

# DEIP

## DECENTRALIZED RESEARCH PLATFORM

Version 0.1 - Working Draft (Subject to Change)

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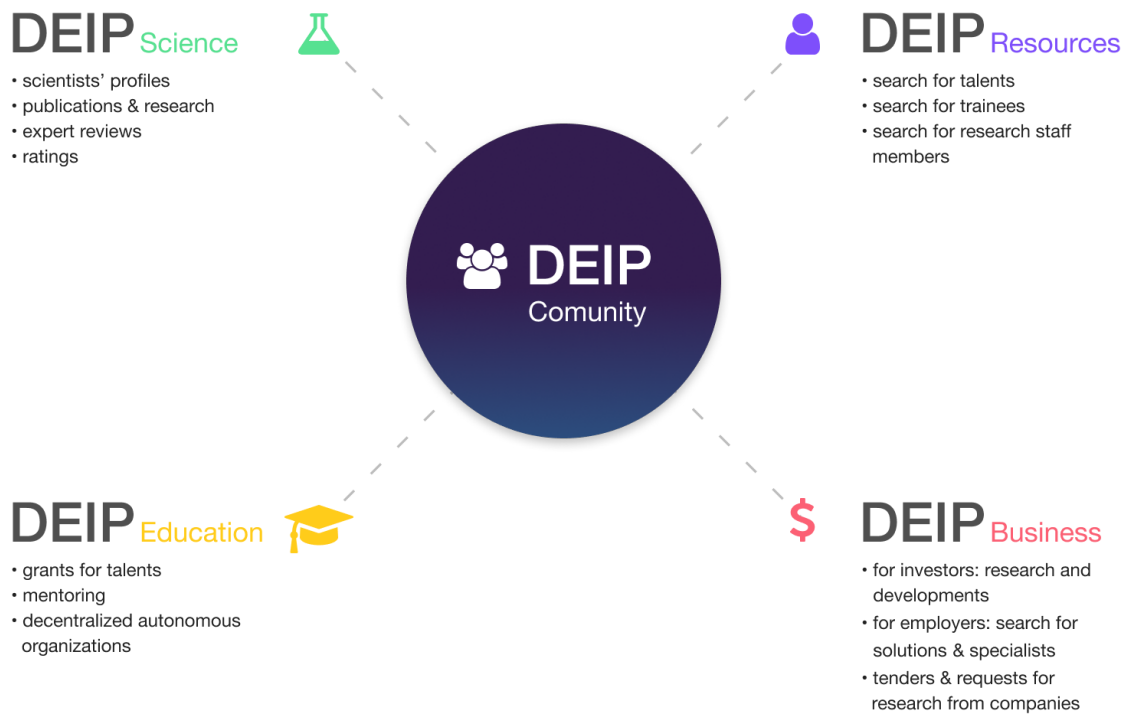
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# PROJECT OVERVIEW

DEIP - decentralized research platform aimed at effective and fair distribution of resources allocated to scientific and research activities:

- it's a free tool for organizing and conducting research
- all researches are published without any limitations and participation of regulatory bodies
- all developments are assessed by an expert community
- even a starting researcher can get funding and make money from his/her projects
- everyone interested can take part in safe and transparent subsidizing of research
- scientists and researchers unite in decentralized autonomous organizations
- all researches are open and always available, regardless of their findings and future – there is no such thing as a failure in science – all experience is invaluable
- communities around decentralized education and scientific activities come into being here

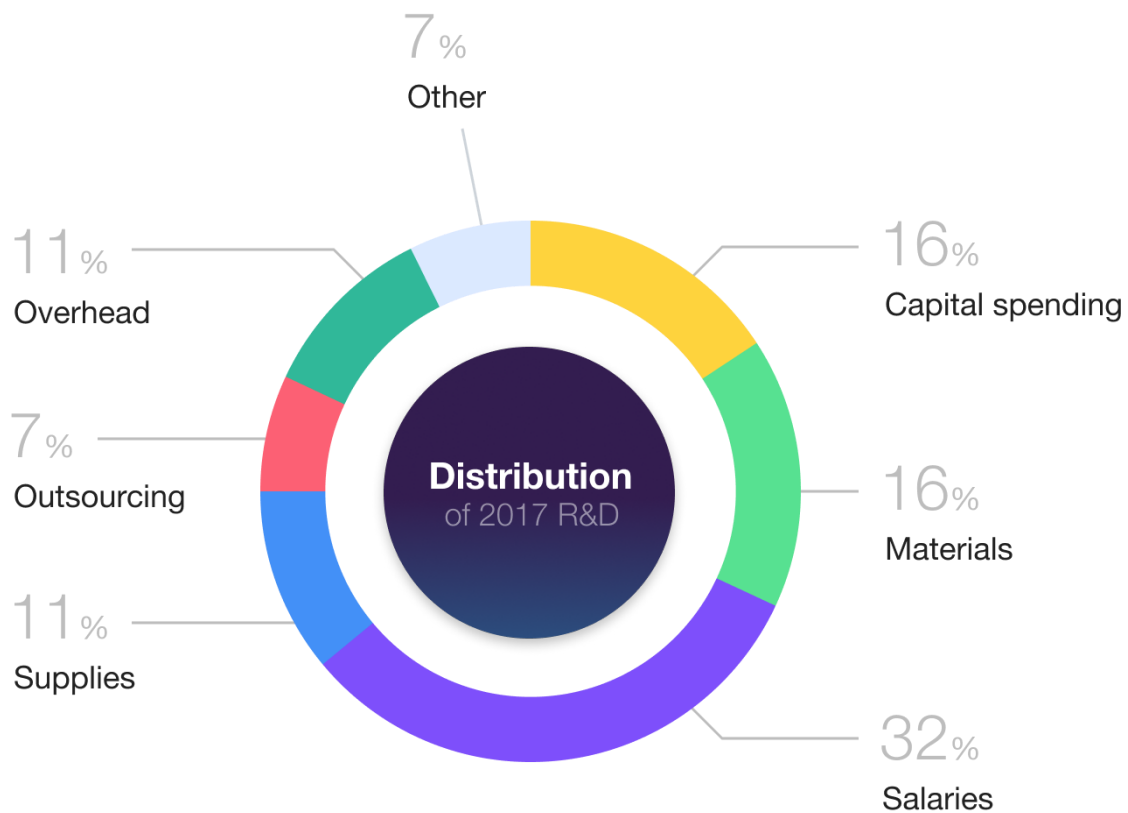
The economic model of DEIP is aimed at encouraging all members to make a high-quality contribution to the science and education sector, to assess everyone's contribution, as well as to reward them by means of decentralized allocation of expert tokens and internal cryptocurrency in accordance with the assessment of this contribution.



## INTRODUCTION

### Financing Problems

Financing plays a key role in modern science. Scientific researches undoubtedly constitute very costly projects and directly depend on external investment. Funds are necessary for purchasing special high-tech equipment and different types of resources, for paying salary to research staff, paying for business trips, covering of associated expenses in the course of experimentation (such as monitoring and disposal of harmful substances, payment for utility and communication services), as well as for covering the costs of lease of laboratories and other premises.



source: [digital.rdmag.com](http://digital.rdmag.com)

Most funds for research financing come either as grants awarded to universities by the state, or from internal budgets of corporate and industrial companies, which perform research for development of their own products. According to the estimates of [Global R&D](#) journal, the amount of gross expenditures on global research activities in 2017 was about \$2,066 trillion US dollars. It should seem that such an enormous figure is supposed to be indicative of absence of financial problems in the global scientific community, but is it true?

### Crisis and its Origins

The reality is that even despite the availability of considerable government grants, the problem still remains acute: the demand for research financing far outstrips the supply. If we take a look at the official statistics of the National Institutes of Health (NIH), USA, we can see that the total number of grant applications, as compared to 1998, has more than doubled. [In 1998](#), of 19,691 applications, 6,986 were granted, which equaled 35.5% of their total number. [Over year 2016](#), the number of submitted applications increased to 54,220, whereas only 10,372 of them were granted, and the approval percent came down to 19.1%

	2014	2015	2016
<b>Research Project Grants</b>			
Number of research project grant (RPG) applications:	51,073	52,190	54,220
Number of new or renewal (competing) RPG awards:	9,241	9,540	10,372
Success rate of RPG applications:	18.1%	18.3%	19.1%
Average size of RPGs:	\$472,827	\$477,786	\$499,221
Total amount of NIH funding that went to RPGs (both competing and noncompeting):	\$15,635,912,476	\$15,862,012,059	\$17,137,754,907

source: [nexus.od.nih.gov](http://nexus.od.nih.gov)

Starting from the latter half of the twentieth century, research in the USA and the rest of the world was developing rapidly, and the number of doctor's degrees conferred and students was increasing. The system of competitive grants was promoting this growth. Leading researchers were in need of highly specialized, inexpensive and talented workforce of recent graduates for their research projects. At the same time, for attracting a significant amount of state subsidies, it was necessary for universities to arrange for doctoral programs in relevant fields for professional development of the teachers who could concern themselves with both a search for external grants and teaching students. These factors gave rise to an increase in the admission of applicants to postgraduate training programs, and, consequently, in the number of doctoral graduates. Official figures of the National Science Foundation (NSF), USA, show that in 2015 the number of annually conferred doctoral degrees, as compared to 1957, increased [almost eightfold](#) (8,611 as of 1957 and 55,006 as of 2015).

Such dynamics results in tremendous pressure on the federal budget. Within the period from 1994 till 2003, the National Institutes of Health [doubled](#) the amount of funds allocated for financing of research projects (from \$20,994 billion to \$39,043 billion), however, this action did not have a due impact on the resolution of the problem, on the contrary, it turned things worse for the best research projects due to the increased competition for winning a grant. Universities and colleges demonstrated the distinguishing ability to absorb the increase in the federal financing due to extension of research infrastructure. In the United States and Western Europe, the human and financial resources invested in scientific activities were growing much faster than the population and economy of these regions. Such rapid growth can

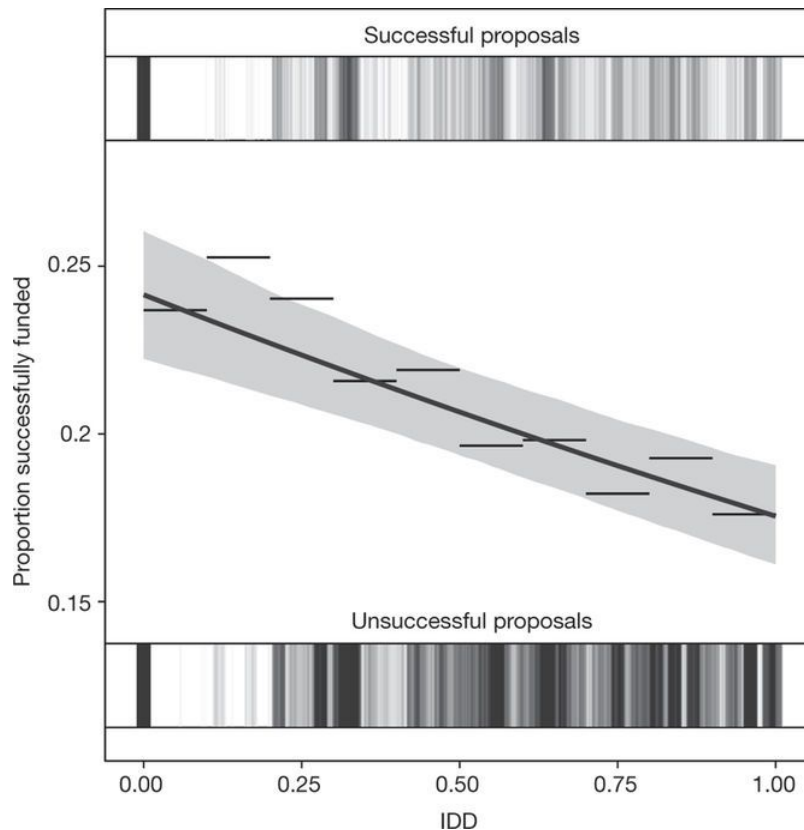
continue only until the absolute number of scientists remains rather small as against the overall population, and the budget of R&D funds represents a nonessential share of the general economy of a state. Otherwise, the emerging dissonance leads to a reduction in the allocated funds as against the total demand. Such a tendency was supposed to face a financial crisis sooner or later, it was just a matter of time.

DEIP protocol is designed to adapt to increasing budgets for distribution across science-activities depending on total number of researches at the platform. It will continue to share resources for science effectively. Operational costs are absent and distribution system works automatically based on scientists and researchers expertise assessments.

## Non-transparency of Financing

The criteria of approval of grant applications for projects aimed at research into fundamental scientific fields remain very vague for the majority of researchers. Even after preliminary expert review and receipt of positive feedback, denial of financing is not an unlikely scenario. Only one thing is obvious: when it comes to financing of science, governments are not interested in provision of investment for curiosity driven research. They are likely to think strategically and make more forward-looking plans, sponsoring the research, which is more likely to expand social benefits for the population and to advance progress in the field of technology and military equipment. For instance, currently, such trends are nanotechnology or alternative sources of energy. These fields are undoubtedly very promising and important for humankind, but one should not forget that most of current achievements did not result from some scheduled program, they were a consequence of unforeseen success. By prioritizing only a few strategic areas, government loses sight of prospective future achievements and accidental discoveries, which can significantly help in resolving most pressing issues.

Another important prejudice in approval of grants is the disregard of cross-disciplinary research aimed at solving multifaceted problems, such as global climate change, and involving several scientific fields. From the results of the global [meta-analysis](#) performed by Australian Research Council's Discovery with regard to 18,476 sent applications over 5 successive years, including successful and rejected ones, one can see that researches with a larger degree of interdisciplinarity (IDD) have much less of a chance to be financed than more narrowly focused ones. Moreover, even such indicators as the number of participants and the type of establishment do not have a significant impact.



source: [nature.com](https://www.nature.com)

Ethical issues are also an important aspect of awarding grants. In the course of consideration of applications, the expert panel shall impartially assess the significance of a prospective research, putting any prejudices aside, placing great focus on the objectives, proposed methods and baseline data. Racist and sexist prejudices are unacceptable on the path of development of scientific progress and humankind. Besides, we should not ignore the conflict of interest, which can be expressed in loyalty to the applications of the authors who are on friendly terms with the expert panel members or in intentional promotion of a specific research institution. Unfortunately, due to lack of complete transparency, we cannot be completely sure of absence of the abovementioned factors. Moreover, the current system offers opportunities for fraud, [instances of which](#) again and again come to light in the media.

The society has every right to know what taxpayers' money is spent on, whereas researchers should understand, what exactly they can improve for applying for a government grant. Both these conditions require a fully transparent funding system.



DEIP platform aims to create an ecosystem for science and research activities where the value of each research relatively global science will be assessed by experts community. Each research regardless of its final goal will be fairly rewarded if corresponding experts acknowledge its significance.

## Commercialization of Science

Most research investment comes from the industrial sector, which comprises privately-owned and government-owned corporations, as well as small business. In the USA, this share equals 2/3 of the total amount of subsidies.

2017 U.S. Source-Performer Matrix							
Billions, US\$/Percent changes from 2016							
Source of Funds		Federal Gov't	Industry	Academia	FFRDC (Gov't)	Non-Profit	Total
	Federal Government	\$43.2 0.5%	\$30.0 3.4%	\$38.5 1.3%	\$15.5 3.3%	\$6.0 -0.5%	\$133.2 1.4%
	Industry		\$336.8 2.6%	\$5.2 4.0%	\$3.6 23.3%	\$2.1 5.0%	\$347.7 2.7%
	Academia			\$19.0 5.6%	\$0.3 0.0%		\$19.3 5.5%
	Other Government			\$7.0 7.7%			\$7.0 7.7%
	Non-Profit			\$5.5 10.0%	\$0.1 0.0%	\$14.7 2.1%	\$20.3 4.1%
	Total	\$43.2 0.5%	\$366.8 2.6%	\$75.2 3.7%	\$19.5 6.0%	\$22.8 0.4%	\$527.5 2.9%

Source: R&D Magazine

source: [digital.rdmag.com](http://digital.rdmag.com)

Although the corporate sector certainly makes a valuable contribution to the technological progress, anyway it indirectly encourages research commercialization. If a business company sponsors some research, it expects positive results, which enable to improve the quality of their products and, consequently, to increase the profit. A lot of scientists who work in industrial laboratories understand this context and try to meet their sponsors' expectations. Any research, which progress has no sign of desired results, can be suddenly stopped upon the investor's request. This has a significant impact on research projects design and puts pressure on researchers, making them ignore any lines which do not constitute a business value.

In earlier times, when scientists got financing from government programs, it gave them the opportunity to pay the costs of performance of their experimental research in universities for acquiring new knowledge. Today, due to commercialization, university faculties are personally interested in obtaining grants to enable their regulator (university) to raise income and profit from research being conducted. At present, universities and other educational institutions are often compared and assessed based on the investment annually raised by them. This striving for grants became the main reason why doctoral students actively apply for teaching positions in academies. Professional reputation of a research faculty in any field of science now depends on the total amount of raised funds, and such features as innovation, significance, complexity and quality of research, have taken second place. Following this trend, research activities have developed into some sort of new business.

And yet, the research development factor predetermination is not the most serious flaw of commercialization, corruption is its most unethical manifestation. [Cases are known](#) to the society, in which in the pursuit of profit and enrichment, manufacturing corporations lost their heads and falsified research results by corrupting unscrupulous individuals involved in an experiment. Such actions are not only harmful to science, but also dangerous to the public, which unfortunately became the final consumer of a product.

Any research can receive funding either for getting profit from initial investments or satisfying research curiosity ("Blue skies research") at DEIP platform. The latter is justified by the fact the majority of participants of platform are scientists themselves which aim to produce new knowledge.

## Excessive Competition

Excessive competition has emerged, and it continues to grow as a result of a reduction in the amount of funds received by universities in recent decades. Investment funds, which provide grants for supporting research projects, tried to encourage participation of a large number of applicants in competitions, and were happy to see an increase in the submitted applications. At first glance, it might appear that greater competition among scientists is likely to have a positive impact and enhance the quality and significance of obtained experimental findings, because the scientists who won a grant competition in a specific field must be the best in research of this field as well. This hypothesis is possible in theory, but in reality, such system produces a wide range of negative consequences:

- Research activities in academic institutions are becoming akin to business, where specialists are recruited for the purpose of raising investment and increasing the employer's financial returns. A search for new knowledge and discovery of truth by means of research serve only as a tool for achieving this aim.
- A search for grants and preparation of applications takes up too much time of the best professors and doctoral students. According to some specialists, it takes up more than half of their working time, which they could devote to research and teaching recent graduates.
- The definition of the phrase *a successful scientist* has acquired a distorted meaning, which is now understood as the ability to find and obtain grants, as well as to have well developed business skills. And at the same time, born specialists in time-honoured scientific fields, who do not have sufficient experience in negotiations with investors, remain unnoticed.
- Denial of a grant can demoralize and discourage applicants due to enormous pressure from research institutions ([Publish or Perish](#)) and can cause an identity crisis. A denial of grant extension can mean loss of a laboratory and staff, stop of a research, damage to reputation or salary reduction, and often dismissal.
- The consequences of losing funding are so severe, that many researchers are ready to cheat and use the services of specialized agencies, professional editors and commercial advisors to design showcase research projects. Besides, it is well known that cases of corruption and fraud are more frequent in the face of external pressure.

There is much evidence that competition reduces internal motivation ([Kohn, Alfie 1993](#)). Even for more successful applicants, the aim of obtaining a grant can become more important than the performance of the research itself. Research productivity must be achieved by means of collaboration instead of rampant competition.

DEIP platform promotes cooperation around the knowledge and collaboration between research groups. Every new research is based on existent human experience and has all chances to be rewarded for its contribution to global science.

## Power of Publishers

Journals are one of the main components of scientific literature and a fundamental means of sharing knowledge and experience by scientists. On the other hand, they constitute a powerful tool, which can raise the profile of authors of published articles manifold.

Nevertheless, for any journal, commercial benefit is the key motive and incentive for its further activities. The wider its readership is, the lower its commercial risks are, and the higher its prosperity is. In today's capitalist world, it sounds natural and justified.

However, such an approach is unacceptable for such a fundamental area and engine of human progress as Science. In the way of dissemination of knowledge, there must be no obstacles, whether commerce, competition or censorship.

These days, journals publish a large number of screaming headlines and articles, where key emphasis is placed on the result of a research, but not on the knowledge itself obtained during this process. It is mainly done for expanding readership and attracting subscribers, who go for this kind of sensationalism, as well as for marketing any particular brand. The fact that such publications do not add real value to the scientific community due to their shallowness is not the most problematic issue. Worst of all, expert reviews described there are often absurd, they mislead the reader and contain no details of methods applied in research, which does not allow reproducing the stated results.

The influence of eminent publishers is so enormous, that they often succeed in securing support from governments. Thus, in 2012, the United States Congress considered a bill known as [The Research Works Act](#), which was aimed at restriction of free access to the research financed by the State from taxpayers' money. The sponsors of this bill were, first of all, major publishers, who managed to persuade some Congressmen of its usefulness.

In accordance with the long-standing industry practice, upon transfer of copyright to a publisher, a reasonable attitude existed to publishing materials on personal websites of real authors and universities, who set up the research. Today, however, the mercenary spirit of some publishers went beyond all bounds, [when they prohibited](#) educational institutions from disseminating their own research in personal media networks. And although it is lawful within the framework of copyright provisions, most members of the scientific community are concerned about such policy and consider the following [slightly different, unspoken rules](#) to be acceptable: to respect business partnership as opposed to the scrupulous tracking of purchased content use.

## Sensation-Seeking Journals

Striking results and findings are much more favoured as the contents of articles being published than newsbreaks of the majority of linear research, and the actual knowledge gained in the course of research remains behind the scenes. Catchy headlines attract attention better and make fuss over a topic being explored, thus increasing popularity of a publisher and a specific edition.

Actually, true starters in science are quite rare. Due to intense competition among research teams for the opportunity to publish their works in reputable periodicals, the so-called perverse incentives often emerge. In order to continue their work, scientists have to regularly make themselves heard in mass media and raise funds for their projects. The fact that publishers approve for publishing the works with a more striking effect more willingly, tempts many researchers to exaggerate and overestimate results of their works, as well as to choose safer and predictable subjects of discussion.

For instance, misuse of statistical significance ([p-value](#)) is widespread, when reports specify and emphasize only statistically significant results, which are considered the indicator of fitness for publishing by journals, whereas really important findings, which do not seem significant enough, are kept in the dark. According to the figures of [one of the meta-analyses](#) performed, the share of the published biomedical research containing statistically significant indicators in the introduction, during some period reached 96%.

Some scientists follow the fashion for increasing citation of their works and jump from one topic du jour to another, undertaking superficial research in the early stages after the disclosure of an important event. Such practices were named *ambulance chasing*.

The run for statistical significance, as well as proneness to successful results set control parameters, which results in a great deal of new ill-designed and irrelevant research. The current system has done too much for rewarding the result itself, where it is difficult to avoid a conflict of interest: - A scientist must be impartial and must work exclusively on confirmation and assessment of a particular hypothesis, yet a scientist desperately wants this hypothesis to be true.

All researches on DEIP platform are assessed, first of all, from the point of view of their significance and quality. Newsbreaks, which are not really valuable to the scientific community, will not receive wide publicity without a proper expert review, which is supposed to urge researchers to design better research projects.

## Negative Results Not Published

Works resulting in a failure to confirm the hypotheses being considered are very rarely submitted for publishing, and only a tiny number of them is approved by publishers. The share of the published researches with negative results [has dropped](#) to 14%, whereas in 1990 it amounted to 30%.

For scientists it is equally important to know what is false and what is true. Lack of free access to findings of research projects, which ended in failure, makes scientists autonomously undertake the same research to confirm their assumptions. Productivity of new research could be boosted given the opportunity of at least partial clearing up of arising questions by means of looking through materials of related researches conducted by their colleagues earlier, if all these researches were published in full, regardless of their final result.

A mistake has always been an essential part of scientific activities, and it is natural that most experiments end in failure. Instead of judging a research only by the final result, one should assess the significance of issues being looked into, the rigour and precision of methods being applied, as well as comprehensiveness and amount of detail of an analysis being performed.

DEIP for ever retains all entries ever made. All researches, regardless of their final result and current status, will be available to any interested person for identifying useful information.

## Paid Access to Information

Publishers of R&D works can collect a fee from authors of research and readers as well. In the former case, works are usually made publicly available, and the researcher keeps the copyright, therefore the works can be studied by everyone interested. In the latter case, the copyright is transferred directly to the publisher, who makes readers pay for looking through the materials by paid subscription or micropayments.

Both approaches seriously hamper free spread of scientific knowledge. The fees for release of articles to the public can reach [four-digit numbers](#) (US dollars), which entails additional expenses on research projects, exacerbating further their financial standing, which is already unstable. At the same time, paid subscription and micropayments in several periodicals can reach even larger amounts for readers.

Taking into account the fact that a considerable part of the intended readers of such publications are students and recent graduates, who do not have sufficient funds to buy all information they need and advance further, the situation is turning dispiriting.

[Shocking cases](#) are not uncommon, when even after payment of a commission fee for making an article publicly available, journals provided the materials only on a paid subscription basis.

According to [some estimates](#), over 80 % of major publishers' proceeds come from university libraries, which have to buy subscription to journals. The cost of subscription to each journal ranges from single digits to tens of thousands dollars per year, besides, sometimes, upon request of a publisher, subscription is possible only to a set of journals. Subscription costs of libraries amount up to 65 % of their total budget, which seems absurd, given that universities are the primary source of the majority of published research.

It is worth noting that thanks to the Internet and a thirst for knowledge, archiving platforms emerge. They provide the opportunity to release a new research to the public and study the available researches totally free of charge. Some platforms do not disregard piracy and purposefully make piratical materials freely available, asserting that copyright must not be applicable to research activities. Some scientists spend much time on writing scientific articles in Wikipedia, because they believe that such an approach advances progress more than closed academic publications. And some grants in the first place specify the conditions of the release of the final research findings to the public.

It allows us to observe, how desperately the scientific community needs creation of a common, freely available, collective human knowledge base. All the abovementioned means are in some way or other justified, nevertheless all of them do not provide a specific uniform protocol of communications among scientists, researchers and investors, hinder identification of intellectual property and do not contain a strong economic model inciting to make a clean break with the obsolete model of publication, which is based on financial gains of publishers and limited access.

DEIP platform is and will always remain absolutely free for its users. The platform is kept operational by means of a protocol and its underlying economic incentives. Any research materials and reviews published will be available for studying to all interested persons.

# Decentralized Models Work in Public Interest

## Cooperation Around Learning

It is extremely necessary to team up for more efficient work. However, the tendency of the contemporary society toward competition and the need for individual assessment are creating certain dissonance and wash away the benefit of the cooperation around learning. We are going to get it right. We will show that by uniting in autonomous groups, students will not only be able to achieve more in the depth and width of learning certain material, but also to obtain more grants for their education. And an open platform will show the most effective cooperation model for students. We are going to undertake research based on the platform data and provide information on how best to arrange the decentralized autonomous organization model in order to increase efficiency, improve the quality of own contribution and increase the chances of obtaining grants and investment.

Due to the teaming up as autonomous groups in DEIP and the creation of decentralized autonomous organizations (DAO), students, scientists and inventors will be able to increase their research yield manyfold, and consequently attract more grants for their development. And high-skill teachers will have the opportunity to act as mentors and tutors for research teams and earn directly in the platform's cryptocurrency.

## Tendencies towards decentralization

In one form or another, attempts are already being made in the world to introduce decentralized models not only at the government political level, but also in the private business sector. By no means all these attempts were successful. To a large extent, it is due to the complexity of introduction of decentralized models.

Taking into account the high level of control in today's society, states find it difficult to accept a new decentralized model even for an isolated field of the present-day society. This is because a decentralized model can run properly and efficiently, only if the control of this model is also decentralized. In the context of a state, it leads to the need to give part of its regulatory function to decentralized consensus. In this case, decentralized consensus shall be represented by a specific protocol and a network servicing this protocol.

In our time of rampant development of technology and information-oriented society, all-new models and concepts are increasingly emerging, which offer an alternative to the deeply rooted models. For many life spheres of our society, there is no more concern about how soon this sphere will be reformed. Almost in all spheres,



a lot of new hi-tech models are already springing up, which compete with each other in order to provide such benefits to the today's society, which it will be impossible to ignore.

The blockchain technology has taken this competition to a new level, to the level of decentralized protocols. The key difference of this level from everything that existed before is the decentralization itself. Decentralized models have to work in the interest of the community of their members. For communities which understand the principles of a decentralized model, this fact makes deciding between centralized and decentralized service a trivial task.

DEIP is trying to provide a decentralized model (protocol) for interaction of researchers, investors and communities, and sets itself the following goals:

- to effectively distribute the resources allocated for research
- to establish the system of expert tokens which reflects the expertise of researchers and scientists within DEIP blockchain
- to provide a mechanism of distribution of resources by means of expert tokens
- to enable scientists and starting researchers to raise funds for their projects
- to relieve scientists and researchers from the necessity to perform best-selling research to obtain financing for other significant projects
- to make the awarding of research grants safe and transparent to enable those who wish to participate in this process
- to give an opportunity to starting researchers to make money on their research
- to provide a free tool for arrangement, structuring and performance of research
- to unite scientists and researchers in decentralized autonomous organizations (DAO).
- to democratize and decentralize the education market
- to create communities around the decentralized education
- to popularize the blockchain technology within the scientific community
- to store the confirmations of the platform users' skill and knowledge in an immutable distributed ledger
- to ensure performance and publishing of research regardless of their final result, which will allow researchers of related projects to take into account any existing experience
- to solve the problem of piracy in research papers
- to launch own research in the blockchain technology field

# SOLUTION

## Solution Overview

In order to solve the above problems, a fundamentally new approach is required. In our opinion, the blockchain technology in the best way possible suited to DEIP platform implementation.

DEIP is an open and free platform for performance of research, where everyone can both start own research and get free access to other research findings on the platform. All data about research and researchers' profiles is stored in DEIP blockchain.

We believe that the system of creation and spread of knowledge should be implemented solely and exclusively in a public blockchain for ensuring transparency, auditing and immutability of entries in a distributed ledger.

Economic and reputational incentives included in the blockchain protocol of the research platform allow avoiding introduction of centralized regulators, who decide on budget allocation among researchers, as well as performing an independent assessment of scientific contribution of a research.

## Publication of Research

Researches posted on DEIP are available to everyone who is connected to the Internet, and all internal tools for conducting research are absolutely free for users. As of today, such level of accessibility and reliability can be achieved by means of blockchain technology.

## General Principles

- Free-of-charge use

All the tools provided for publication facilitate effective performance of research and interaction among researchers, reviewers and the community; and they will always be provided free of charge. This is due to the fact that the economic model applied relieves from the necessity to collect payment for any functions of the platform.

- Open knowledge without restriction

Research findings, along with all collected data on the research performance process, are stored in the blockchain, which allows making it impossible to restrict access to them.

Any knowledge here is available without any restriction. Anyone can take part in creation of new knowledge and be fairly assessed by the expert community.

- No centralized control

Researches are not selected by a centralized committee to be posted on the platform. All researches get access to assessment by the expert community.

- Maintenance by the community

The platform does not need funds for maintaining its operation, since the communities receive economic and reputational incentives to develop and maintain it.

- Self-sufficiency

DEIP platform is controlled via a protocol, therefore it has no single-point failure. Economic incentives work within the platform for maintaining the protocol and boost research activities. Due to the mechanism of internal cryptocurrency issue distribution, the research support does not require external input.

- Reliability and High Capacity

Supported by DPoS decentralized consensus algorithm. The performance capacity of the platform and data consistency are maintained by the Delegated Proof of Stake algorithm, which has proved its performance capacity in such platforms as Steemit, Bitshares, Golos.

## Types of Research Publications

Depending on the stage of work on a research, the following main types of publications can be distinguished:

- a. Announcement of a new research
- b. Milestone (intermediate results of a research)
- c. Final results of a research, after which the research is considered completed

## Search and Selection Mechanisms

All researches are categorized by disciplines. Due to the abundance of historical records within DEIP blockchain, we can offer flexible mechanisms for search and filtering of researches. You can find below some search criteria, which will be present in the first version of the platform's user interface:

- a. Search and filtering by expert review of research participants
- b. By number of collected expert votes
- c. By amount of raised funding
- d. By contribution of selected scientists

## Reference System

Any research uses past scientific experience. The practice of making a list of references to earlier research is important not only to confirm the source of the data taken as a basis but also to enable the reader to go into detail. By means of citation rating increase, scientists receive necessary publicity around their research, thus drawing attention to the most topical issues for humankind. The current citedness-based rating system has inadequate performance and it received scientists' criticism a number of times.

We do not consider the rating of being referenced as an indicator of importance of a publication, however, we have borrowed all the best from the current model and have added economic incentives within our protocol:

- References to other publications within the platform allow not only to receive quick access to related research, but also to share a reward, which probably would not have been received without knowledge gained in additional sources.
- Upon research completion, references to this research can continue generating income for the researchers and holders of research tokens, and the total tokens earned by referenced researches enable to calculate a research rating in the most objective way.
- DEIP platform makes it possible to attach references not only to resources inside it, but also to refer to external resources:
  - a. Internal links in the platform help to go to the researches, to which the current research is referring, and guarantee its availability.
  - b. External links. Since a lot of completed researches and publications are stored outside the platform, it will take some time to transfer the vast majority of research to DEIP platform. In view of this, we find it necessary to keep the possibility of making external references to researches located outside the platform. External links can be transformed into internal ones, if a research specified in a reference has been added to the platform.

## Expert Feedback

It is important to researchers to receive feedback from experts in their discipline. Each research can require not only independent assessment, but also advice of other researchers.

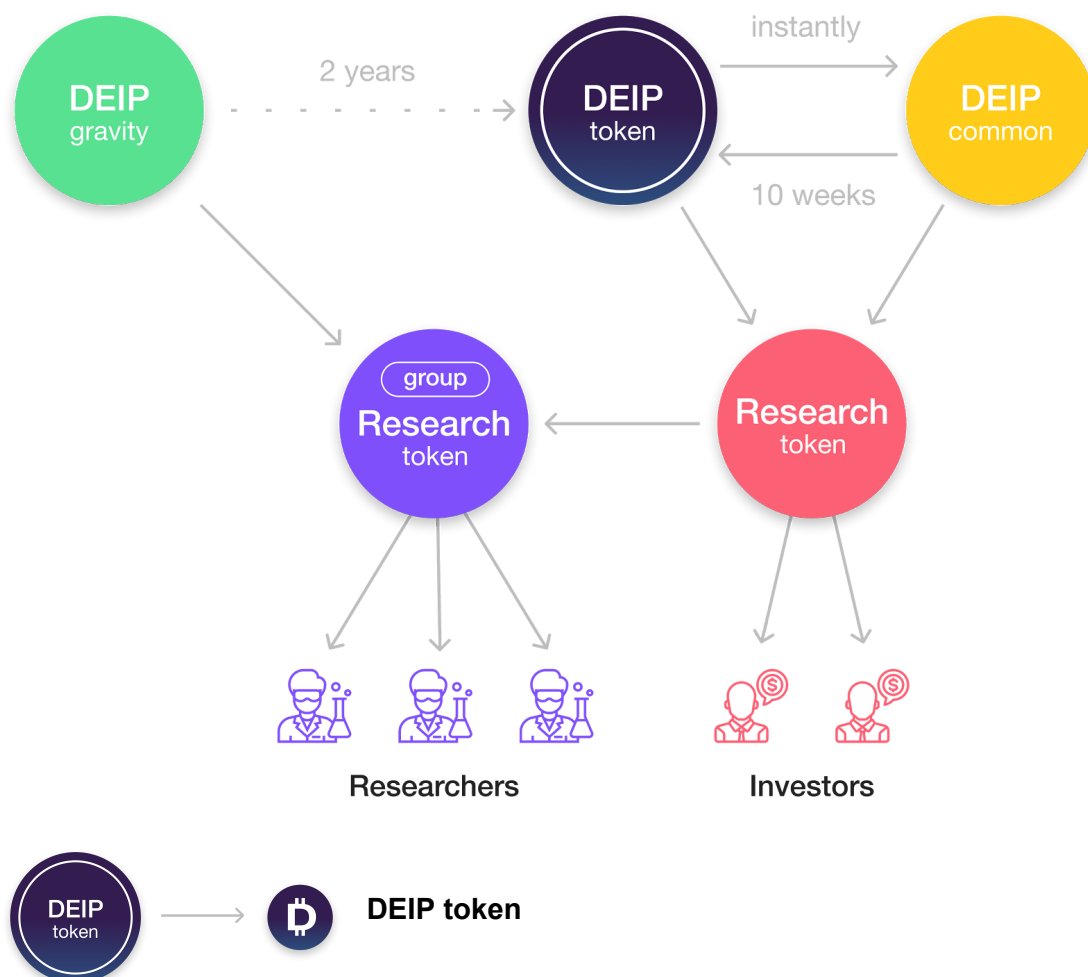
DEIP provides for feedback in the form of reviewing and replication of research results, and this function is stimulated by the protocol. Experts, in their turn, receive economic and reputational incentives to review other researches. And the more expert tokens a researcher has, the more responsibility he/she has to the society for research development in his/her discipline.

Researchers can encourage experts to review their research by determining the amount of income from the research, which they want to share with the ones who provide feedback.

The percentage figure of the income, which can be shared with reviewers, ranges from 5% to 50% at the discretion of a researcher. Thus, less competent researchers will be able to encourage their more competent colleagues to give feedback just by charging a part out of the research income for them.

## Token System

Operation of any public blockchain requires internal tokens, which form the economic model and provide financial incentives. First and foremost, these incentives are aimed at maintaining the network and protocol. In DEIP, encouragement to perform own research and fair assessment of other research is part of the protocol. For this purpose, we have developed a system of tokens, each of which is intended to ensure stable operation of the economic model.



- Main transferable liquid token of the platform.
- Basic token for conversion and purchase of research tokens.
- Used as the main economic incentive for keeping the network functioning and rewarding block producers.
- A financial incentive for any activities aimed at protocol support and contribution to research.
- Used as internal cryptocurrency for making internal payments, disbursements within a research team, as well as for purchase of research tokens.



### **DEIP Common**

- Non-liquid, cannot be transferred from one account to another.
- Taken into account in network capacity allocation among holders of this token. 20% of the network capacity is allocated for holders of DEIP Common tokens.
- Issued to new users upon registration to enable them to use DEIP platform functions free of charge.
- Available for conversion from the liquid DEIP token. DEIP token -> DEIP Common token conversion happens in the blink of an eye.
- Available for conversion into the DEIP token. The period of conversion into the DEIP token is 10 weeks, and the conversion is carried out uniformly throughout the time.



### **DEIP Gravity**

Expert tokens constitute the basis of DEIP's economic model and enable their holders to control distribution of the internal cryptocurrency emission and allocation of expert tokens to research on DEIP platform.

- DEIP Gravity is a collective name for the set of tokens, each of which is specific to one scientific discipline.
- DEIP Gravity is an expert token created for fair reflection of its holder's expertise in any discipline.
- DEIP Gravity cannot be bought, since this token reflects expertise and proficiency, which can be earned only by making own contribution to science and research.
- Non-liquid, cannot be transferred from one account to another.
- The model of obtaining an expert token is connected with contribution assessment: a researcher earns expert tokens by publishing researches and

doing reviews within the blockchain, which are then assessed by other expert token holders.

- A researcher can have expertise of different kinds, and, consequently, different expert tokens.
- An expert token of a specific discipline allows participation in reviewing researches within this discipline.
- Expert tokens allow dividing researches into separate disciplines, as well as creating cross-disciplinary researches, by marking them with one or several expert tokens.
- An expert token holder can accept a reduction in his/her expertise against other members, and thus weaken his/her expertise. A weakened expert token loses its voting power, and within three years, by equal stages, it is converted into the liquid DEIP token.



### **Research token**

The research token gives the right to receive a research income share in liquid tokens. Every research has its own tokens, and initially all 100% of the tokens belong to a research group.

In order to raise funds at an early stage of research, a research group, along with other tools, can sell part of research tokens to a prospective investor.

Research token holders can earn by taking part in distribution of income from a specific research coming from internal cryptocurrency emission. Research token holders receive part of the income of DEIP liquid tokens, but do not receive expert tokens. A research token can be transferred (resold) to any platform user.

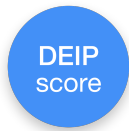


### **Research group token**

Each research group has its own token, which performs two main functions – internal management of research and income distribution within a research group.

- Possession of a research group token reflects the fact of belonging to a specific research group.
- Research group tokens are owned by researchers of a specific group and are distributed only among its members.
- Has an impact on reward distribution. In case of admission of a new member to a research group, he/she is provided with a number of tokens, which is determined by voting within the group.

- An action on behalf of a research group, which requires consent of the majority of members of this group, initiates voting. For participation in the voting, it is necessary to have the research group token.



### DEIP Score

- Reflects the aggregate number of expert tokens ever obtained
- Reflects a scientist's rating

As we can see, the platform has liquid tokens, tokens which can be bought for other tokens, as well as tokens which can be only earned by making a contribution to development of human knowledge, which is assessed by other parties to the protocol.

The economic model based on the token system described above enables to create an independent system for research funding and assessment.

## Decentralized Funding of Research

One of the key mechanisms of research funding on DEIP platform is based on distribution of the internal cryptocurrency emission. It enables to make this mechanism automatic, when distributing the emission in accordance with the expert assessment of each research. This mechanism is part of the protocol and allows ensuring income security for researchers, who conduct their activities on DEIP platform.

The bulk (>99%) of the internal cryptocurrency emission is used for rewarding the parties to the protocol for their contribution to research activities and creation of new knowledge. This contribution can be expressed both in performance of new research, and in reviewing of researches currently in progress and voting for them. The balance of the emission goes to block producers, who maintain the platform infrastructure and also make a certain contribution to research activities.

The emission received for allocation for a contribution to research activities is divided among the global pools – Common Pool and All Disciplines Pool.

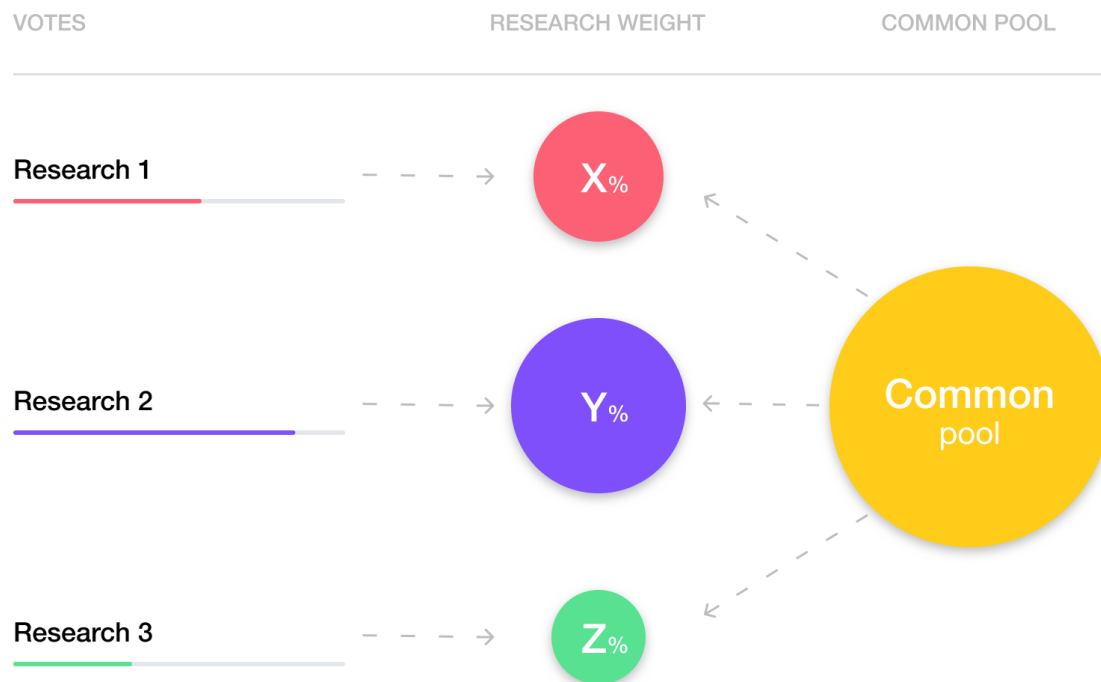
In rewards, Common Pool accounts for 20% of the received emission, and All Disciplines Pool accounts for the remaining 80%. This ratio is based on the fact that we want to provide scientific experts with as many opportunities as possible for managing the platform tokens emission, but at the same time, we want to leave available the opportunity for other parties to the protocol, who do not have the sufficient number of expert tokens, to vote for the researches they liked.



## Common Pool

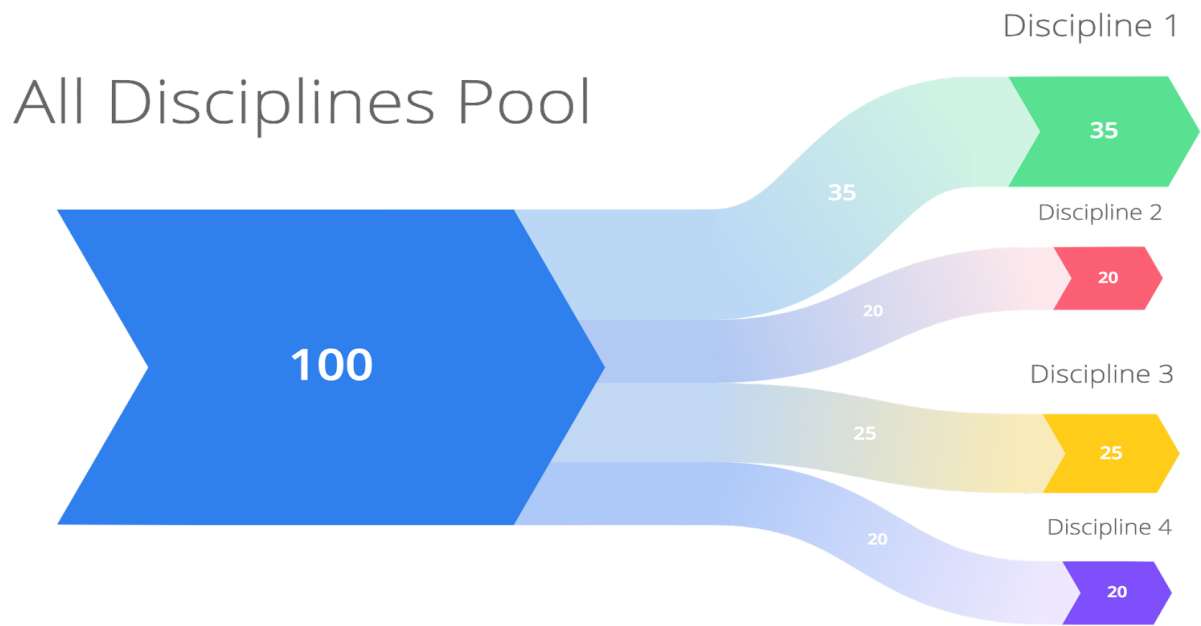
The aim of this pool is to allow all persons interested to influence research funding, even if they do not have the expert token.

The emission from Common Pool is distributed among all researches depending on the number of votes given to each research:



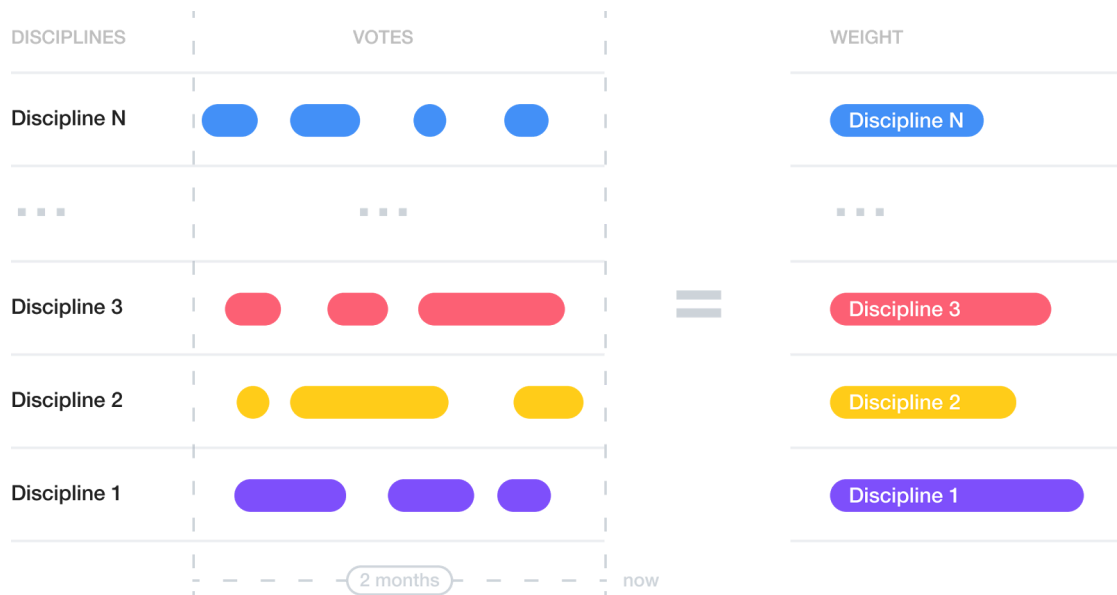
## All Disciplines Pool

All disciplines pool contains all tokens to be distributed among discipline pools. Tokens in all disciplines pool are not connected to any discipline until they are allocated to specific discipline pool.

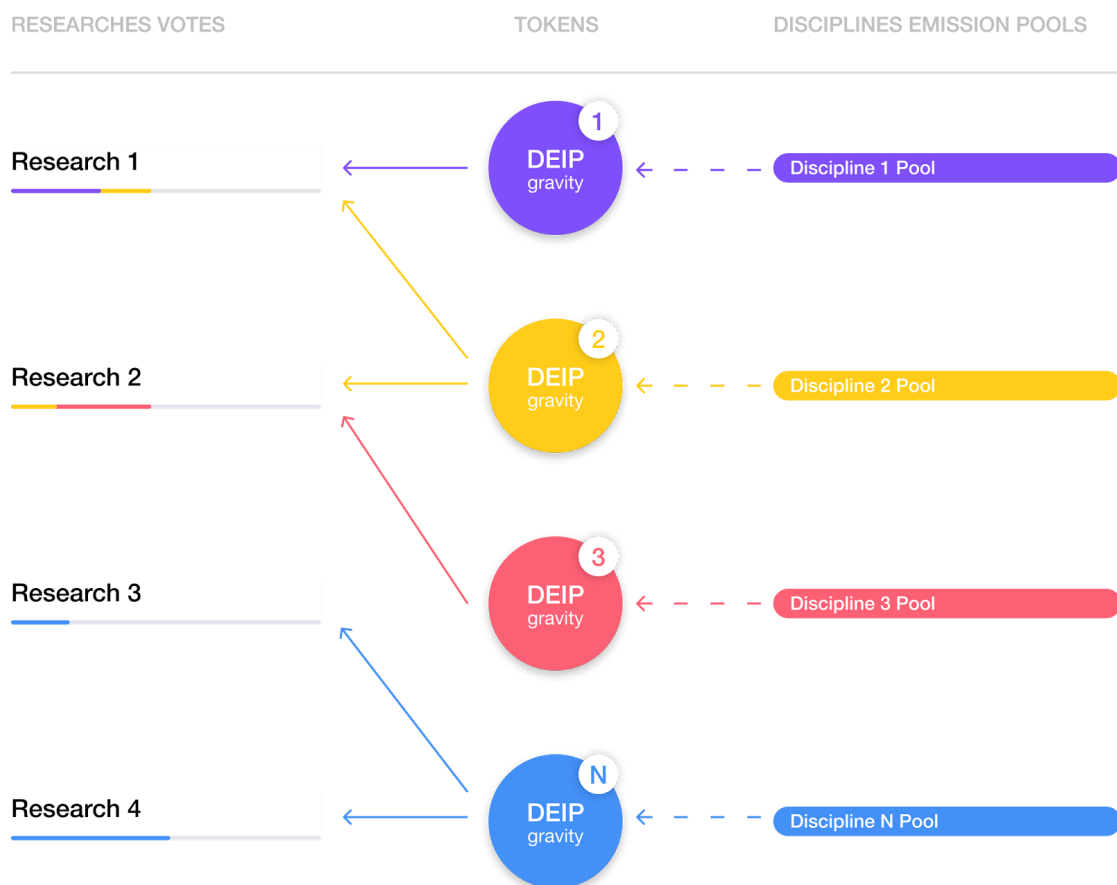


Expert tokens emission is distributed among disciplines pools, depending on the index of the square root of the total number of votes accumulated in each of the disciplines within a two-month period.

$$W_{D_n} = \sqrt{\text{sum}(\text{votes}(D_n))}$$



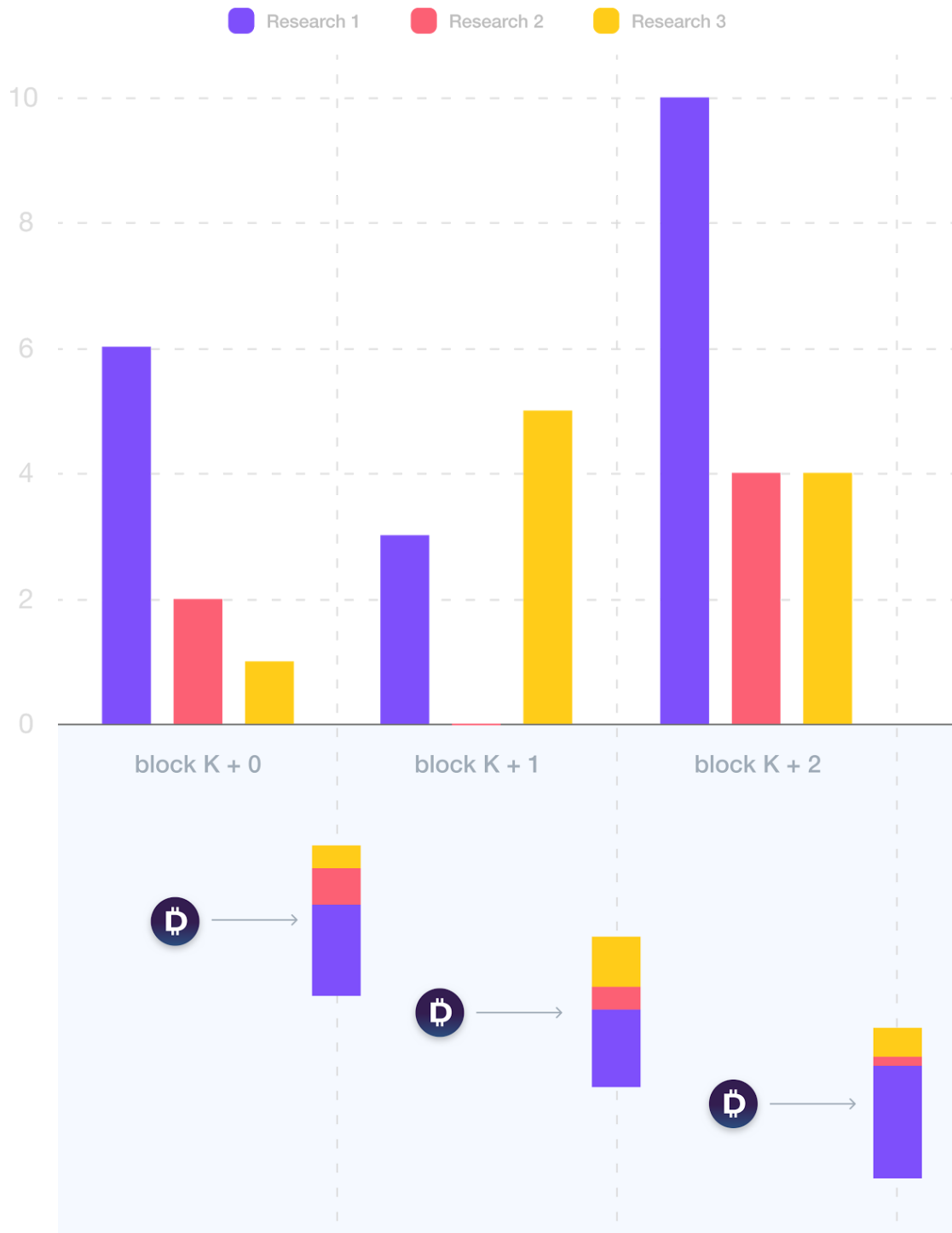
Within each pool of disciplines, emission is distributed among researches in proportion to the number of votes of the currently active publication of each of the researches raised to power 1.5:



## Research Rewards

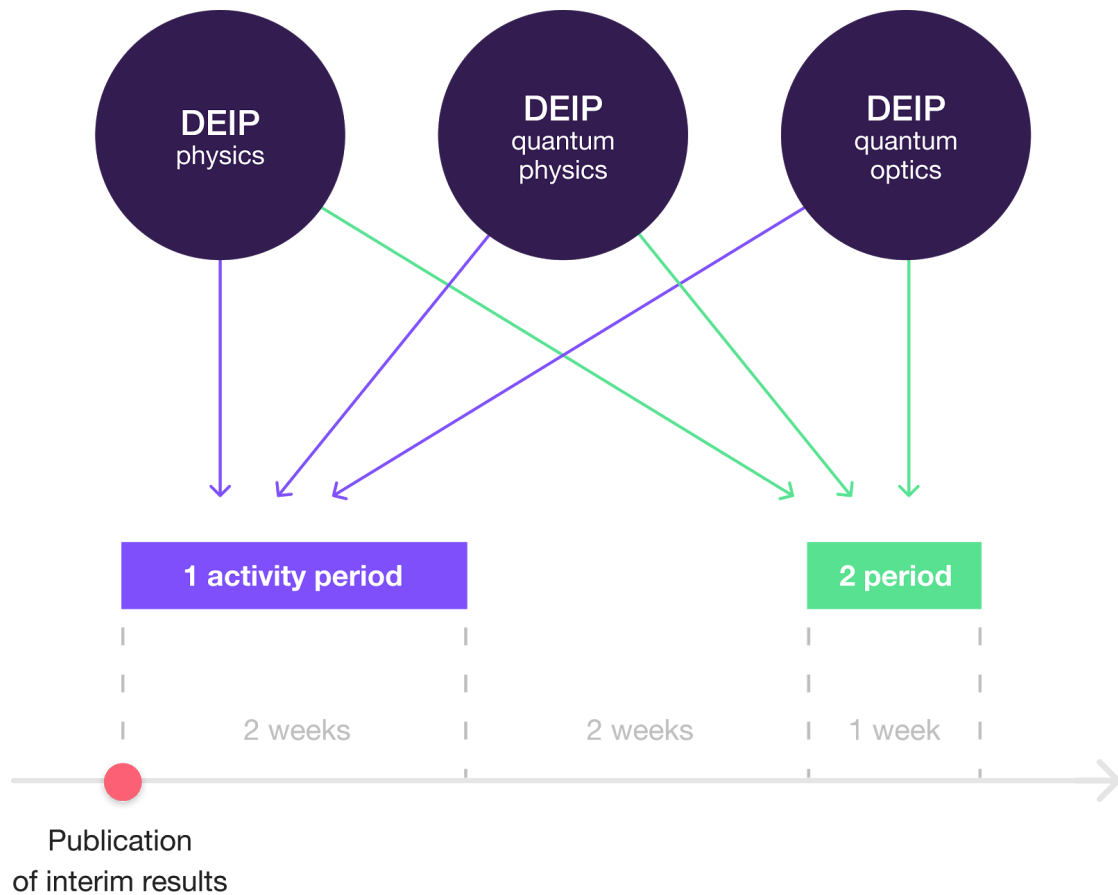
- Publications have several active periods, during which they get a reward from relevant reward pools.

### Researches votes

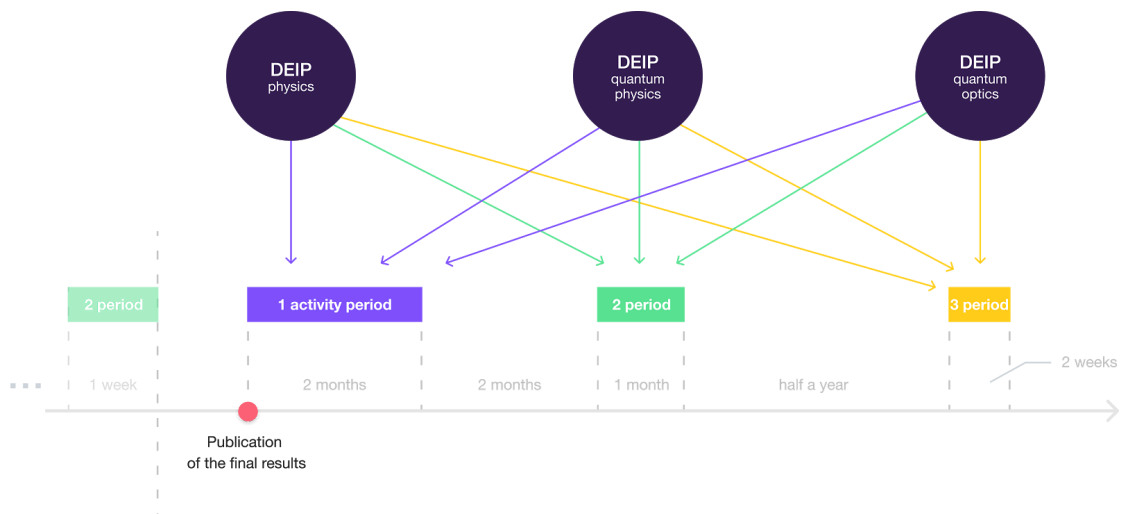


- Publication of **milestone** results of research activates two activity periods:

1. The first period starts immediately upon publication and lasts two weeks.
2. The second period starts in two weeks after the expiration of the first period and lasts one week.



- Publication of **the final results** of a research initiates opening of three activity periods:
  1. The first period starts immediately upon research completion and lasts two months.
  2. In two months after the expiration of the first activity period, the next activity period opens and lasts one month.
  3. Upon expiration of the second activity period, the next activity period opens in half a year and lasts two weeks.

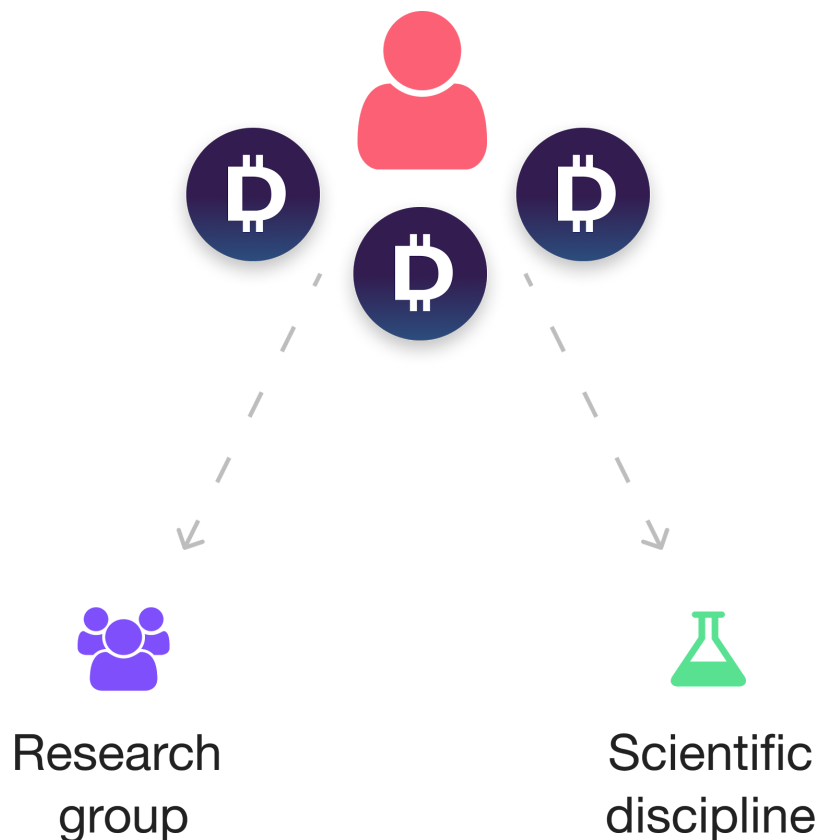


At the milestone results publication stage, the votes given only to this milestone publication are factored into emission distribution, and at the final results publication stage the total of the votes for all publications within the framework of a specific research is factored in.

- Rewards received by researches are shared equally between DEIP Gravity and DEIP Token. For instance, if, in the course of distribution of a reward from DEIP Physics, **X** DEIP Tokens were allocated, **0.5\*X** of them will be distributed in the form of liquid DEIP tokens and **0.5\*X** in the form of non-liquid DEIP Gravity Physics tokens.
- Upon the last collection of rewards by a research from emissions, and upon expiration of all its activity periods, it can still receive a reward, if an internal reference is made to it in any other research. In this case, 15% of the research income will be distributed among the reference sources of this research (references), which can be found on the platform.
- If the last activity period of a research, to which a reference is made, has not expired yet, this research will receive its reward at the ratio of 50% to 50% of the liquid and expert tokens. If this period has expired, this research will receive 100% of the reward in liquid tokens.

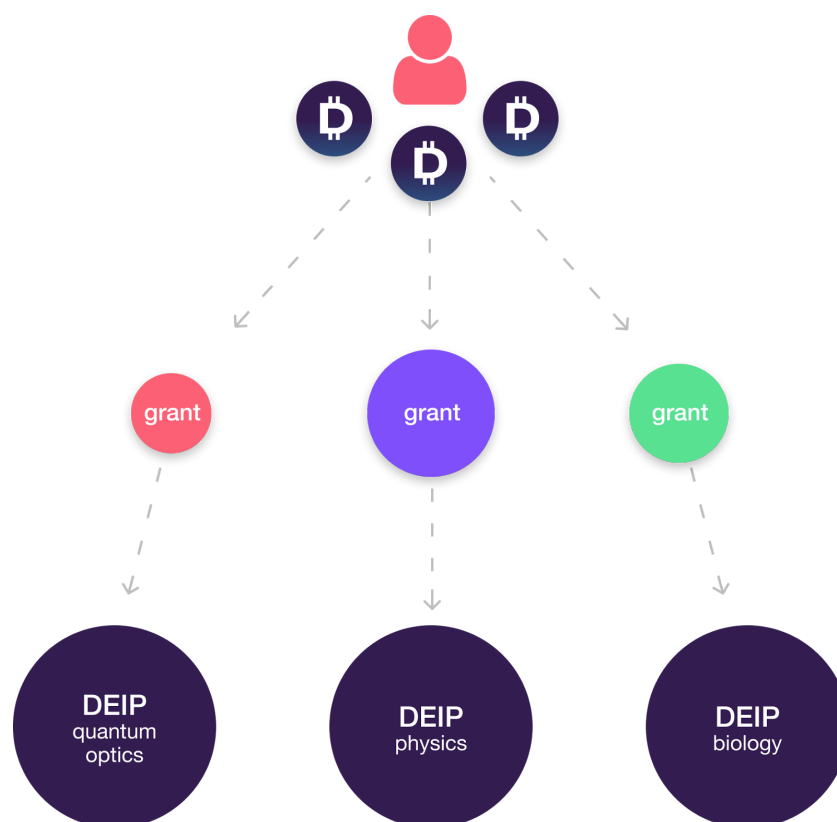
### Grants for Researchers

Any holder of DEIP liquid tokens can provide a non-repayable grant to a research group or for a specific research.



- A grant is transferred to the account of a research group and is managed by this research group along with the other funds.
- A grant can have restrictions with regard to its use, if the donor has set valid-from or valid-to timeframes of the grant:
  - a. When the condition of valid-from timeframes exists, researchers will be able to start using this grant only after the specified date.
  - b. When the condition of valid-to timeframes exists, if the funds have not been fully utilized by the specified date, the remaining part of the grant shall be returned to the donor.
- A grant can have a restriction with regard to its intended use. Use of funds can be restricted by the donor at his discretion, for instance, to purchase of specific equipment.

Holders of DEIP liquid tokens can provide non-repayable grants for a whole discipline, transferring them to one of the discipline pools



- While transferring a grant to discipline pool, the following shall be specified:
  - a. Amount (which will be transferred from user balance)
  - b. Time limit (within which this amount will be evenly distributed among active researches)
  - c. Distribution commencement date (for attracting preliminary interest in a discipline before the grant distribution starts)
- Upon the transfer of a grant to the pool, all researches, which will be active during the grant distribution period, will receive part of the reward from this pool in proportion to the emission distribution.

### Ways of Attracting Investment

A researcher of a research group can attract investment for their research from other members of the platform, by providing them an opportunity to buy part of research tokens. Through this mechanism, a research group can obtain the necessary funding in the early stages. Investors will receive part of research tokens, which will automatically entitle them to part of the income from DEIP liquid tokens of this research group. Non-liquid expert tokens do not constitute research income and go in full to the research group for subsequent distribution among its members.

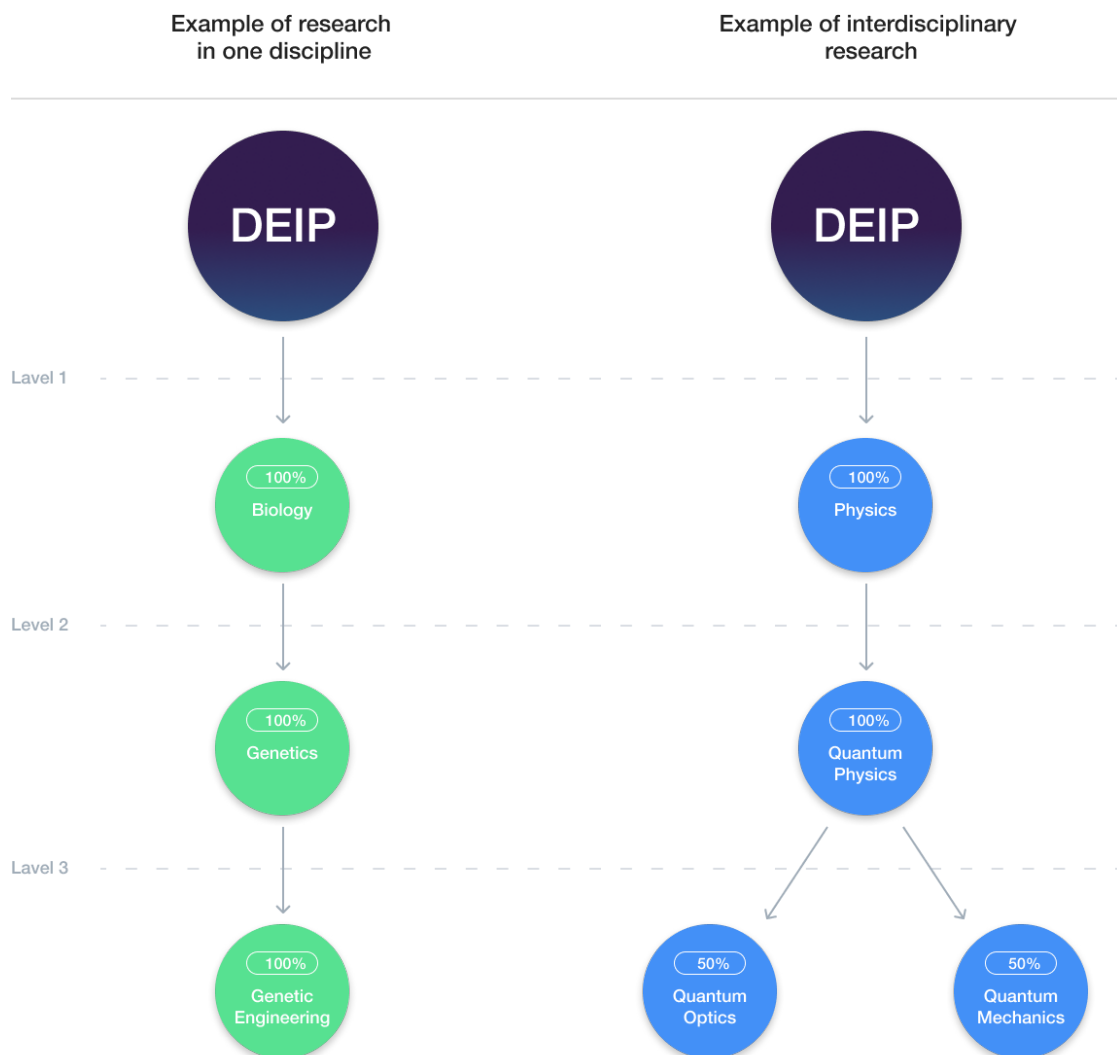
Upon completion of the active period of research, research tokens owned by the research group are distributed among its members. The subsequent reward, for instance, from use as internal references in new researches, is also distributed proportionally among the research token holders.



# Research Assessment System

DEIP aims to provide such a mechanism of impartial assessment of research, which will encourage collaboration among all researchers, thereby accelerating scientific progress. Moreover, to automate the process of rewarding for research review.

Research assessment is based on expert tokens.



- Researches are marked with one or several expert tokens
- If a research is marked with any expert token from the tree of disciplines, this research also becomes marked with all the higher-level disciplines of this tree.

- A research shall be marked with at least 1 expert token. Besides, since the non-expert Common token is located in the very root of the tree, each research will be marked with at least two tokens – an expert one and a Common one.
- One can vote for a research only with the tokens which it is marked with
- In order to encourage researchers to mark a research only with the disciplines, to which it actually makes a contribution, in case of adding several marks, the power of an expert vote, which this research can obtain, is reduced. The reduction is proportionate to the number of selected disciplines at the same level of the tree of disciplines.

Research assessment allows reviewers to earn expert tokens.

When reviewing a research, the sooner a reviewer writes a review of a research, which will receive a lot of expert votes in future, the more the reviewer will earn as compared to those who will review after him.

### **Voting for Researches**

Holders of expert tokens of DEIP Gravity disciplines have the opportunity to vote for researches in relevant disciplines.

- When the voting takes place, expert tokens remain unspent, but they are weakened by 10% of their current power of vote per each vote taken and are restored at a speed of 100% a week.
- Expert votes received by a research or a review are factored into the distribution of the emission of each of the disciplines, in which the research or the review have received votes.
- Besides, research votes are factored into the distribution of income from other researches, which have specified the original research as a reference.
- The aggregate number of votes distributed over the last two months to each of the disciplines is factored into the distribution of the emission among the disciplines.

### **Adding New Disciplines to the Tree of Disciplines**

While launching the platform and initializing the starting state of DEIP blockchain, we will create a primary tree of disciplines and relevant expert tokens, since research can be performed on the platform only within the framework of the available expert areas.

At the start of the platform, we are restricted to a range of primary disciplines, and we are unlikely to incorporate all disciplines at once. The main reason for this is the fact that a discipline cannot exist on the platform without profiles of scientists in place, who have expertise in this discipline, and we are restricted to the number of

experts, who we will manage to engage before the launching of DEIP blockchain. However, even if we manage to engage a sufficient number of experts from every existing field, the number of disciplines in the world is steadily increasing, and new areas emerge as human knowledge develops.

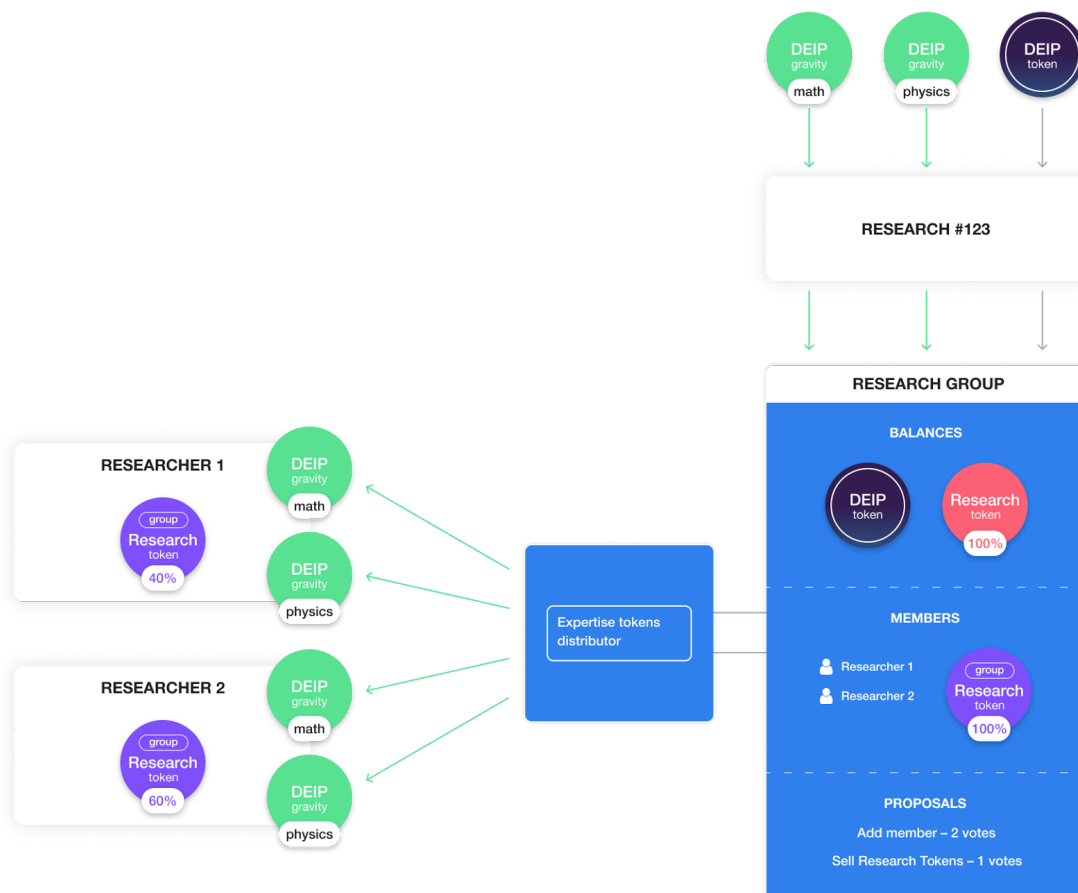
It is evident, that in the near future, the need will arise for a mechanism of adding new disciplines to the tree of disciplines, after DEIP blockchain launch. And the process of adding will have to be regulated by decentralized consensus and be protected by the economic model.

- In order to add a new discipline, researchers shall mark a research with a new token of the discipline yet to be created. We call this type of token ***the transparent expert token***.
- Researchers will not receive a reward for votes sent to the transparent token, and they will receive less profit than they are due from the discipline, which is the parent for a transparent expert token, until the new discipline is integrated into the general tree.
- The lost profit will go to **the prospective pool of the new discipline** – the pool of rewards of the transparent expert token.
- Once the sufficient size of this pool is achieved, a new discipline will be created, and all the expert tokens accumulated in the prospective pool will be distributed among the researches, which took part in the creation of this discipline.
- The researchers, who see the need for creation of a new discipline, can contribute to its adding to the general tree of disciplines, but upon that, they risk receiving less profit from current disciplines, if the token of the new discipline is never created.
- At the time of creation of a new discipline, the researches which have already been completed and have the mark of **the transparent expert token** of the discipline being created, will receive rewards from the distribution of the accumulated prospective pool of the newly established token. And new and currently active researches will start receiving expert tokens from the emission of the new discipline tokens based on the standard DEIP research assessment model.
- In order to mark own research with **the transparent token**, it is necessary to specify the name of a new discipline and its position in the tree of disciplines.
- When a new discipline is created, only the marks with the identical name and position in the tree of disciplines are taken into account.
- A discipline shall have a unique name, therefore if there are competing prospective disciplines with identical names but different positions in the tree of disciplines, if the threshold size of the prospective pool is reached by one of them, the other one is destroyed and all its potential tokens go to the newly created discipline for further distribution.
- The threshold for creation of a discipline is a parameter of DEIP protocol and is regulated by **delegates** from each of the **disciplines**.

Thus, the decentralized mechanism of creation of new disciplines on DEIP platform is guaranteed, and researches in them will receive their own income due to the distribution of the emission of the pool of the discipline being created.

## Specific Features of the Decentralized Research Management System

For conducting research activities on DEIP platform, we have provided for a research group management mechanism. The general principle of creation and functioning of research groups is based on collective possession and emission of research group's tokens and constitutes the model of a decentralized autonomous organization (DAO). A research group's token reflects membership in this group and entitles to participate in voting on management issues.



- Research management is performed on behalf of a research group.
- A research group is a decentralized autonomous organization, which is managed collectively by all its members.
- Actions within a research group, decision-making in which requires participation of a quorum of its members, initiate creation of proposals, which, in case of approval, ensure execution of a proposed operation (research completion, putting of a publication, transfer of funds)

- The number of votes in a research group is reflected as the ratio of the existing tokens of this research group owned by each of its members
- Tokens of a research group can be transferred only to members of this research group and only subject to approval by the other members of the group.
- When a new member is added, a group, by general voting, decides on the number of group's tokens to be emitted for the new member.
- Earned tokens are distributed depending on the selected research management model (in proportion to the tokens of a research group):
  - DEIP liquid tokens remain on the balance sheet of a research group
  - Expert tokens are distributed among the members at the time of their receipt by a research group (i.e. they cannot be kept on its balance sheet)

We understand that, having only one research group management model, it is impossible to fully meet the needs of all prospective users of the platform. Therefore, we will also provide a mechanism of creation of own models of research group management, comprising possible implementations of adjustable income distribution models, expert tokens distribution models and models of decision-making on behalf a research group. This mechanism constitutes implementation of specialized smart contracts for the fine tuning of the research group management model.

## Genesis State of DEIP Blockchain

At the time of the public blockchain initialization, an initial state can be presented, which determines the primary allocation of values within this blockchain. This state is called the **genesis state**, and the very first (or zero) block, where this state is stored, is called the **genesis block**.

In the majority of blockchains being created, the balances of its first members are initialized in the genesis state.

The genesis state of DEIP blockchain will comprise as follows:

- Balances of the investors, who have supported the DEIP platform development and have obtained DEIP tokens before the blockchain launch.
- Balances of DEIP platform founders.
- DEIP fund balance for supporting research on the platform.
- List of primary disciplines.
- Blockchain launch time.
- List of primary delegates with a minimum number of votes issued (for launching block production).
- Accounts of the scientists and researchers, who have agreed to join the platform before its launch.
- Research groups formed before the platform launch.
- Researches completed before the platform launch, the authors of which have given consent to their publication on DEIP platform.
- Initial distribution of expert tokens.

## Distribution of Expert Tokens

- In the genesis block, the initial expert tokens will be distributed among the scientists and researchers, who have joined DEIP community before the blockchain launch.
- Each expert will be issued 50,000 DEIP Gravity (expert tokens), which they will be able to allocate at their discretion.
- An expert will be able to allocate the tokens issued to him/her to one or several disciplines.
- The first experts who will receive the expert tokens will not be able to allocate them to more than five disciplines.
- Despite the fact that the standard expert token can be converted into the liquid DEIP token within three years, the expert tokens created in the genesis block can never be weakened.
- The experts chosen by the first participants of the platform shall have public confirmations of their expertise, besides, they shall have publications in relevant disciplines.
- Researchers will be able to submit their research for publication on the platform as early as in the genesis block. Moreover, activity windows for all the researches published at the start of the platform will be increased threefold, and, consequently, will participate in the token emission distribution three times longer.

## SUMMARY

Now it has become evident, that the distribution of our civilization's resources can be much more effective, and we believe that it can be achieved by means of the blockchain technology.

Decisions on distribution and allocation of funds will be taken not by centralized regulators, but by decentralized blockchain protocols. These decisions will be taken at lightning speed and with maximum efficiency, due to the protocol, which is perfectly configured for addressing its specific task.

The objective of DEIP protocol being developed by us is the efficient distribution of the resources allocated for science and research. All functions and processes within the protocol have been designed solely for achieving this objective.

We believe that mass use of DEIP protocol will allow to substantially boost the scientific and technological progress. People no longer need to place important decisions in the hands of intermediaries and to worry that funding processes might be compromised by someone for personal gain. In DEIP blockchain protocol, everything has been configured for efficient allocation of resources, and those, who make a contribution to creation of new knowledge, are fairly rewarded.

By removing the obstacles, which scientists and researchers are facing, we will be able to free the human capital and direct it to solving really important problems of our time. Just imagine what it can lead to!

DEIP will mark the beginning of reforms in science and educational systems by providing a much more effective way of both creation and transfer of knowledge.

Development of DEIP platform will result in the following: all world resources allocated for advancement and creation of human knowledge will be distributed through the expert community following DEIP blockchain protocol. We believe that it is possible, since, when strong economic and reputational incentives are introduced, the whole expert community starts working towards maintaining efficient allocation of resources and development of the protocol.

In order to translate this into reality, we need support of both scientists and regulators. This presents a challenge, which cannot be met without the support of the community.

Join us!  
DEIP.WORLD