user contributions to the platform are made available for reuse under a CC BY 4.0 license.

ResearchCoin can be earned by:

- Sharing Research - Users can submit PDFs of research outputs to ResearchHub's forum. The total amount of RSC earned by each submission is determined by the aggregate number of upvotes and downvotes the PDF receives during community curation.
  Curate.

[1] "Badges to Acknowledge Open Practices: A Simple, Low ... - Plos." 12 May. 2016, https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1002456. Accessed 3 Jan. 2020.

- Curating Content - Once research has been submitted, members of the community can upvote or downvote the content. The original author will receive RSC in proportion to the number of upvotes, and community members will also receive RSC for their contributions.
- Summarizing - Users can earn RSC for adding plain-english summaries to the research outputs that have been shared within ResearchHub.
- Reviewing manuscripts - The community can add comments to the research outputs shared within ResearchHub. The total amount of RSC earned by each comment is determined by the aggregate number of upvotes and downvotes each post receives.

ResearchCoin provides those who earn it with the following utility:

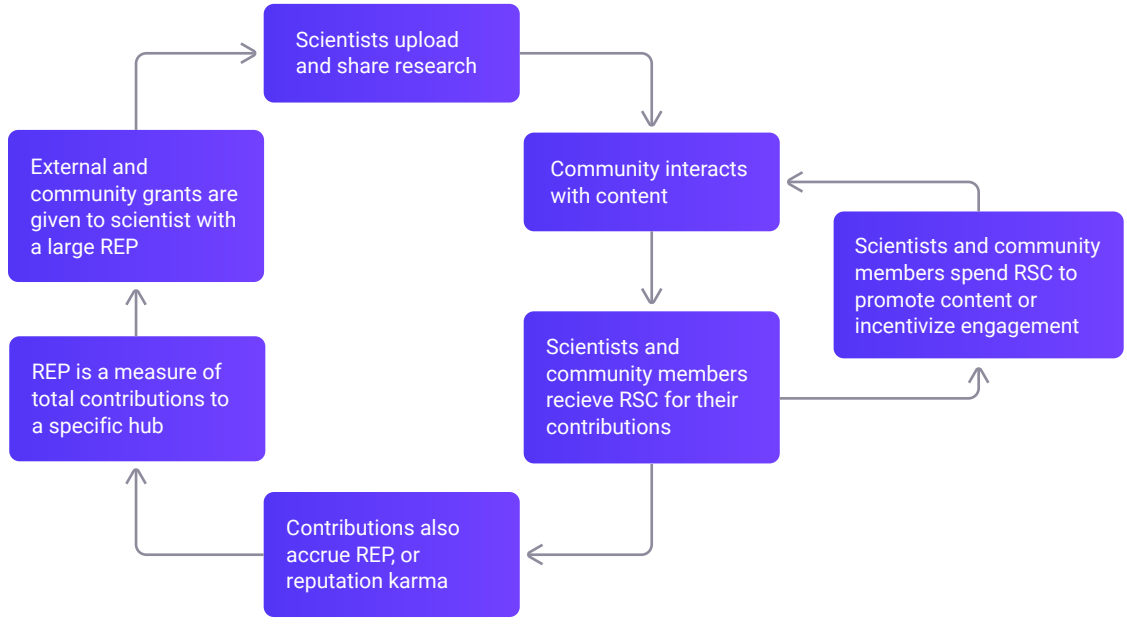
Voting Rights - For every RSC a community member holds, they are entitled to one vote in the ResearchHub DAO. Initially, these are the issues that will be democratically considered by the DAO:

- Voting on updates to RSC rewards
- Economic details of RSC supply and distributions
- Altering the Code of Conduct

Research Funding - RSC is a novel vehicle to fund academic research. Users with RSC can:

- Fund research proposals
- Tip valuable content
- Incentivize research outputs in specific fields science

Boosting content - A user can spend their RSC boosting a specific piece of content. When RSC is spent on a boost, a portion is immediately "burned" (destroyed), and a portion is distributed back to the DAO to replenish RSC assigned to reward community participation. Because there is a limited number of ResearchCoins, burning a portion on though boosts makes everyone else's RSC more scarce.



Supply and Distribution

Initially there will be one billion ResearchCoins in existence. Of this 20% (200m) will be retained by ResearchHub and earmarked for distribution to the community. The incentivization structure will become more encompassing and complex as interactions on the platform occur, but an overview the initial structure is provided below. As RSC rewards mature, up-to-date information regarding Roles and Privileges can always be found on ResearchHub's help page.

User Action	RSC Reward
Submit Paper	+1 (+10 if author)
Add a Key Takeaway	+1
Edit Summary	+5 if the first summary edit
Upvote Comment Reply	+1 for every upvote received (+5 if author)
Downvote Comment Reply	-1 for every downvote received
Flag paper (copyright violation)	+1 (if a moderator removes the paper after being flag)

These coins will be distributed solely as rewards for contributions on the ResearchHub platform. ResearchHub Inc. will not be hosting an initial token sale of RSC

ResearchHub DAO

Upon the launch of the network, ResearchHub will create a DAO to facilitate the decentralization of ResearchHub's governance.

Within ResearchHub's DAO, one RSC is equivalent to one vote. Over time, as RSC is distributed to the community, ResearchHub Inc.'s voting majority will dissipate, allowing the scientific community to assume responsibility for the network's governance.

Researcher Representation

One of the largest frustrations of the modern day researcher is the misalignment of incentives between academic publishers and the scientific community at large. The ResearchHub DAO creates an opportunity for the community to have direct influence over the ResearchHub network, ensuring that it will respond appropriately to the incentives of the community as a whole.

Why Create ResearchCoin?

Academic research today is centered around a concept that has not evolved at the same speed as technology: the academic journal. Scientific progress, being an inherently iterative and collaborative process, is stymied by barriers and frictions that occur naturally in this journal-based paradigm.

The result of this is that researchers often live in their own world, one in which citations are the dominant professional incentive and one in which researchers often operate in silos. The implications of this are myriad and far-reaching, but the net effect can be summarized as such: due to the broken infrastructure and incentives for communicating scholarly research, society as a whole fails to realize the full potential of the academic community.

ResearchHub's thesis is that providing a modernized platform for open scientific communication can help bridge this gap, increasing connectedness within the world of research, and also between the world of research and the world at large. ResearchCoin has been created to augment the platform and target incremental improvement in the areas of **open science participation and curation**. In order to understand how RSC could impact the scientific ecosystem the motivations behind the creation of the coin--the current barriers holding research back in these three critical areas--must be examined.

Open Science Participation

The most obvious and maligned barrier in academia is the paywall: paywalls limit access to roughly three quarters of academic literature, with publishing companies reaping the rewards of the work of the scientific community[2]. Publisher Elsevier's parent company, RELX, captured revenues of roughly $10 billion dollars in 2018 at 31.3% operating margin in 2018[3]. For comparison's sake, Alphabet (Google's parent company) achieved 21% in Q4 2019[4]. Some progress has been made, as the decades-long struggle for Open Access among scientists, combined with the recent push toward open access by funding organizations such as the National Institute of Health, European Commission, and the Chan Zuckerberg Initiative, has led to a substantial increase in openly available articles in recent years. Even accounting for this progress, roughly half of newly published papers are still paywalled. This is in spite of inherent advantages afforded to authors who publish openly, most notably in the form of increased citations and social media mentions.

This form of lack of access is only one symptom of a broken system. The status quo is also painfully inadequate in facilitating discussion, both among scientists and between scientists and people who may be able to take academic research and apply it outside of academia. As scientific journals can be dense, jargon-filled, and generally inaccessible, the public generally is dependent upon science journalists and the media to relay researchers' findings. By doing so, a new set of biases can be introduced, as sensationalized or outright skewed representations of findings are not uncommon. This has lead to a serious disconnect between the public and the scientific community, where there is a large gap between the two groups with regard to their perceptions of critical issues such as climate change.

In the realm of directly connecting scientists to the world at large, Reddit, with the subreddit r/Science, stands out as a success story. With over 23 million subscribers and hundreds of moderators (many of whom are active in academia), it has been described as the largest two-way dialogue between scientists and the public. Within this forum, "flair" allows for credentialed researchers to self-identify, and "Ask Me Anything" sessions give researchers an outlet to discuss their findings in an informal setting.

In spite of the successes achieved by this subreddit, scientists have noted serious issues with moderation that inhibit this conversation. In a paper proposing a new, crypto-incented paradigm for this type of communication, a Reddit moderator who was active in academia noted that the majority of threads suffer from heavy moderation--a claim that has been echoed by scientists who have participated in "Ask Me Anything" sessions. This same moderator suggested that there are not enough scientists contributing (proportionally) to stimulate sustained serious discussion, and opined that bolstering incentives for researcher contribution could provide improvement in this regard.

Curation

Consumption of scholarly content is by and large dictated by journals, conferences, the media, and social and professional circles. As such, the power and influence that comes with the responsibility of content curation is relatively concentrated within tight academic groups, rather than distributed to the community as a whole. The risks associated with this are profound: entire sub-disciplines run the risk of becoming dogmatic in their approach due to the feedback loop of publication and funding.

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[2] "state of OA: a large-scale analysis of the prevalence ... - PeerJ." 13 Feb. 2018, https://peerj.com/articles/4375/. Accessed 3 Jan. 2020.

[3] "Annual Report and Financial Statements 2018 - RELX Group." 20 Feb. 2019, https://www.relx.com/~/media/Files/R/RELX-Group/documents/reports/annual-reports/2018-annual-report.pdf. Accessed 3 Jan. 2020.

[4] "Alphabet Profit Margin 2006-2019 | GOOG | MacroTrends." https://www.macrotrends.net/stocks/charts/GOOG/alphabet/profit-margins. Accessed 3 Jan. 2020.

A particularly notable example of this is in Alzheimer's research, where several scientists have recently opined that years of progress had been lost due to near-fanatical dedication to a single hypothesis. Researchers noted that this field was controlled by a "cabal" of sorts that repressed alternative hypotheses, and as a result, enormous amounts of time, energy, and money have been funneled too narrowly with relatively little return. This centralization of curation power, combined with the ever-increasing volume of scholarly work, results in a landscape of information that can prove challenging for researchers. About two new papers are added to the PubMed database every minute, and the number of scientific papers published grows at roughly an 8% clip annually. Given such volume, it is impossible for scientists to keep up with the output completely on their own, and at the present time they must rely on curation that may---or may not---give top billing to the most impactful research.

ResearchCoin's Impact on the Scientific Community

Open Science Participation

ResearchCoin is a unique and novel incentive designed to encourage participation in a system that is completely open and accessible to everybody, everywhere, with no content residing behind paywalls and no costs to participate.

In a scholarly review of an analogue with this level of accessibility, Wikipedia, researchers found that the collaborative encyclopedia had a causal impact on articles found in academic journals. This reflects a circuit where the repository both reflects and affects the state of science. The same researchers extrapolated the results of their initial study beyond Wikipedia, suggesting that "increased provision of information in accessible repositories is a cost-effective way to advance science." With a causal link between a huge and accessible repository and the state of the art established in the academic world, it is not difficult to imagine the impact that a more thorough, focused, and incentivized platform could have on the pace of scientific progress.

These benefits would not be endemic to the academic world: outside groups who may not currently benefit from the access university subscriptions provide, such as entrepreneurs, citizen scientists, and independent researchers, would benefit greatly from increased availability of access. In the case of ResearchHub this comes not only in the form of access to the uploaded literature and related summaries, but also in the form of interaction with experts in the scientific community through the discussion forum.

By inviting interaction between researchers and non-researchers alike, ResearchHub fosters collaboration and interdisciplinary progress. ResearchCoin provides a concrete incentive for this interaction to occur, giving reason for scientists to take time out of their day to contribute to the progress of this newly created community.

Curation

By rewarding contributors for curating content to a general audience, ResearchCoin incentivizes users to share content that is impactful both to the research community as well as society as a whole. In practice, this allows for a diversity of opinions on the value of research to be expressed in a meaningful way, with cross-functional and commercial value becoming factors that affect visibility of research on the platform. This democratic method of curation stands in stark contrast to the insular nature of journal-based communication. Placing this power in the hands of the community ensures that a small minority cannot hold a field hostage with regard to what is, and what isn't, made available for consumption.

In addition to the actual act of sharing content, prioritization of content is crowd-sourced via the same upvote/downvote mechanism that impacts RSC compensation and reputation. Individual Hubs will essentially act as journals within focus areas, with highly upvoted posts (ie the paper and its associated summary and discussion) moving to the top of each Hub. Without the artificial scarcity that journals impart, there are no limitations to what can be posted on ResearchHub. At the same time, the mechanism for community curation allows the platform to act as a single point of access for consuming and discussing the state of research.

Summary

ResearchCoin has been created to incentivize participation in a highly collaborative and entirely open access platform, ResearchHub. This first of its kind token serves to galvanize a community of academics and nonacademics in support of ResearchHub's goal of creating an all-encompassing forum for the communication of academic research. The downstream benefits of the success of such a community are significant: with adoption, silos that currently exist in the world of research are eliminated. As a result of this improved communication, the pace of research and the application of research are accelerated.