PoSciDon

Scientific funding revolutionized

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0 Abstract

Funding for scientific research is highly centralized and is frequently subject to many forms of bias. This leads to politics-driven decisions, inefficient allocation of funds, lack of funding, favoritism and many other factors that hamper scientific progression. In addition, institutions own all the intellectual property (IP) and only a fraction or nothing of the proceeds are given to the scientists.

A decentralized and unbiased, community-driven initiative is the solution to overcome these issues. Thus, the PoSciDon Decentralized Autonomous Organisation (DAO) was created. PoSciDon DAO is a community-governed collective that efficiently funds personalized medicine research for many diseases, including solid and blood cancers; multiple sclerosis and rheumatoid arthritis, and monetizes data and IP assets generated as a result of the funded research. In this way, PoSciDon DAO is the first ever decentralized biotech organization focused on personalized therapies targeting life-altering diseases.

PoSciDon DAO is built upon the PoSciDon protocol. The PoSciDon protocol is a set of smart contracts deployed on zkSync Era, a network on top of Ethereum's distributed ledger technology, also known as blockchain. This protocol facilitates transactions from donors and investors to scientists by leveraging blockchain's most important features: transparency, decentralization and censorship-resistance.

The PoSciDon protocol is designed in such a way that it does not only benefit scientific funding, but also investors, scientists and other members of the DAO. Using the PoSciDon protocol, PoSciDon DAO can incentivize 1) the funding of personalized medicine research, 2) contributions of knowledge and skills and 3) participation in DAO-related activities including governance through a multi-token model. This multi-token model consists of two different tokens: $PO and $SCI.

1. The $PO token is a non-tradable non-fungible token (NFT), also known as account-bound, that is received upon participation in governance-related activities. Staking of this NFT together with $SCI tokens allows you to receive yield in the form of $SCI tokens.
2. The $SCI token is the only tradable token PoSciDon DAO will issue. Staking of this token provides members with the right to vote on proposals and have a say in PoSciDon's future. $SCI tokens can be earned through the execution of tasks for the DAO or can be retrieved through trading. Staking $SCI tokens makes members eligible to receive a part of the 30% of the proceeds from PoSciDon DAO's commercialized data and IP assets.

Using this token model, PoSciDon DAO encourages anyone to join the organization including scientists, entrepreneurs, investors and other decentralized science enthusiasts. PoSciDon DAO creates a decentralized, democratized and non-discriminatory organization that will revolutionize and better personalized medicine research funding.

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1 Introduction

Our philosophy at PoSciDon is that everyone - no matter their background, knowledge in scientific topics/methodologies or academic abilities - should be able to have a say in how their funds are contributing to scientific research. With this in mind, we created the PoSciDon protocol.

The PoSciDon protocol is the first ever scientific research funding application powered by zkSync Era, a network on top of Ethereum's distributed ledger technology, also known as blockchain, and democratized by the PoSciDon Decentralized Autonomous Organization (DAO). Hereinafter, PoSciDon DAO will be referred to as PoSciDon.

PoSciDon can be considered a combination between a BioDAO and an InvestmentDAO (Tyler, et al., 2023; Krishnakumar, 2022). A BioDAO is mainly focused on decentralizing a process related to science where members do not directly receive any proceeds from scientific output (e.g. VitaDAO), while an InvestmentDAO mainly focuses on generating profits for investors or other members involved in the DAO (e.g BitDAO) (VitaDAO, 2021; BitDAO, 2023). PoSciDon can be considered a hybrid version of both DAO approaches as it aims to generate profits and to reward investors through a mint and burn-based buyback system. With this in mind, PoSciDon hopes to attract anyone with any intention to participate in the DAO including entrepreneurs, scientists, contributors and investors.

PoSciDon focuses on funding cutting-edge personalized therapies that target life-altering diseases. Our protocol allows everyone to fund revolutionary scientific research projects while leveraging the benefits of blockchain technology: decentralization, non-discrimination, transparency, accessibility and censorship-resistance.

This whitepaper will help you understand:
1. Why PoSciDon is necessary for the prosperity of scientific research.
2. How our unique multi-token incentive system will change the way people look at funding of scientific research and how it benefits both investors and scientists.
3. How PoSciDon could become the first ever decentralized personalized medicine-focused biotech organization run by a community.

1.1 Scientific Research Funding Challenges

Funding scientific research is a highly centralized process, so decentralization, democratization and non-discrimination are needed. The actions of institutions involved in the scientific research funding process do not benefit the scientists nor the scientific research funders. Often, they even hamper the progress of scientific research.

The following actions executed by these institutions affect science negatively:
1. Inefficient allocation of funds
2. Lack of funding

3. Lack of funding transparency
4. Limited funding opportunities
5. Full and sole ownership over intellectual property
6. Favoritism
7. Personal vendettas
8. Politically-driven decisions
9. High retainment of funds from fundraisers ([James, 2022](#))

Removing these forces will reduce unfavorable behaviors and can lead to improved scientific efficiency and output with less money wasted. This is where PoSciDon protocol and PoSciDon come in.

1.2 Solving Scientific Research Funding Challenges

PoSciDon and the PoSciDon protocol have been developed to establish a democratized, decentralized and non-discriminatory scientific research funding process. It allows everyone to vote on which research project should get funded. These funds will then be transferred from the treasury directly to the scientists. Thus, it eliminates many middlemen and biases in the process of scientific funding. In turn, this will increase the fund allocation efficiency and will greatly reduce the presence of personal, political and institutional bias in the scientific funding process. Overall, PoSciDon aims to make the scientific funding process for personalized medicine research run easier and more smoothly compared to the current funding system. Besides that, the PoSciDon protocol revolutionizes the incentive system of the scientific funding process benefitting both investors and scientists. Read more about our token-based incentive system in Section 2.2 ([PoSciDon's Token Economy](#)).

1.3 Scientific Research Focus

At PoSciDon, we mainly focus on funding early-stage, pre-patented projects from academic research groups, private labs or early-startup biotech companies that work on bridging the gap between academic research and industrial commercialisation for personalized medicine research. Our team consists of experts in virology, immunology, oncology and epidemiology. With our in-house experience, along with the expertise of our community members, we are able to assess which projects have the potential to impact the personalized medicine field.

Personalized medicine, also known as precision medicine, is an approach to research and develop novel therapies that treat patient subpopulations of a target disease. For example, within Pancreatic Ductal Adenocarcinoma (PDAC; simply put: pancreatic cancer) multiple subtypes have been identified, whereby each subtype consists of patient tumors with similar genetic profiles ([Torres, 2018](#)). In this case, a personalized medicine approach would consist of creating therapies that only target one subpopulation and not the whole population of PDAC patients. Current treatments targeting the whole PDAC population only results in 9% survival [(Siegel, 2018)](#). This indicates that a one-size-fits-all approach is an inaccurate and inefficient method to treat patients. Thus, personalized medicine research is immensely needed.

Here are some of the diseases PoSciDon focuses on where research into personalized medicine approaches is needed:

1. Immunologically cold solid tumors (e.g. colon, pancreas, and brain cancers)
2. Blood cancers (e.g. leukemia and lymphoma)
3. Multiple sclerosis
4. Type 1 diabetes

Several personalized medicine approaches have been developed so far and can be used to attempt to treat some of the aforementioned diseases. These are some of the therapies we focus on:

1. Chimeric Antigen Receptor (CAR) immune cells
2. Viro-immunotherapies/Oncolytic viruses
3. Gene therapies including lentiviral delivery vehicles
4. Nanoparticles including exosomes
5. Monoclonal antibodies
6. (Cancer) vaccines
7. Cytokine/Chemokine treatments

These are our guidelines, but we are willing to invest in other types of projects if chosen by the community through a proposal.

2 DAO Overview

PoSciDon is made up of several key elements:

1. The PoSciDon protocol to facilitate the multi-token incentive models, governance and funding distribution (see Figure 1).
2. Crews that dedicate their time and effort to further develop the DAO.
3. A business model focussing on monetizing data assets and intellectual property generated by scientific research funded by PoSciDon. These assets are represented by Non-Fungible tokens (NFTs) through the Molecule framework.
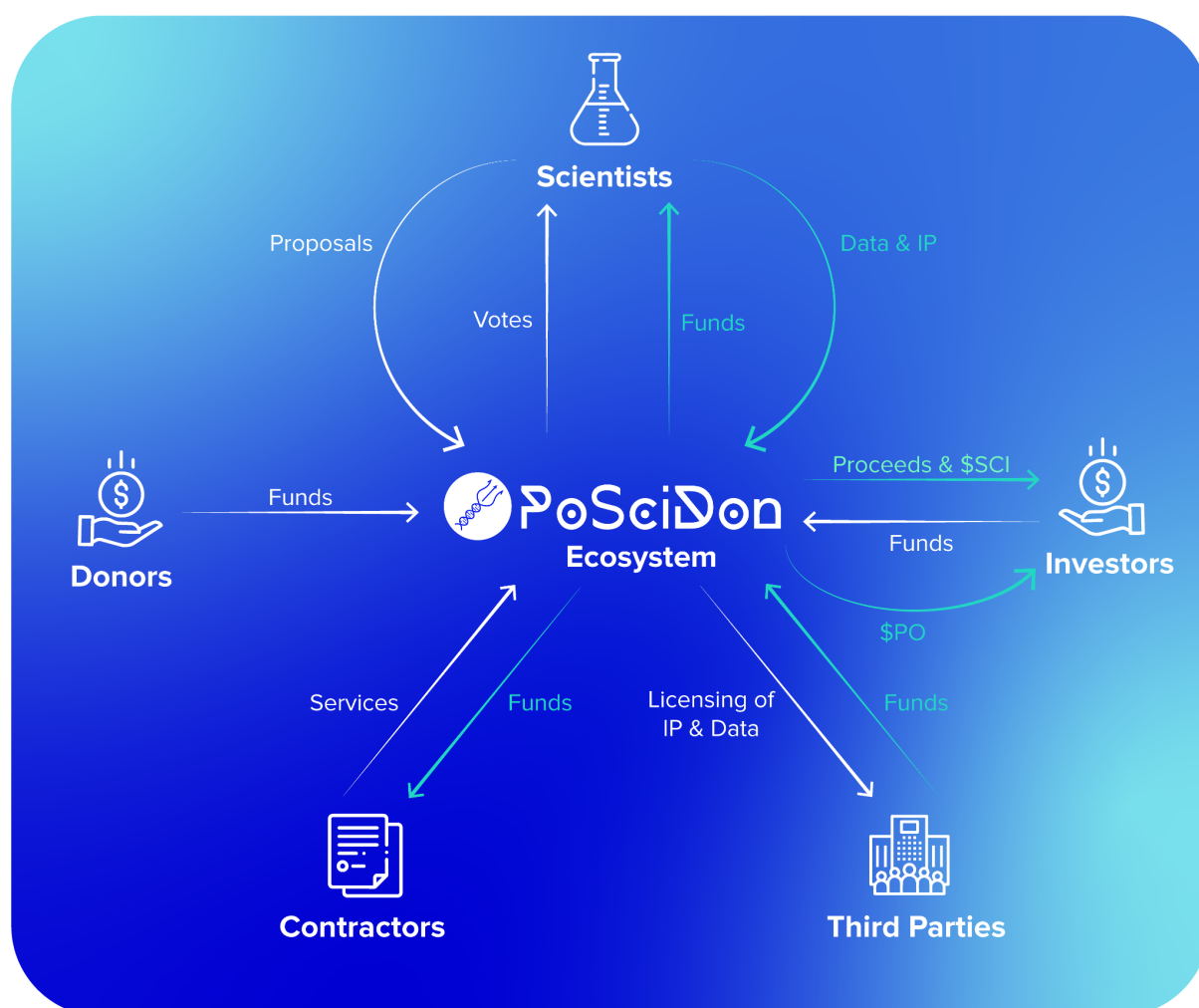

Figure 1 - Overview of the PoSciDon Ecosystem

2.1 The PoSciDon Protocol Infrastructure

The PoSciDon protocol is built upon zkSync Era, a network on top of the Ethereum blockchain. The zkSync Era network is a rollup that uses a cryptographic method called zero-knowledge (ZK) proof to verify the correctness of transactions (Ethereum Foundation, 2023). Therefore, zkSync Era is also known as a ZK rollup. These ZK rollups perform blockchain-related

calculations off-chain and roll many transactions up into one single batch. This batch is then sent to the Ethereum blockchain in a single action. Because of this technology, transactions are quicker, have lower gas fees and maintain the high level of security that Ethereum provides. Thus, all transactions executed through the PoSciDon protocol will inherit the benefits from zkSync Era, making the scientific research funding process more cost effective and faster compared to projects built directly upon the Ethereum blockchain (Gluchowski, 2022).

The PoSciDon protocol will be the first decentralized science project that has been deployed on zkSync Era. Interactions with zkSync Era will be done through the PoSciDon protocol which is a set of smart contracts. A smart contract is immutable code that allows interaction between the member and the blockchain (Wackerow, 2022). The PoSciDon protocol comprises of several key elements:

1. A multi-token incentive system including $PO and $SCI tokens.
2. Smart contracts that facilitate staking, the process of locking up tokens for a limited time, for each token in the multi-token model.
3. On-chain governance for $SCI tokens. This system follows Open Zeppelin's standards (OpenZeppelin, 2023) and is modeled after MakerDAO (MakerDAO, 2017).

Interaction with the PoSciDon protocol allows holders of $SCI tokens to participate effortlessly in our dual governance structure. The protocol allows participants to have a say in the allocation of funds to scientific research projects and the management of the operations, treasury, intellectual property, and data assets.

2.2 PoSciDon's Token Economy

At PoSciDon, we researched many incentive models of tokens in decentralized science projects. We found that most of these projects lack incentive models for members to be sufficiently engaged in the ecosystem for long periods of time. This often leads to no incentive to invest, to hold a token or to participate in governance or in DAO operations. The PoSciDon protocol contains the first-ever multi-token incentive model for a decentralized science project on zkSync Era. To make sure PoSciDon can sustain itself for a long time, its token economy design follows the web3 sustainability loop system (McConaghy, 2021). Our incentive model consists of two tokens: $SCI and $PO.

2.2.1 $SCI Token

PoSciDon will launch the tradable $SCI token when the DAO expects to offer enough. The $SCI token is obtained by trading on decentralized exchanges and, eventually, centralized exchanges, by staking $PO tokens (see here for more on the $PO token) or by contributing to the DAO. Contributions include, but are not limited to, working for the DAO by joining one of the crews and by providing data and intellectual properties.

Features

Holders of the $SCI token will be able to stake these tokens through our protocol and receive governance power. In addition, the DAO has a burn mechanism for the $SCI token in the case of revenue. For example, when the DAO generates 100k USD, 30% of that will be bought back by the DAO and that amount of tokens will then be burned (see Figure 2). This will result in a lower token supply while maintaining the market capitalization of the $SCI token.
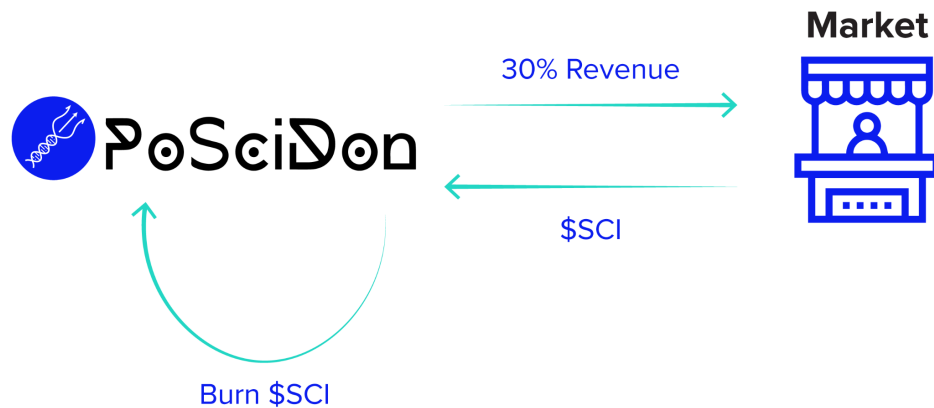

Figure 2 - $SCI Token Burn Mechanism.

Genesis and Token Allocation

During Genesis, 10% of the total supply will be offered to the community through a public sale. When PoSciDon's governance system is live, initially 10% will be allocated to $PO token stakers as a passive $SCI reward for participation (see the $PO token section for more information) (Fasco, 2022). Additionally, 5% will be allocated to compensate contractors, and another 5% will be allocated for crew members. The remaining 70% of the $SCI tokens will be held in PoSciDon's treasury (see Figure 3). These numbers are subject to change and can be changed based on the choices made by the DAO.

Token Supply

Immunotherapies are one of the treatment types that are in need of personalized medicine research as most immunotherapies have shown to only work in a subset in patients. In 1891, Dr. William B. Coley was the first ever scientist to use an immunotherapy based on the bacteria *Erysipelas* to treat a patient with a range of advanced stage tumors that were too big to be removed through surgery. After treatment this seemingly untreatable patient was cured of his tumors and resumed his regular life (Coley, 1893). Although Dr. Coley did not receive the credits he deserved during his lifetime for this remarkable finding, he is considered the "Father of Immunotherapy". Therefore, 1891 marks the year that the first patient ever was cured of cancer using immunotherapy. The year 1891 will be a part of PoSciDon forever as the initial total supply of $SCI will be set to 18,910,000 tokens (see Figure 3).
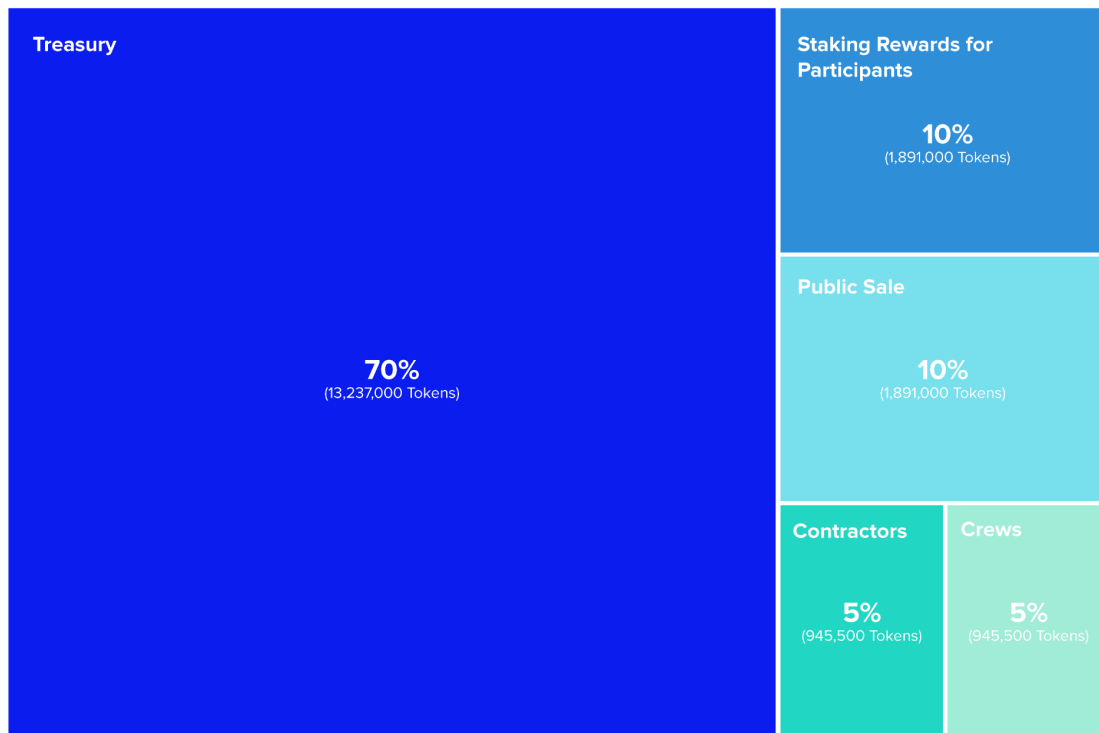
Figure 3 - Allocation of Tokens to Stakeholders.
The initial supply is the sum of all allocated tokens: 18910000 $SCI.

Public Token Sale

The public sale of the $SCI token will be completed in a transparent and non-discriminatory manner. This will be achieved by using a lockdrop + liquidity bootstrapping auction (LLBA) modeled after Delphi Digitals' LLBA (Delphi Digital, 2022). An LLBA ensures that price discovery and distribution of tokens is done in a fair and transparent way. As the name already indicates, an LLBA consists of two phases, the Lockdrop and the Liquidity Bootstrap Auction.

The Lockdrop phase, also known as the distribution phase, is an airdrop of the $SCI token to anyone involved in PoSciDon including, but not limited to, contributors / crew members. The amount of tokens that will be airdropped, depends on how much has been contributed. However, these airdropped tokens are locked until the end of the second phase.

The Liquidity Bootstrap Auction (LBA), also known as the price-discovery phase, is the second phase of this protocol. The LBA will be done through Fjord Foundry on the zkSync Era network with the aim to create a $SCI-$USDC liquidity pool and to allow community members to decide the initial $SCI token price (Fjord Foundry, 2023). During this phase, members that were part of the Lockdrop phase can choose to deposit a portion or all of their lockdropped $SCI into one side of the liquidity pool. Additional tokens will be provided by PoSciDon to assure that 10% of the allocated tokens are made available during the LBA. After $SCI tokens have been committed, other members can then provide $USDC to the liquidity pool, effectively buying $SCI tokens from participants of the Lockdrop phase and from PoSciDon. An estimated $3,000,000 is needed to fund the initial research projects, and this number will be set as a requirement for a successful LBA.

Token use case summary

After tokens have been distributed to donors and contributors, the $SCI token can be traded or held. Holders of these tokens have the choice to stake them to vote on the future of the DAO. More information about our governance systems can be found here. If scientists were able to generate data and intellectual property and PoSciDon was able to successfully commercialize those assets, a portion of the revenue will be used to buy back $SCI tokens. More information about the distribution of possible proceeds and the token buy back can be found in Section 2.5.3 (Distribution of proceeds).

2.2.2 $PO Token

 In order to incentivize participation in PoSciDon's governance framework, every time a $SCI token holder participates in governance by voting on proposals, they will receive a proof of participation ($PO) token (see Figure 4). Users can obtain the $PO token once the $SCI token has been offered to community members and investors and once the first proposal has been established. The $PO token is an account-bound NFT that can be staked on our protocol. Each token you stake together with $SCI tokens will give a certain amount of $SCI tokens per day. The more you participate, the more $PO tokens you can stake and the more $SCI tokens you will receive. $SCI token emission schedule will be released at a later time.
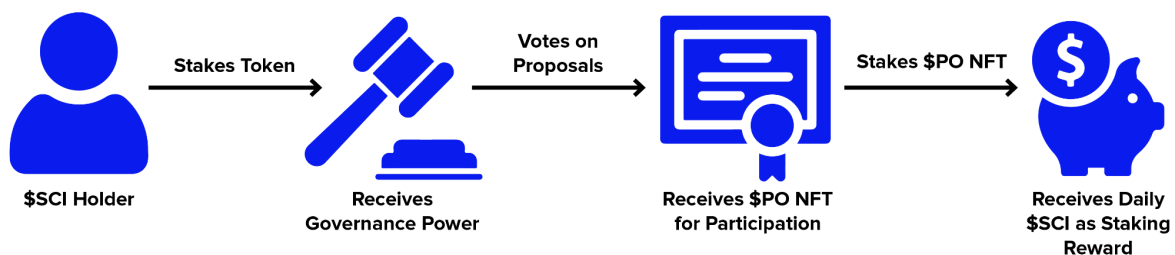

Figure 4 - $PO Token Staking

2.3 On-chain Donations

Approximately 50-60% of the donations given to fundraisers for charities, actually reach the charities (James, 2022). Furthermore, there are many middlemen between charities and scientists, further decreasing the amount of money reaching the scientists. Therefore, PoSciDon protocol allows you to donate on-chain using ETH or USDC. More than 95% of the funds donated will go directly to the selected scientific research projects. The remaining 5% will be used for marketing.

2.4 Governance Structure

Anyone that holds or stakes PoSciDon's $SCI tokens through the PoSciDon protocol is considered a PoSciDon member. PoSciDon members hold all the governance power and, thus, are eligible to vote on the course of the DAO. All token-based voting will be done through our

protocol. The governance structure can be split up into two main parts: DAO operation governance and scientific research funding governance.

2.4.1 DAO Operation Governance

This governance architecture is dedicated to proposals not related to the funding of scientific research. These proposals can be created and shared with the community by any member. However, only Due Diligence crew composition, and funding- and tokenomics-related proposals will require token-based voting through our protocol. For example, if you think our marketing crew needs to receive more funding to complete their tasks, you can follow these steps:

1. Initiate a discussion on your proposal idea to determine if other community members support it.
2. Members can write a proposal and share the first draft of the proposal by posting it in the "proposal" channel on Discord.
3. The other community members will be able to provide feedback to the proposal and the proposer will refine the proposal until all feedback has been implemented.
4. For token-based voting on the proposal, the final version must be uploaded to our protocol. The community can then exert their voting power using their $SCI tokens.
5. The proposal will be implemented into PoSciDon once more than 2.5% of the holders support the proposal, otherwise it will be rejected. The quorum of 2.5% is subject to change.

The DAO operation proposals not related to the allocation of funds will follow a more time-efficient approach. These proposals are often held within crews or during the due diligence of scientific research projects. In this scenario, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis will be made by the proposer and each participant will only have one vote. Crews should limit their amount of votes to 1 to 3 per meeting. To know more about PoSciDon's operations governance process, go to https://app.poscidon.com/govops.

2.4.2 Scientific Research Governance

During the funding process of scientific research, we aim to reach 100% transparency. The DAO determines through the operations governance system who becomes part of the Due Diligence crew. This crew votes through the scientific research governance system which projects are going to receive funding. At any time, members of the due diligence crew can be added or removed, as long as the DAO votes in favor of that change. To know more about the scientific research funding governance process, please visit https://app.poscidon.com/govres.

2.4.3 Voting

For a user to become a PoSciDon member and to be eligible to vote, the following steps need to be taken:

1. You can buy $SCI tokens through our liquidity bootstrap auction.
2. Go to https://app.poscidon.com/

3. You can log in by connecting an existing account, also known as a wallet, or by creating a new account using your email address.
4. You can buy $SCI tokens.
5. Stake tokens at https://gov.poscidon.com/stake/
6. Visit the governance tab and select the amount of tokens you want to allocate to each project in a funding round.

2.5 PoSciDon Crews

A crew can be seen as a group of experts that contribute to PoSciDon by completing tasks. Anyone can join a crew based on their experience or expertise in the chosen crew. PoSciDon has several crews:
1. Due Diligence
2. Operations
3. Legal
4. Governance
5. Tokenomics

Initially, PoSciDon will focus on setting up the Operations and Due Diligence crews. The Operations alliance focuses on awareness and organization of PoSciDon. The Due Diligence alliance is dedicated to finding and reviewing high quality personalized medicine-related research projects that are in need of funding. After the initial $SCI token offering, the Legal and Governance crews will be initiated, followed by the Tokenomics crew. Additional crews may arise if needed.

2.6 Business Model

As the scientific research progresses of projects funded by PoSciDon, datasets and intellectual properties will be generated. These assets can then be commercialized through licensing (see Figure 5).
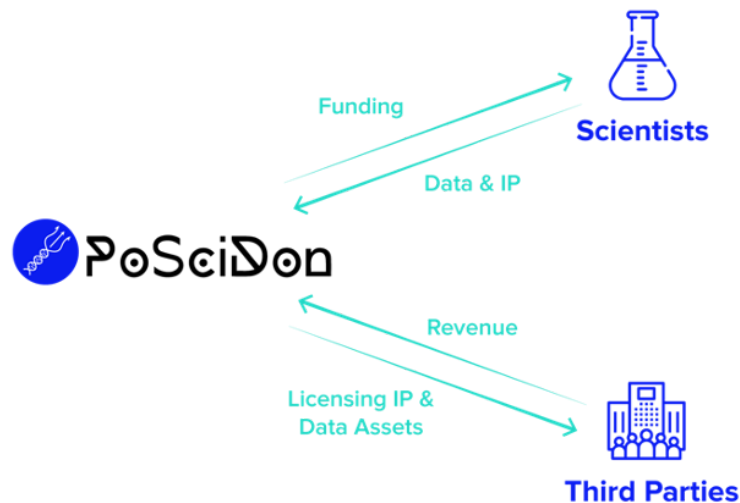
Figure 5 - Business Model Overview

2.6.1 Data Assets and Commercialization

During scientific research, much data and valuable datasets will be created. Research-related data include but are not limited to raw and processed flow cytometry data, dose-response data (e.g. cell viability), sequencing data, protein-related data (e.g. mass spectrometry and western blots), RNA-related data (e.g. single or multiplex RT-qPCR and northern blots) and microscopic data. The term data further includes *in vitro* (e.g. cell culture) and *in vivo* (e.g. mice) models, laboratory reports, half-yearly updates and displayable items such as final figures for publication. There are various stages of data generation.

1. Preliminary data: this is data that is often generated on a small scale, which can also be considered early proof-of-concept experiments. This data will be shared with community members to keep them up to date on the ongoing research and to show progress is being made. This data will not be fully disclosed to prevent compromising the potential to turn the preliminary data into intellectual property.

2. Intellectual property data: this data that has been confirmed multiple times on larger scale experiments compared to preliminary data. The exposure of this data to community members will be limited as it will be used to file for patents.

3. Public data: consist of data that are viewable by members and will be monetized through decentralized data marketplaces.

PoSciDon will own all the data assets and results from the funded research. PoSciDon will safekeep the data and make it available to its community depending on the aforementioned stages of data generation. PoSciDon will attempt to monetize the datasets through OceanONDA, a decentralized data marketplace built by Ocean's protocol (Ocean Protocol, 2022). OceanONDA allows data owners to mint NFTs that represent exclusive licensing rights to their provided data.

2.6.2 Intellectual Property Filing and Commercialization

Prior to submission of research projects, scientists are required to describe their approach to generate intellectual property (IP) and one or more ways to protect the IP during the lifetime of the project and to eventually commercialize it. Although obtaining enough data to support the filing of IP is the primary objective of scientists; and this approach on how to obtain and commercialize IP is tentative, it helps scientists to focus on the economic side of their research. Then it is up to the Due Diligence and Legal crews to assess the achievability of their proposed approach to IP filing and commercialization. If the shared approach is not feasible, an alternative method will be provided by the same crews.

After the community has voted on a project to obtain funding, PoSciDon will negotiate ownership over the potential IP rights with the scientists of the chosen project. PoSciDon expects to have sole ownership over most of the generated IP and follows a similar strategy as VitaDAO ([VitaDAO, 2021](#)). However, this might change based on several criteria, including the amount funded and how advanced the preclinical research is.

Depending on the aim and the scientific output of the research project, the patentability of findings can fall into four different categories according to the United States Patent Law: method, machine, article of manufacture or composition of matter. All four categories will be explored by the Due Diligence and Legal crew to maximize the patentability of scientific research findings.

Once IP has been granted, the IP will be represented by NFTs using the IP-NFT architecture developed by Molecule ([Kohlhaas, 2021](#)). Through Molecule, PoSciDon aims to create an extensive portfolio of intellectual property.

The incentive to innovate and generate IP and to maintain the right to health for the general public is a longstanding dilemma ([Khachigian, 2020](#)). PoSciDon's IP portfolio and eventually marketable treatments will be governed by a community that can benefit the most from those treatments. Based on the prices set by PoSciDon's community, treatments could become more accessible to the public. Consequently, the right to health will be more widespread and lower prices can possibly make a dent in alleviating the pressure of the high prices governments, insurance companies and patients have to pay for novel treatments.

2.6.3 Distribution of Proceeds

Once PoSciDon's funded projects are able to generate proceeds, they will be distributed to the treasury and to the scientists. Additionally, a portion of the revenue will be used to buy back $SCI tokens as described in [section 2.2.1](#) (see Figure 6).

Figure 6 - Distribution of Potential Revenue.

3 Example of the Initial Scientific Research Funding Life Cycle

PoSciDon hopes to fund its first research project through the offering of $SCI tokens. Providing a proof-of-concept of PoSciDon's approach to revolutionizing the scientific research funding process. The life cycle of funding a scientific research project through PoSciDon's protocol could be as follows:

1. Members buy $SCI through the liquidity bootstrap auction.
2. $SCI token holders stake their tokens allowing them to gain governance power.
3. PoSciDon provides the initial batch of research projects that are eligible for funding.
4. $SCI token holders can then vote through the PoSciDon protocol on which projects should receive funding.
5. Once a research project has received the most votes, that project will be eligible for PoSciDon's funding.
6. Ownership and profit distribution of potential IP and data assets between PoSciDon and researchers will be determined before funds are distributed.
7. PoSciDon's multi signature treasury wallet will be authorized to fund the researchers leading the chosen research project.
8. Prior and during the research progress, a range of approaches to file and commercialize intellectual property and to license data will be discussed with the researchers.
9. Upon the generation of the monetizable assets such as intellectual property and datasets, funds will be distributed according to the predetermined terms of ownership and profit distribution.

4 Conclusion

The described efficient funding route for personalized medicine research targeting life-altering diseases can significantly reduce the personal and institutional bias that currently affects the research funding process. This novel streamlined funding process will lead to more capital for scientists and, thus, more personalized medicine research can be executed. Together with a multi-token model, PoSciDon reinvents the incentives of the scientific funding process as scientists, investors, entrepreneurs, donors, lawyers and other biotech enthusiasts are incentivized to be a part of PoSciDon's goal to become a decentralized biotech organization. Token stakeholders obtain governance power that can be used to vote on proposals that can be about every aspect of the scientific funding process, the commercialization of data and intellectual property and beyond. As community members can determine the pricing of licenses of IP, data and eventually, approved drugs, treatment regiments, etc. this will significantly increase access and availability of treatments to the patients that need them. Ultimately, this will create a paradigm shift in the current academic and biopharmaceutical system, advancing scientific research and patient care.

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