Genotype

A Mendelian Genetics Game

Rulebook

1 Game Board

Place the **Game Board** in the center of the play area. The major areas of the Board feature Punnett Squares and Dice Pool Areas in 4 colors, an Abacus for tracking Research Upgrade prices, and a display of available Pea Plant and Tool Cards.

2 Offspring Dice and Gene Tiles

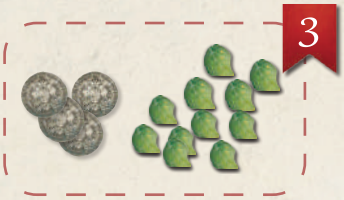
Place the **5 Offspring Dice** and **2 Parent Gene Tiles** of each color next to the Punnett Square of the same color until they are needed.

3 Coins and Trait Markers

Place the supply of Coins and Trait Markers ( ) in reach of all players. (The supply of these is unlimited; use a substitute if they run out.)

4 Starting Coins

Place 4 starting Coins on the Board, 1 on each spot next to the 4 Punnett Squares.



FOR SOLO PLAY:
Genotype can be played as a solo game against a simulated opponent. After learning the standard game rules, see p. 14 for the solo rules.

Setup

5 Round Tracker

Start the **Round Tracker** on 1.

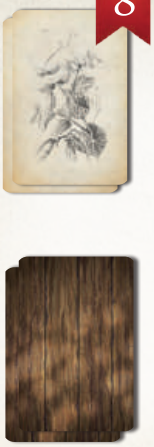
6 Abacus Markers

Place the 4 **Abacus Price Markers** on the starting prices for each Research Upgrade (shown as darker beads).

7 Research Upgrades

Place the **New Plot Tiles, Dice Slots,** and **Assistant Cards** next to the Research Upgrades area of the Board.

Draw 3 **Assistant Cards** face up as the starting options.



8 Pea Plant and Tool Cards

Shuffle the **Pea Plant Cards** and **Tool Cards,** then place these decks face down next to the Nursery and Tool Shed, respectively. Draw face-up Cards to fill the Nursery with Pea Plant Cards and the Tool Shed with Tool Cards, based on player count, as shown in the table below. (3 player setup depicted.)

Players	1-2	3	4-5
Cards	3	4	5

9 Player Mats and Pieces

Give each player a **Player Mat** as well as **3 Action Markers** ( )and **3 Phenotype Research Markers** ( ) in their player color (9a). Place the 2 additional Action Markers for each player color with the Research Upgrades (9b)

Each player takes **1 Coin** from the supply, then draws **3 Pea Plant Cards** and **1 Tool Card** from the corresponding decks (9c). Players must choose 1 of their Pea Plant Cards to place in a Garden Plot on their Player Mat, 1 to keep in their hand, and 1 to discard (next to the Pea Plant deck).

10 First Player Marker

Give the First Player Marker to the Player who has most recently done any garden work. You're ready to begin!

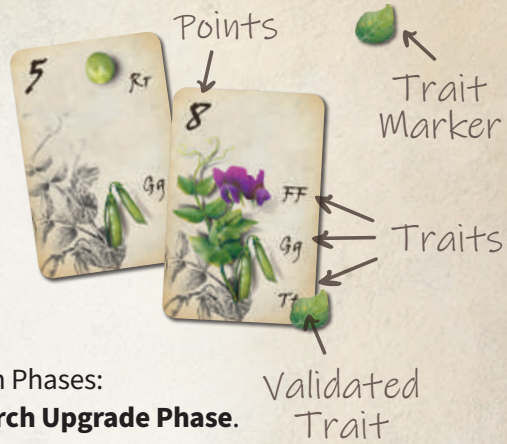
Full Components list on p. 19.

Genotype: A Mendelian Genetics Game

For 2-5 Players

Gregor Mendel was a 19th Century Augustinian Friar, credited with the discovery of modern genetics through his work with pea plants. In **Genotype: A Mendelian Genetics Game,** players take the role of **Research Scientists** on the grounds of the monastery where Mendel conducted his experiments.

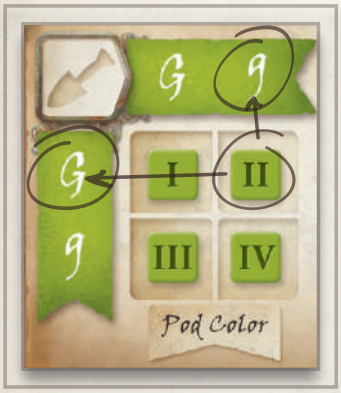
Players have a Garden of **Pea Plants** with different genetic **Traits**. The Traits are each shown as a pair of letters called a **Genotype**. The goal of the game is to **Validate** the Traits on your Plants by taking Dice that match the Traits. Validated Traits are covered with **Trait Markers** to track your research progress. When all the Traits on a Plant are covered, it has been completely researched, and will earn the Points shown in the corner.



A game of Genotype is played over 5 Rounds, made up of 3 main Phases: the **Working Phase**, the **Plant Breeding Phase**, and the **Research Upgrade Phase**.

Phase 1 In the **Working Phase**, players will place their **Action Markers** to take actions that will prepare their gardens, acquire funding, and secure access to the Traits they need for their research.

Phase 2 The **Plant Breeding Phase** is the main way that players will find and Validate the Traits on their Pea Plants. Players will take turns picking from a pool of Offspring Dice that represent possible genetic combinations in the plants. The values of Dice are interpreted using **Punnett Squares**, scientific tools demonstrating how parent genes are passed to offspring.



The II Die represents the Genotype *Gg* , taken from its row (*G*) and column (*g*). It may be used to Validate the *Gg* Trait on the Pea Plant. (By the same process, the I Dice both mean *GG*, the III is another *Gg*, and the IV Die is *gg*).

Phase 3 In the **Research Upgrade Phase**, players may spend their Coins on powerful Upgrades to optimize their future turns.

After 5 Rounds, players total up their Pea Plant research and unspent Coins. The player with the most Points wins!

1. Working Phase

Action Space

In the **Working Phase,** players take turns placing 1 of their available **Action Markers** ( ) on an empty **Action Space** on the Game Board or on their Player Mat. They then immediately take the corresponding action (all the possible actions are described on the next few pages). Once an Action Space is covered by an Action Marker, it is occupied for the Round and cannot be chosen again by any player, though there may be additional Action Spaces for the same action.

The player with the First Player Marker will have the first opportunity to place 1 Action Marker and take an action. In clockwise order, players will then continue taking turns placing 1 Action Marker and taking the corresponding action until every player has placed all of their available Action Markers. Players begin the game with 3 Action Markers in their player color, but may gain more through Research Upgrades.

The actions that players may take are as follows:

GARDENING

The **Gardening** action is used to manage your Pea Plant Cards. Throughout the game, you will draw new Pea Plants into your hand, and must Garden to move (**Sow**) them into the Plots on your Player Mat.

When taking the Gardening action, perform each of the following 3 steps, in order:

- ***Draw 1 Pea Plant or Tool Card,*** either from the face-up options on the Board or from the deck.
- ***Harvest any Pea Plant Cards*** that have Trait Markers covering **all** of their Traits. Return the Trait Markers to the supply and place the completed Pea Plant Cards face down next to your Player Mat for end game scoring. You may look at your completed Pea Plants at any time.
- You may ***Sow new Pea Plant Cards from your hand,*** placing them into available Plots on your Player Mat. These Plant Cards are now available to have Trait Markers placed on them.

GARDENING EXAMPLE:
Marco has completed 1 of his Pea Plants and takes the Gardening action with 2 Pea Plants in hand. First he draws a **Graft Knife Tool Card** from the Tool Shed. He then **Harvests his completed 5-Point Pea Plant**, removing its Trait Markers and setting it aside to score later. (His 9-Point Plant still needs a *Rr* Trait and cannot be Harvested yet.) Finally, he decides to **Sow the 6-Point Pea Plant** into his newly available Plot. He may place Trait Markers on this Pea Plant in future turns.

TEMPORARY DICE SLOT

Place an Action Marker to unlock a **Temporary Dice Slot** on your Player Mat for the current Round. This action has no immediate effect, but in the Plant Breeding Phase, you will be able to take an additional Offspring Die and place it on this Dice Slot.

SETTING PARENT GENES

Take 1 of the 4 **Set Parent Genes** actions to modify the corresponding Punnett Square using Parent Gene Tiles. These Tiles are placed on top of the Parent Genes printed on the Game Board and change the Offspring Dice outcomes.

When taking this action, you may choose to **add 1 Gene Tile** to the Board with either side face up, or to **remove 1 Gene Tile** that had previously been placed, or to leave the Parent Gene Tile as it is. You **may not flip** a Tile already on the Board to its other side.

If there was a Coin next to the corresponding Punnett Square, take it.

Parent Gene Tiles will change the likely Offspring Traits during Plant Breeding.

COINS ON THE BOARD

The 4 Punnett Squares will each have 1 Coin next to them at the beginning of each Round. The first player to place an Action Marker at either the **Set Parent Genes** or **1st Shift** Space for the Punnett Square of each color will gain the corresponding Coin in addition to taking the action on that Space.

1ST SHIFT

The **1st Shift** actions have no immediate effect, but grant the first pick among the Offspring Dice of the matching color during the Plant Breeding Phase.

If there was a Coin next to the corresponding Punnett Square, take it.

2ND SHIFT

The **2nd Shift** action has no immediate effect, but grants 1 earlier pick during the Plant Breeding Phase (after the 1st Shift picks).

The 2nd Shift area may hold any number of Action Markers, adding new Action Markers to the left, and players will receive their early picks in the same order, right to left. This is the only unlimited Action Space on the Board.

SET PHENOTYPE RESEARCH GOAL

Set a Phenotype Research Goal to earn additional Points for specializing on particular Traits. To take this action, pay the cost shown on the Action Space (2 or 3 Coins), then place 1 of your **Phenotype Research Markers** on any 1 unoccupied Phenotype Research Goal ( ).

Each Phenotype Research Goal is located under the Dice Pool Area for 1 or 2 Genotypes. During end game scoring, the player who claimed each Goal will earn additional Points as shown for each of their completed Pea Plants containing the Genotype(s) shown above the Goal.

EXAMPLE: These 2 Phenotype Research Goals pertain to Seed Shape (the blue Dice). During end game scoring, **Brandy** will earn 2 Points for each of her completed Pea Plants with an *RR* or *Rr* Trait (Round Seeds). The Goal on the right would earn 3 Points for each completed Pea Plant with an *rr* Trait (Wrinkled Seeds).

✧ TREASURY

Take the **Treasury** action to gain 2 Coins.

✧ UNIVERSITY

Take the **University** action and pay the cost shown on the Action Space (1 or 2 Coins) to immediately Validate any 1 Trait on 1 of your Pea Plant Cards.

ACTION SPACE DIFFERENCES

Some actions have more than 1 Action Space that perform the same action but differ in cost or availability.

Some actions have Spaces with different costs and are cheaper for the first player to take that action each Round.

4+ Some Action Spaces are only available in games with 4 or 5 players.

✧ NURSERY AND TOOL SHED

Take the **Nursery** action to draw 2 Pea Plant Cards from the face-up options or from the deck, in any combination. These Plants will go to your hand and can only be placed onto your Player Mat with the Gardening action.

Take the **Tool Shed** action to draw 1 Tool Card from the face-up options or from the deck.

TOOL CARDS

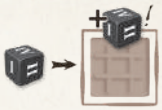
Tool Cards provide one-time benefits. They are kept in your hand until played, then are discarded to the Tool discard pile. Tool Cards may normally be played at any time during your turn in the Working Phase, and do not replace your normal action. Tool Cards with ➤ may be played whenever the condition to the left of the arrow is met (in any Phase).

Seed Bag - Draw 5 Pea Plant Cards from the deck, keep 2, and discard the rest.

Watering Funnel - Validate any 1 Trait. You must play this Card immediately when you receive it.

Dissertation - Pay 1 Coin to Set a Phenotype Research Goal.

Flower Pot - Play Flower Pot next to your Player Mat. Immediately take 1 Pea Plant Card (from the face-up options in the Nursery or from the deck) and place it on the Flower Pot. Flower Pot is treated as a Plot in your Garden until the Plant is Harvested, then Flower Pot is discarded.



Graft Knife - Play when taking an Offspring Die to immediately take another Die, which does not use a Dice Slot (place it on Graft Knife).

Rake - Play when taking an Offspring Die to Validate any 1 Trait of that Dice color instead of using the Die normally.

Pollen Brush - Play when Validating a Trait to Validate every copy of the same Genotype on your Pea Plants.

Hand Lens, Pocket Watch, Garden Line - Play when taking the Parent Gene, 1st Shift, or 2nd Shift action (respectively) to gain 2 Coins.

Grant - Play when purchasing a Research Upgrade to discount the cost by 2 Coins.

2. Plant Breeding Phase

In the **Plant Breeding Phase,** players roll and then draft (take turns picking) the Offspring Dice, 1 at a time. As each player chooses and takes a Die, they must place it on 1 of their available Dice Slots to Validate a corresponding Trait on 1 of their Pea Plants. Players continue making selections until they run out of Dice Slots or usable Dice.

PLANT BREEDING

The Phase begins with Plant Breeding. The players collectively roll the 20 Offspring Dice and sort the results according to the Punnett Square matching the color of each Die:

- For Dice results of I-IV, locate the matching Die face on its Punnett Square, note the Gene letters shown in its row and column, and place the Die onto the Dice Pool Area with this pair of letters on the Game Board.
- A Die showing the mutation symbol is re-rolled exactly once. If it now shows I-IV, move it to the appropriate Dice Pool Area. If it re-rolled again, place it in the *De Novo* Mutations Area for its Dice color.

EXAMPLE: **Alina** gathers and rolls the 5 blue (Seed Shape) Dice, getting II, II, IV, , and . She checks the Punnett Square to find that II represents *Rr* and IV represents *rr*. She places these Dice in their corresponding Dice Pool Areas and re-rolls the pair of .

One of the re-rolled Dice shows a I and is placed in the *RR* Area. The other Die shows again, and is placed in the *De Novo* Mutation Area.

→ Changing the Parent Genes has made some combinations impossible and others (basically) guaranteed.

SELECTING OFFSPRING DICE

After rolling and sorting all the Offspring Dice, players will alternate **Research Shifts** (turns) picking Dice to Validate the Traits on their Pea Plants. Players who reserved earlier picks in the Working Phase will go first, then all players will continue picking Dice as follows:

- First, any players with Action Markers on **1st Shift** Spots take 1 Offspring Die of that Dice color.
- Next, any players with Action Markers in the **2nd Shift** area select **any** 1 Die, in order (from right to left).
- Finally, players continue to take Research Shifts **in turn order, starting with the player with the First Player Marker** until all players have passed.

Some players may reserve earlier Shifts, but most Dice are picked in normal turn order.

During each player's Shift, they take **1 Die** from the Game Board in order to Validate 1 matching Trait on 1 of their Pea Plants, covering it with a Trait Marker. The Die must then be placed in an available Dice Slot on their Player Mat.

In order to take a Die, a player *must* have an available Dice Slot on their Player Mat and *must* use the Die (it cannot be taken for no effect). If a player cannot take a Die on their Shift, they pass for the remainder of the Phase.

EXAMPLE: Alina chooses the I Die (RR on the Punnett Square) and places it in the available Dice Slot on her Player Mat. She then adds a Trait Marker to her Pea Plant Card, covering the RR Trait.

DE NOVO MUTATIONS

Dice in the ***De Novo* Mutations Slots** can be chosen instead of a normal Research Shift pick, including during a 1st or 2nd Shift. They are used in one of 2 ways:

1. **Gain 1 Coin** and place the Κ Die in a Dice Slot like normal.
2. **"Mutate"** another Offspring Die: Take the Κ Die and another Die of the same Dice color and place them in 2 of your Dice Slots. You may then Validate **any Trait** of that Dice color.

   Note that Mutating Dice allows players to Validate Traits for which there are no remaining Dice, or even Traits that would have been impossible with the current Parent Genotypes.

EXAMPLE: Marco is looking to Validate the *ff* Trait, but the Parent Genes have made this offspring Genotype impossible. **Marco** takes the Κ Die in order to count the II Die as an *ff* Trait. Both Dice are added to **Marco's** available Dice Slots.

Mutating Dice can overcome unlucky rolls or unfavorable Parent Genes, but it also provides a chance to frustrate your opponents' Research!

3. Research Upgrade Phase

(Skip in Round 5)

Last in the Working Phase is the first to Upgrade.

In the **Research Upgrade Phase**, players have opportunities to use Coins they have acquired to purchase 1 or more permanent Upgrades. Turns are taken in the **reverse player order** in this Phase: the player to the right of the First Player Marker has the first chance to buy an Upgrade, then play proceeds counter clockwise until all players have passed.

There are 4 types of Research Upgrades that players can purchase:

✧ NEW PLOT

Take a **New Plot Tile** and place it next to your Player Mat. You will now be able to have an extra Pea Plant Card in play.

✧ DICE SLOT

Take a **Dice Slot** and place it next to your Player Mat. In the Plant Breeding Phase, you will now be able to draft an additional Die.

✧ ACTION MARKER

Take an additional **Action Marker** of your player color. In the Working Phase, you will now be able to take an additional action in subsequent Rounds. Players may have a maximum of 5 Action Markers.

✧ HIRE ASSISTANT

Take 1 of the available face-up Assistant Cards and place it next to your Player Mat, gaining its ability. (Assistant Cards are not refilled until the end of the Round.)

On each player's turn, they **may purchase 1 Research Upgrade** by paying Coins equal to the current price of that Upgrade. Each Upgrade price is tracked by an Abacus Marker, and the prices change over the course of the game. Each time a player buys a Research Upgrade, its **price increases by 1** (if already at the highest price for that Upgrade, it stays the same). All prices will decrease by 1 at the end of the Round.

Players proceed counter clockwise, purchasing 1 upgrade at a time. If a player cannot or decides not to buy an Upgrade, they pass, and may no longer purchase Upgrades this Round. When all players have passed, the Round is over.

EXAMPLE: Brandy spends 2 Coins to Hire an Assistant. She takes an Assistant Card, and increases the Hire Assistant price to 3. The player to her right gets the next turn.

THE ASSISTANTS

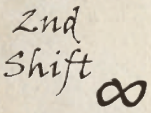
Assistants provide powerful ongoing benefits, often enhancing or rewarding other actions. Using an Assistant does not replace your normal action. Assistants showing may be used once per Round: turn the Card sideways to indicate that the Assistant has been used, and reset it at the End of the Round. Assistants showing → may be used when the condition to the left of the arrow is met.

Brother Alipius - When Gardening, draw an extra Card (face-up or from the deck).

Sister Elisabeth - Once per Working Phase you may Validate a Trait that matches 1 of the Phenotype Research Markers you have placed.
EXAMPLE: Earlier in the game, **Alina** set the *TT/Tt* Phenotype Research Goal. During this Working Phase, she uses Sister Elisabeth to Validate a *Tt* on 1 of her Pea Plants.

Sister Anna - Once per Working Phase you may pay 1 Coin to Validate a Trait.

Father Omari - You may place an Action Marker on Father Omari's Card as your turn during the Working Phase to take a special action. Roll 1 Die of each color, and re-roll any results until they are not . Check the Genotype of each Die result on its corresponding Punnett Square. For each Die, you may Validate 1 matching Trait among your Pea Plants as though you had taken the Die during the Plant Breeding Phase, then return the Dice. (Only you may take this action.)



Father Anton - In the Plant Breeding Phase, you are considered to always be first in the 2nd Shift area (without placing an Action Marker). After 1st Shifts, you may select 1 of the Offspring Dice, then proceed through the Action Markers in the 2nd Shift area as normal.

Brother Franz - You have 2 additional Dice Slots during the Plant Breeding Phase, however, you must pay 1 Coin in order to use them for the Round. (Pay before you take the first Die that would be placed on either Slot. You only pay once for both Slots and must pay in any Round that you use them.)

Sister Maria - Once per Plant Breeding Phase, when taking a Die, you may Validate any Trait of that Dice color instead of using the Die normally.

Brother Leopold - Your Coin costs are all reduced by 1, to a minimum of 1 Coin.

Sister May - Whenever you Validate a Trait, you may Validate every copy of the same Genotype on your Pea Plants.

Brother Eduard - This Assistant acts as a permanent Extra Plot with its own Pea Plant that automatically refills. When the Assistant is Hired, immediately take 1 Pea Plant Card (from the face-up options in the Nursery or from the top of the deck) and place it on the Assistant. When the Pea Plant is Harvested, take another Pea Plant in the same way.

4. End of Round Reset

Once the main 3 Phases have been completed, the Round is over. Perform the following steps:

- Advance the **Round Tracker.**
- **The First Player Marker** passes clockwise.
- Move each **Abacus Marker to the left by 1** (Upgrades at the lowest price stay the same).
- **Discard the remaining Pea Plant Cards, Tool Cards, and Assistants.** Refill Tool and Pea Plant Cards based on player count (see p. 3) and refill 3 face-up Assistants. When any of these decks have run out, reshuffle the discard pile to continue drawing.
- **Refill 1 Coin** next to each Punnett Square that doesn't already have a Coin.
- Players **recover all their Action Markers** and **return Offspring Dice** to the side of the Game Board.
- **Do not** remove or modify Parent Gene Tiles or any of the players' Phenotype Research Markers Pea Plants, Trait Markers, or Research Upgrades.

Players then proceed to the Working Phase of the next Round.

End of the Game

The game ends after the Plant Breeding Phase of Round 5. Each player may **Harvest any completed Pea Plant Cards,** then players tally up the Points they have accumulated from the following sources:

- **Completed Pea Plant Cards -** Players score the Points printed on their completed Pea Plants.
- **Phenotype Research Goals -** For each Phenotype Research Marker on the Game Board, the player who placed it scores the indicated Points for each instance of the matching Trait(s) among their completed Pea Plants.
- **Incomplete Research -** Players score 1 Point per Trait Marker on their incomplete Pea Plants.
- **Unspent Coins -** Players score 1 Point for each unspent Coin.

The player with the most Points wins! If there is a tie between 2 or more players, the player with the most completed Pea Plants wins. If there is still a tie, then the victory is shared.

EXAMPLE: At the end of the game, **Alina** completes her final Harvest and proceeds to end game scoring. She has 41 Points from completed Pea Plants, 6 Phenotype Research Points from her pair of completed *ff* Plants, 1 Point for the Trait Marker on her incomplete Plant, and 3 Points from Coins, for a Final Score of 51.

Rules Reminders and Clarifications

- In the Working and Plant Breeding Phases, players must take a turn if they are able.
- Players may not take an action that requires Coins if they cannot afford it, and they may not take the Set Research Goal action after placing all of their Phenotype Research Markers.
- There is no hand limit for Tool or Pea Plant Cards. Cards may be kept secret.
- Tool Cards and Pea Plant Cards are only refilled during the End of the Round Reset, not when taken. Players may draw Tool Cards or Pea Plant Cards from the deck instead of the face-up options. If a Card deck is ever empty, shuffle the discard pile as needed.
- When Hiring an Assistant, only 1 of the 3 available face-up Assistants may be selected.
- There is no limit to the number of Tool Cards that may be played or Assistant abilities that may be used during a player's turn.
- Tool Card and Assistant abilities may be used immediately when drawn, even during Gardening. For example, a player might acquire and immediately use a Seed Bag during Gardening to draw new Pea Plants to Sow.
- *De Novo* Mutation Dice may Mutate other *De Novo* Mutation Dice of the same color, taking both Dice to Validate any Trait of that Dice color.
- Research Upgrades are limited to the provided quantities. If all of the available copies have been purchased, they are no longer available. Trait Markers and Coins are unlimited.

TOOL CARDS AND ASSISTANTS

- If a player is dealt the **Watering Funnel** in their starting hand, they must play it during their first turn.
- **Graft Knife** may be played when taking a 1st or 2nd Shift. If played during a 1st Shift, the additional Die must be taken from the Dice of the same color as the 1st Shift pick.
- **Graft Knife** grants 1 additional temporary Dice Slot. If it is used to take a pair of Dice using a *De Novo* Mutation, 1 of the Dice is placed on the Grant Knife and the other on a normal Dice Slot.
- **Pollen Brush** may be used in combination with other Tool Cards, Assistant abilities, and actions. For example, a player may change an *FF* Die to *Ff* using a Rake Card, then play Pollen Brush to Validate multiple *Ff* Genotypes.
- The **Rake Card** and **Sister Maria's** ability function like a "wild" *De Novo* Mutation Die: any 1 Die may be used to Validate any Trait for that Dice color, even Traits that would have been impossible with the current Parent Genotypes.

Genotype Solo Rules

Genotype can be played as a solo game against a simulated opponent named Brother Johann, an administrator at the monastery. Johann's actions are controlled by a deck of 9 Automa Cards that determine his actions, Dice picks, and Upgrades. Three double-sided Reference Cards outline the solo rules.

To set up a solo game, prepare the main Game Board and your player setup for a normal 2-player game. You will have the First Player Marker for the entire game.

Give Johann **3 Action Markers**, the **3 Phenotype Research Markers** of his player color, **1 Coin**, and **2 Pea Plant Cards** placed vertically to form his Garden. Shuffle the **9 Card Automa deck** and place it face down. Johann does not need a Player Mat or starting Tool Card. You may choose to play an **Easy, Standard,** or **Hard** game, which will affect how Johann uses his resources to accelerate his research. For a Hard Game, Johann begins with an **Assistant** (see p. 19).

Johann's Cardinal Rules

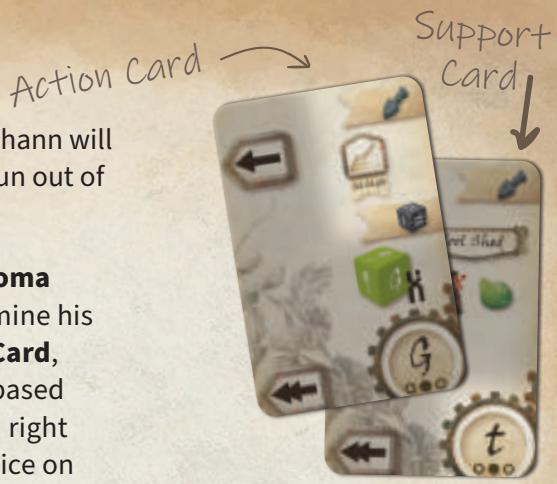
Johann has 4 **Cardinal Rules** that apply at all times.

- Johann's Pea Plant Cards are kept in his Garden, arranged in a vertical column of Cards.
- When he receives a new Pea Plant Card, it is always added to the top of Johann's Garden. Completed Pea Plant Cards (with all Traits Validated) are immediately Harvested and set aside for end game scoring (slide the remaining Cards down).
- Johann's Garden holds a maximum of 4 Pea Plant Cards. If he already has 4 Pea Plants and would gain another, he Validates a Trait instead.
- When Johann would Validate a Trait (for any game effect or instead of gaining a 5th Pea Plant), he Validates the bottom-most uncovered Trait in his Garden.

Working Phase

You will always be the Starting Player, and you and Johann will alternate turns in the Working Phase, until you both run out of Action Markers, like normal.

For Johann's turn in the Working Phase, **draw 2 Automa Cards.** The first is the **Action Card**, which will determine his action for the turn. The second card is the **Support Card**, which is used to make any decisions for that action based on the Gene Trait letter or pips shown on the bottom right (explained below). If there is an invalid action or choice on either Card, redraw that Card (for example, if Johann cannot afford to pay Coins to take an Action Space or would choose a Phenotype Research Goal that is taken).



The Action Card determines Johann's action and the Support Card makes Joann's decisions requiring a Gene Trait letter or Card position.

When Johann draws Automa Cards for his turn, the **Action Card** will indicate where to place his Action Marker, resulting in one of the following actions:

- **Treasury -** Johann takes 2 Coins.
- **University -** Johann takes the cheapest available Space and pays the indicated Coin(s) to Validate a Trait (as per his Cardinal Rules, he Validates the bottom-most uncovered Trait in his Garden).
- **Nursery -** Johann will add 1 Pea Plant Card to his Garden and discard a second Pea Plant Card from the Nursery. The pips on the Support Card will show which Card to take from the 3 slots. If that Card is not available, he will take the next available Plant Card to the right (wrapping around to the left if needed). If there are no Plant Cards available, he will draw the top Card of the Pea Plant deck. After taking a Pea Plant, he will discard the next available Plant to the right of the one taken.

EXAMPLE: Johann draws the Nursery Action Card. The Support Card pips indicate which Plant Card Johann takes, then he discards the next Card to the right.

- **Tool Shed -** Johann will discard 1 Tool Card from the Tool Shed and Validate a Trait. As with the Nursery action, the pips on the Support Card will show which Card to discard.
- **Set Parent Genes -** Johann will change a Parent Gene Tile and take the corresponding Coin (if available). The Support Card Gene Trait letter will indicate which Action Space Johann takes. If there is already a Gene Tile on the corresponding spot (Top or Left, according to the Card), he will remove it. If there is not a Gene Tile in place, he will add it, on the side shown by the Support Card.

EXAMPLE: Johann draws the Left Parent Gene Action Card and the *f* Support Card. He will place his Action Marker next to the Flower Color (*f*) Punnett Square. If there is a Gene Tile on the Left spot, he will remove it. If there is not a Gene Tile there, he will add it on the "*f f*" side.

- **Claim 1st Shift -** Johann will claim the 1st Shift Space matching the Gene Trait letter on the Support Card, taking the corresponding Coin (if available).

- **Set Research Goal -** Johann takes the cheapest available Space and pays the indicated Coins to set a Phenotype Research Goal, indicated by the Gene Trait letter on the Support Card. A capital letter indicates the Dominant Phenotype and a lower-case letter indicates the Recessive Phenotype. For example, "F" corresponds to the FF/Ff Goal, and "f" corresponds to the ff Goal.

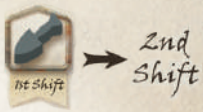
- **Gardening -** Johann takes a Gardening action by Validating 1 Trait for each Assistant he has, then gaining a Pea Plant Card from the top of the deck. (Set 1 of his Action Markers on the Action Card Space to indicate that the Action Marker has been used.)

One Card has the symbol instead of a Gene Trait Letter. If this is the Support Card, treat as the Gene Trait letter from the Action Card. In this example, Johann would set an RR/Rr Phenotype Research Goal.

Automa Phase

After all Action Markers have been placed, Johann has a special Automa Phase for maintaining his Garden. **Note: Johann's Research Upgrades behave very differently than yours.** Do the following:

1. If Johann had placed any Action Markers on 1st Shift Spaces, move them to the 2nd Shift area, in the back of the line.



2. Johann Validates 1 Trait for each of his Assistants.

3. Johann gains 1 Pea Plant Card (from the top of the deck), then gains 1 additional Pea Plant Card for each New Plot he has acquired as a Research Upgrade. All new Pea Plants are added to his Garden. As usual, if his Garden is full, he Validates Traits instead.

4. In a Standard or Hard difficulty game, Johann gains 3 Coins.

5. Finally, reshuffle the Automa Cards for the Plant Breeding Phase.

Johann's responsibilities at the monastery grant some extra perks, but he can't always focus on research like the other scientists.

Plant Breeding Phase

In the Plant Breeding Phase, Johann will compete with you for Offspring Dice to advance his research. Roll and sort the Offspring Dice like normal, then proceed in the regular Shift order.

Johann does not use Dice Slots to limit his picks. Instead, he draws 1 Automa Card on each Research Shift, regardless of the number of Dice he takes. He takes a total of 3 Research Shifts, plus 1 additional Shift for each Dice Slot Upgrade.

For each of Johann's Research Shifts, draw a Card from the Automa deck and place it to the right of the top-most Pea Plant in his Garden that has not been paired with an Automa Card. The Automa Card shows a single arrow and a double arrow, which may line up to Traits on the Pea Plant. For each arrow pointing to an uncovered Trait, check whether any corresponding Offspring Dice are in the Dice Pool. If at least 1 is found, Johann Validates the appropriate Trait and removes 1 Die for a single arrow and 2 Dice (if available) for a double arrow. Johann doesn't use Dice Slots, so the removed Dice are set aside until the next Round.

Additionally, if the Automa Card shows a section with a Dice, Johann will check the *De Novo* Mutation Slot of the matching Dice color. If at least 1 Die is available, he will take 1 to Validate the bottom-most Trait for that characteristic in his Garden (check the bottom-most Plant first, proceeding up until a match is found). If there are no matching uncovered Genotypes, he takes a Coin.

Johann's effectiveness may vary: he may find no matches at all, or he may end up Validating 3 Traits on one turn!

EXAMPLE: On Johann's first Research Shift, he draws an Automa Card with arrows pointing to the *F* and *T* Traits on this Pea Plant Card. There is no *F* Genotype on this Pea Plant, but it does have a *TT* Genotype. Two available *TT* Dice are removed (for the double arrow), and Johann Validates the *TT* Trait, covering it with a Trait Marker.

On his second Research Shift, he draws an Automa Card pointing to the *FF* and *Gg* Genotypes, as well as an *R De Novo* Mutation. There are no remaining *FF* Dice, so Johann can't Validate that Trait, but he does remove a *Gg* Die and cover that Genotype. Additionally, he removes 1 of the Dice to Validate the bottom-most *RR*, *Rr*, or *rr* Genotype in his Garden (in this case, on the top Plant).

Johann will continue drawing an Automa Card during his Research Shifts, placing it with the next-lowest Pea Plant Card and taking the corresponding Dice. As usual, his completed Pea Plants are immediately Harvested. If every Pea Plant has been paired with an Automa Card, discard all the Automa Cards and start back at the top.

Research Upgrade Phase

Johann may use his Coins to buy Research, if he can afford them. In each Upgrade Phase, he will take 1 turn to buy 1 Upgrade in an Easy Game or 2 turns to buy 2 total Upgrades in a Standard or Hard Game.

Since you are the Starting Player, Johann will have the first chance to buy a Research Upgrade. Draw an Automa Card and check the position of the double arrow against the list of Upgrades on the Abacus. If Johann has enough Coins, he will purchase the corresponding upgrade, paying the Coin cost and adjusting the price appropriately. If he can't afford that particular Upgrade, continue drawing until he finds an Upgrade he can buy.

The Research Upgrades grant Johann the following bonuses, some of which differ from their normal uses:

New Plot - Johann will receive an extra Pea Plant Card during each Automa Phase.

Dice Slot - Johann will take an extra Research Shift to draw another Automa Card during the Plant Breeding Phase.

Action Marker - Like normal, Johann will have an extra Action Marker to place.

Hire Assistant - Johann will Validate a Trait during the Automa Phase and any time he takes the Gardening action. When hiring an Assistant, draw a Support Card to decide which Assistant to hire.

If Johann acquires a New Plot, Dice Slot, or Assistant, place it next to his play area (Assistants are placed face down). Johann only uses Upgrades as described above; their normal rules are ignored.

Ending the Round and the Game

Follow the normal End of the Round instructions, except that you keep the First Player Marker. Reshuffle the Automa Cards for the next Working Phase.

End game scoring is the same as in the multiplayer game. If you have the most Points, you win! Perhaps you have a future in running the monastery instead of Johann...

Hard Mode Assistants

To play on the Hard difficulty, give Johann 1 of the following Assistants from the beginning of the game, with special rules. If he hires additional Assistants during the game, place them face down as normal.

Sister Elisabeth - During setup, draw a Support Card to place one of Johann's Phenotype Research Markers. In the Automa Phase, Johann will Validate the bottom-most Trait in his Garden matching any 1 of his Research Goals.

Father Omari - Johann's last Action Marker in each Working Phase will be placed on Father Omari's Card and resolved as normal, Validating the bottom-most matching Traits in Johann's Garden.

Brother Franz - Johann pays 1 Coin in each Plant Breeding Phase and takes 2 additional Shifts.

Sister Maria - When placing Automa Cards in the Plant Breeding Phase, if any arrows point to a Genotype with no matching Trait Dice, Johann Validates those Traits anyway, without removing any Dice.

Brother Leopold - Johann's Coin costs are reduced by 1 (to a minimum of 1) and he will purchase 3 Research Upgrades each Round, if he can afford them.

Sister May - Whenever Johann Validates a Trait, he will also Validate every matching Genotype among his Pea Plants.

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Components

1 Game Board • 20 Offspring Dice • 8 Parent Gene Tiles • 1 Round Tracker • 1 First Player Marker
34 Trait Markers • 20 Coins • 5 New Plot Tiles • 8 Dice Slot Tiles • 4 Abacus Markers
1 Rulebook • 1 Science Behind Booklet
97 Cards: 50 Pea Plants • 25 Tools • 10 Assistants • 12 Solo Cards
5 Sets of Player Pieces: Player Mat • 5 Action Markers • 3 Research Goal Markers

1. WORKING PHASE SUMMARY

In player order, players place 1 Action Marker on an available Action Space and take the corresponding action. Continue until all available Action Markers have been placed.

GARDENING: Draw 1 Tool or Plant, Harvest completed Plants, Sow Plants from hand.

PARENT GENES: Add or remove a Parent Gene Tile, but you may not flip a Tile on the Board.

2. PLANT BREEDING PHASE SUMMARY

Roll the Offspring Dice and sort them by Trait according to the corresponding Punnett Square.
are rerolled once, then sorted normally or placed in the *De Novo* Mutations Area.

Beginning with 1st Shift, 2nd Shift, and then player order, players take turns selecting 1 Die to Validate the matching Trait on 1 of their Pea Plants, placing the Die in an available Dice Slot on their Player Mat.
Dice may be taken with a second Die to Validate any Trait for that Dice color, or may be taken to gain 1 Coin. Continue until players run out of Dice Slots or valid picks.

3. RESEARCH UPGRADE PHASE SUMMARY

In **reverse** player order, players may spend Coins to purchase Research Upgrades, then increase the price by 1, until all players have passed. (Rounds 1-4 only.)

4. END OF ROUND RESET

Advance the **Round Tracker,** pass the **First Player Marker,** and **reduce Abacus Marker prices.**

Refresh **Plant** and **Tool Cards, Assistants,** and the **Coins** next to the Punnett Squares.

Players recover their **Action Markers** and return **Offspring Dice.**

TOOL CARDS

Seed Bag - Draw 5 Plant Cards, keep 2

Watering Funnel - Immediately Validate 1 Trait

Dissertation - Pay 1 Coin to Set a Phenotype Research Goal

Flower Pot - Take a Plant Card; Flower Pot becomes a temporary Plot until Harvested

Graft Knife - When taking a Die, take another (no Dice Slot required)

Rake - When taking a Die, Mutate it

Pollen Brush - When Validating a Trait, Validate every copy of the same Genotype

Hand Lens / Pocket Watch / Garden Line - When taking the action, gain 2 Coins

Grant - When purchasing an Upgrade, discount 2 Coins

ASSISTANTS

Alipius - When Gardening, draw an additional Card

Elisabeth - Validate a Trait matching your Phenotype Research Marker

Anna - Pay 1 Coin to Validate any Trait

Omari - Place an Action Marker to roll 1 of each Dice color, Validating the Traits

Anton - You always lead the 2nd Shifts

Franz - Pay 1 Coin in Plant Breeding for 2 Dice Slots

Maria - When taking a Die, Mutate it

Leopold - Your Coin costs are reduced by 1, to a minimum of 1

May - When Validating a Trait, Validate every copy of the same Genotype

Eduard - Take a Plant Card when empty; becomes a permanent New Plot