Faculty Search Chalk Talk Blueprint

Target: Academic Career Faculty Interviews

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1 Executive Summary & Research Vision Arc

This blueprint outlines the whiteboard strategy for a 45-minute faculty chalk talk presentation. The research program, titled **Engineering Programmable Multicellular Systems for Directed Tissue Morphogenesis**, aims to bridge the gap between synthetic biology and regenerative medicine. The program is built around the development of synthetic morphogen circuits that coordinate cell-to-cell signaling to build functional, three-dimensional tissues in vitro, expanding on pioneering receptor configurations [3].

1.1 Whiteboard Mapping Philosophy

The board is divided into three physical zones:

- **Board 1 (Left):** The 5-Year Vision Arc, core technical challenges, and the unifying theme of the lab.
- **Board 2 (Center):** Three Specific Aims, showing experimental pathways, preliminary data placeholders, and key readouts.
- **Board 3 (Right):** Funding roadmap, personnel recruitment pipeline, and lab integration within the department.

1.2 Research Vision Timeline (5-Year Plan)

The transition from a post-doctoral researcher to an independent principal investigator requires a clear trajectory. The timeline below illustrates the proposed funding and project milestones.

Table 1: 5-Year Funding & Project Milestone Roadmap

Phase / Year	Core Project Focus	Key Lab Personnel	Target Funding	Deliverable
Year 1–2	Circuit optimization of synNotch systems	1 PhD, 1 Tech	Nexa Career	Baseline model published
Year 2–3	In vivo pilot studies in mouse wound models	2 PhDs, 1 Postdoc	Apex Initiative	First R01-equivalent submission
Year 4	Multicellular scaling and pattern control	3 PhDs, 2 Postdocs	Vertex Consortium	Patent on engineered tissues
Year 5	Pre-clinical validation of functional skin grafts	4 PhDs, 2 Postdocs	Meridian Program	R01 renewal & clinical partner

Strategic Chalk Tip: The First 5 Minutes

Start with a blank board. Write the title of your lab in the top center. Draw the "Vision Arc" (from basic science to translational applications) on Board 1. Do not draw everything at once; sketch the base coordinate system of your timeline as you introduce yourself.

2 The Research Vision Arc

The foundational theme of the Jenkins Lab is the orchestration of multicellular behavior using synthetic genetic networks. The vision spans from fundamental cell engineering to translational therapeutics, creating a self-sustaining cycle where translational failures inform basic science discovery, as outlined in recent developmental frameworks [2].

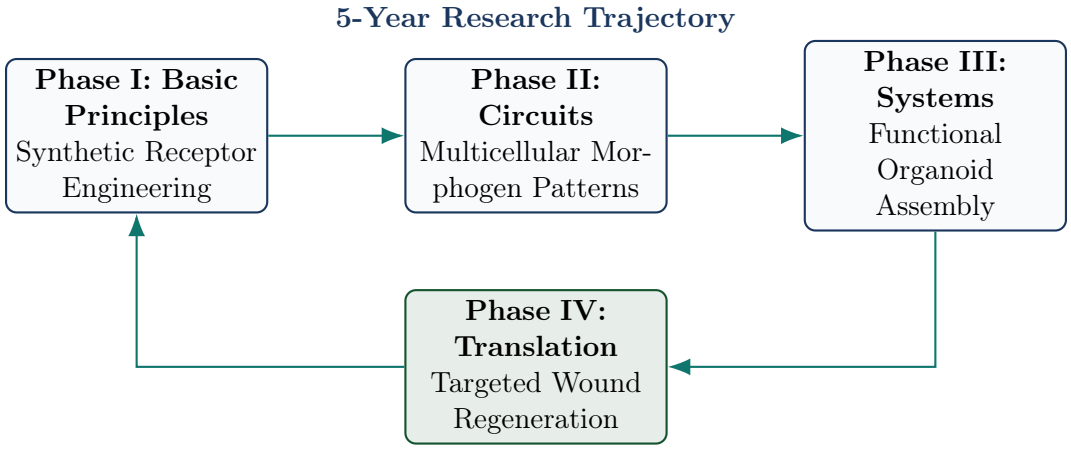


Figure 1: Conceptual workflow of the Jenkins Lab's Research Vision Arc, illustrating the loop between basic synthetic biology and translational tissue engineering.

2.1 Narrative Flow & Chalk Transitions

When presenting this on the board, draw the three horizontal phases first. Use white chalk for the boxes, and **colored chalk (Teal)** for the transitional arrows. Highlight the translational loop (bottom box) in **red/orange** to draw focus when discussing potential clinical collaborations with Meridian Health.

- **Transition 1 (Minute 8):** Connect the fundamental ligand-receptor work to the multicellular system. Show that the primary bottleneck in tissue engineering is not cell sourcing, but the lack of localized, self-regulating developmental cues.
- **Transition 2 (Minute 15):** Transition from the conceptual model to the specific experimental aims that will build this technology.

3 Three-Aim Structure & Technical Roadmap

The core of the Chalk Talk is the three-aim structure. The table below outlines how to pitch these aims to satisfy both the fundamental biologists and the translational engineers in the search committee, using principles established in multicellular programming [1].

3.1 Aim Breakdown and Feasibility Analysis

3.2 Deep-Dive & Board Representation of Aims

3.2.1 Aim 1: Self-Patterning Morphogen Gradients (Years 1–2)

- **The Pitch:** Focus on preliminary data from postdoc work. Show that we can control signaling range by tweaking ligand shed rate.

Table 2: Strategic Breakdown of Research Aims

Aim Title	Biological Hypothesis	Key Methodology	Funding & Risk
Aim 1: Self-Patterning Morphogen Gradients	Localized synthetic morphogens can establish robust spatial patterns in stem cell layers.	Notch-based synNotch receptors coupled to fluorescent reporter readouts.	**Low Risk**
Nexa Career Grant			
Aim 2: Closed-Loop ECM Remodeling	Matrix-degrading enzymes controlled by synthetic promoters prevent fibrous scarring.	Doxycycline-inducible synthetic promoters driving matrix metalloproteinases.	**Medium Risk**
Apex Health (R01)			
Aim 3: Programmable Vascularization	Engineered cell-autonomous migration can form self-assembling vascular networks.	Optogenetic control of chemokine receptors (CXCR4 mutants).	**High Risk**
Vertex Consortium			

- **Board Details:** Sketch a 1D cell array. Use colored chalk to show morphogen emission from a source cell, diffusion across neighbors, and the resulting step-function activation thresholds.

3.2.2 Aim 2: Closed-Loop ECM Remodeling (Years 2–4)

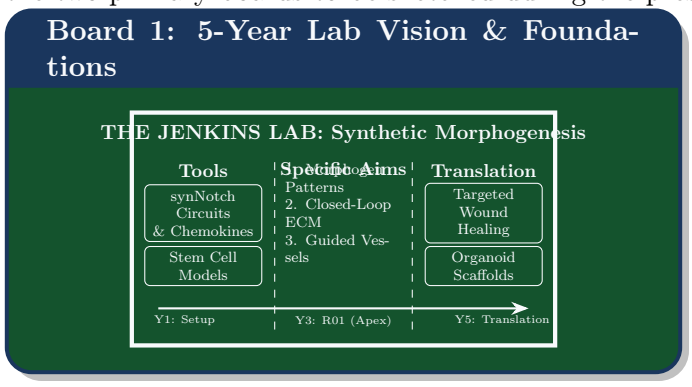
- **The Pitch:** This is the core R01-equivalent project. We will engineer cells to sense mechanical strain and secrete remodelers in response, preventing the fibrotic pathway typical of chronic wounds.
- **Board Details:** Sketch the closed-loop feedback block diagram. Input: mechanical stress; Controller: engineered promoter; Output: matrix metalloproteinases (MMPs) secretion.

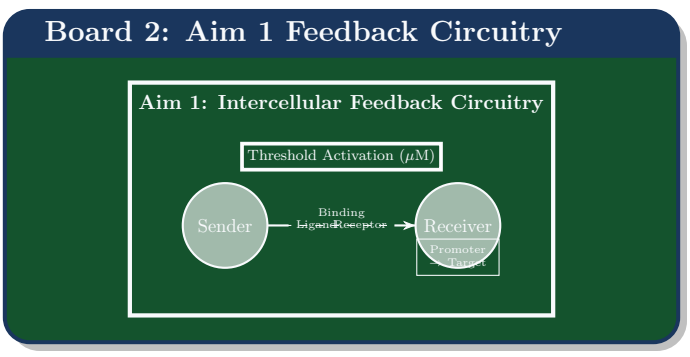
3.2.3 Aim 3: Programmable Vascularization (Years 3–5)

- **The Pitch:** The high-risk/high-reward component. Traditional scaffolds suffer from inner necrosis due to lack of vascular networks. By programming cell-autonomous vascular recruitment, we bypass the need for external printing.
- **Board Details:** Sketch a vascular lumen crossing a synthetic boundary. Write down the genetic circuit wiring that controls migration velocity.

4 Board-Sketch Placeholders

In a chalk talk, the visual layout of your board is as important as the spoken content. Below are mockups of the two primary boards to be sketched during the presentation.





5 Anticipated Questions & Defense Strategy

The Q&A session during a chalk talk is notoriously rigorous. The search committee will test the boundaries of your independence, technical feasibility, and funding realism.

5.1 Strategic Q&A Mapping

The table below presents five critical questions that search committees commonly ask, along with the targeted defense strategy.

Table 3: Q&A Defense Framework

Anticipated Question	Committee Persona	Strategic Response Pattern
"How is this work distinct from your postdoc mentor's lab?"	The Skeptic (Senior Faculty Member)	Emphasize the novel chemokine migration models in Aim 3. Highlight that your mentor focuses on physical scaffolds, while you focus on self-assembling cell systems.
"What is your backup plan if the synNotch circuit fails in vivo?"	The Technical Expert (Cell Biologist)	Acknowledge the in vivo complexity. Pivot to our established plasmid-based delivery systems and transient transfection pilots.
"This requires heavy microfabrication. Can you do this at our institute?"	The Pragmatist (Department Chair)	Mention that the initial screening will use standard cell culture dishes, scaling up through cleanroom facility collaborations.
"Which funding agencies will fund Aim 3? It seems too high-risk."	The Pragmatist (Department Chair)	Frame Aim 3 as the high-reward section of a Vertex Consortium Grant, keeping Aims 1 and 2 targeted for standard Nexa/Apex R01 awards.
"What will your first PhD student start working on on Day 1?"	The Mentor (Supportive Faculty)	The first student will establish the baseline reporter cell lines for Aim 1. This ensures a rapid publication pathway within 18 months.

5.2 Defense Advice Box

Strategic Chalk Tip: Handling Tough Questions

Do not stand defensive. Walk back to the board. Use the board to answer the question. If someone questions the feasibility of Aim 2, draw a quick diagram of your negative feedback control loop to visually demonstrate safety. Writing on the board gives you time to think and commands authority in the room.

References

[1] Jessica Daniels and William Carter. Programming self-organizing tissue structures with synthetic cell-cell signaling systems. *Nexa Biotechnology Reports*, 19(1):56–68, 2024.

[2] Apex Health Initiative Panel. Future directions in regenerative medicine and tissue engineering. *Apex Biomedical Reports*, 8:101–115, 2025.

[3] Arthur Robins and Emily Vance. Engineering customized cell sensing using synthetic notch receptors. *Synapse Bioengineering Journal*, 45(2):112–124, 2023.