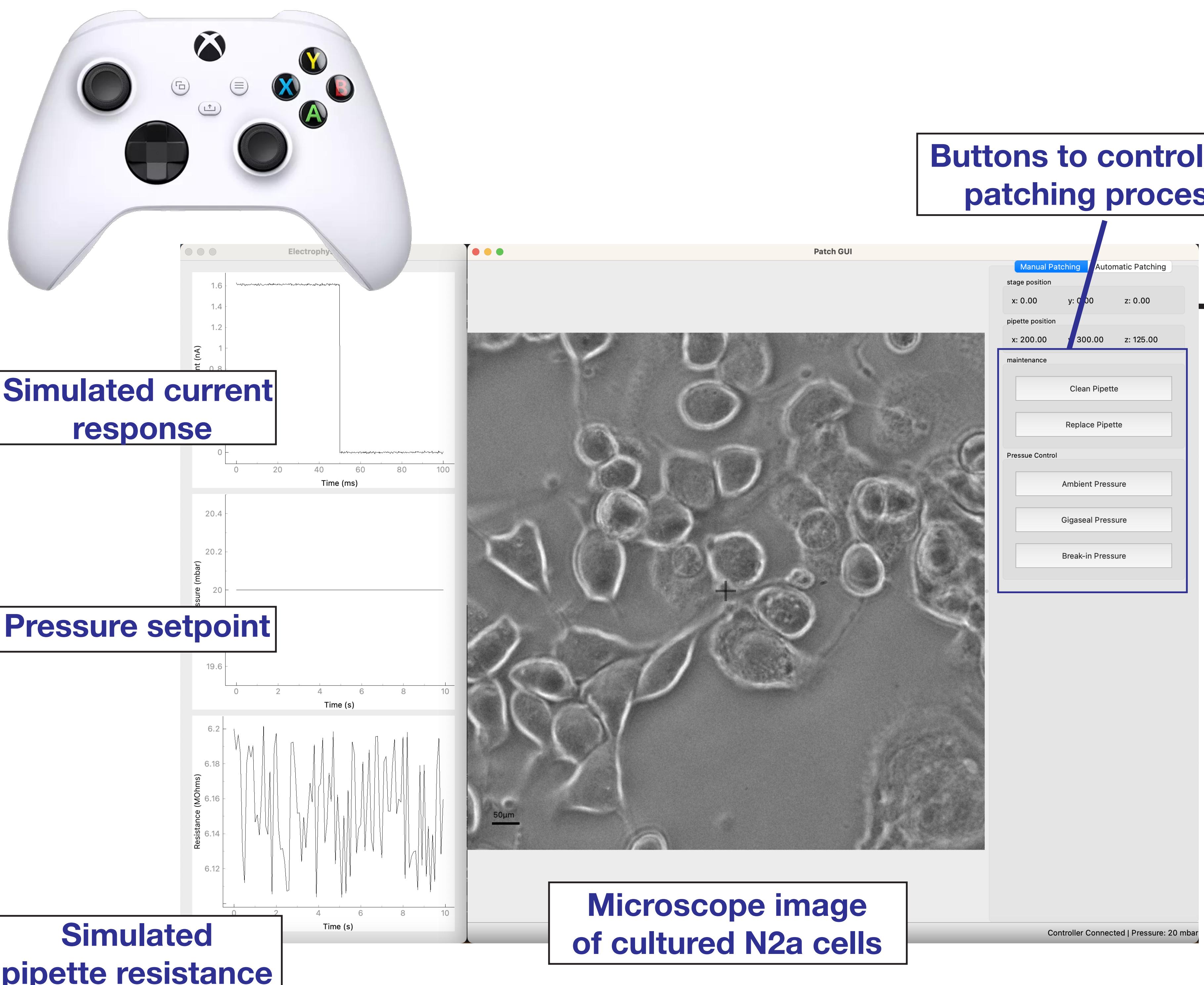


Nathan Malta<sup>1</sup>, Caitlin Van Zyl<sup>2</sup>, Alexandra Dunnum<sup>3</sup>, William Hunt<sup>4</sup>, Mathew Rowan<sup>6</sup>, Marcel Stimberg<sup>7</sup>, Romain Brette<sup>7</sup>, Craig Forest<sup>5</sup>

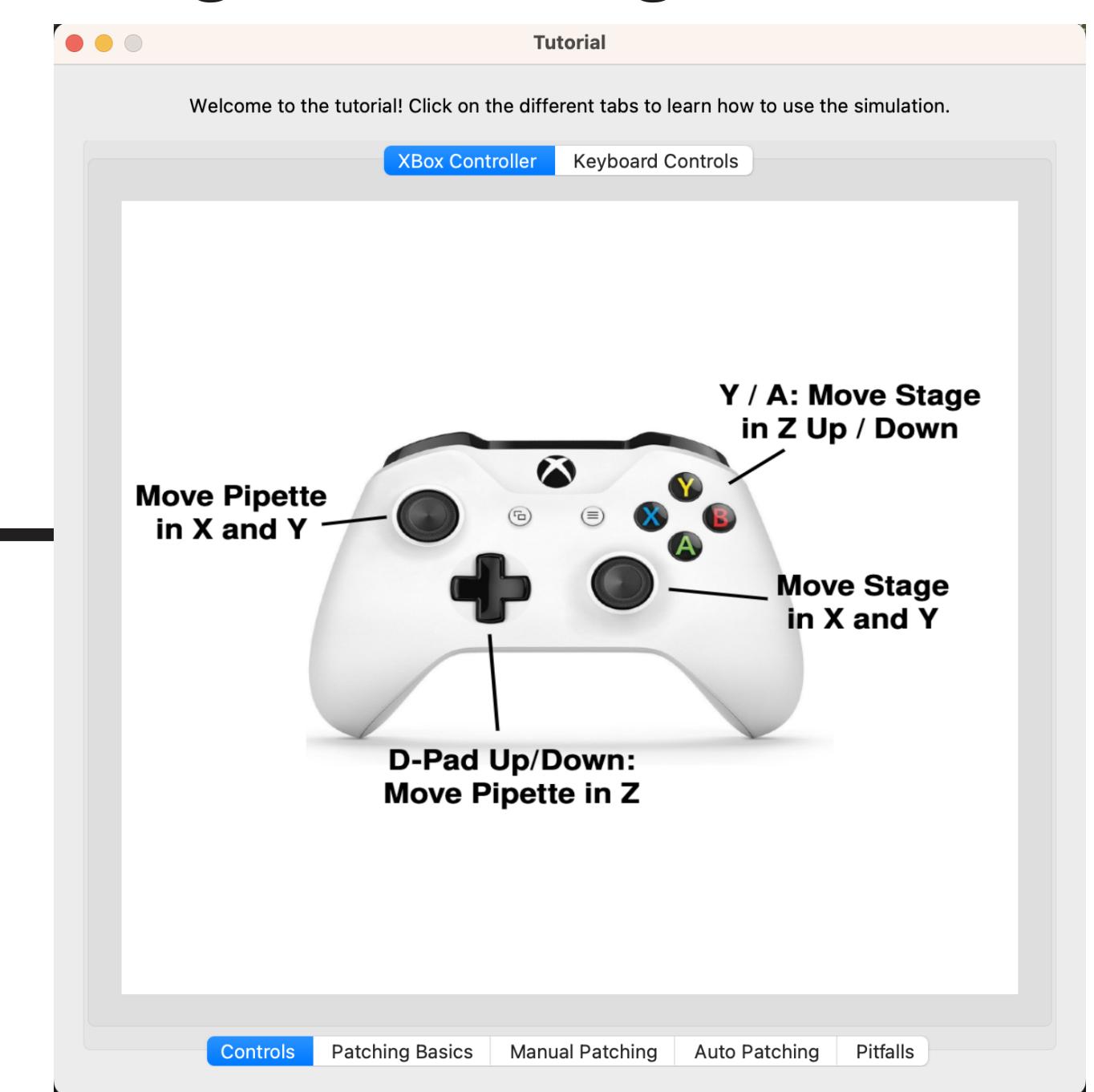
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<sup>6</sup>Departments of Cell Biology, Emory University, Atlanta, GA, <sup>7</sup>Sorbonne Université, INSERM, CNRS, Institut de la Vision, Paris, France

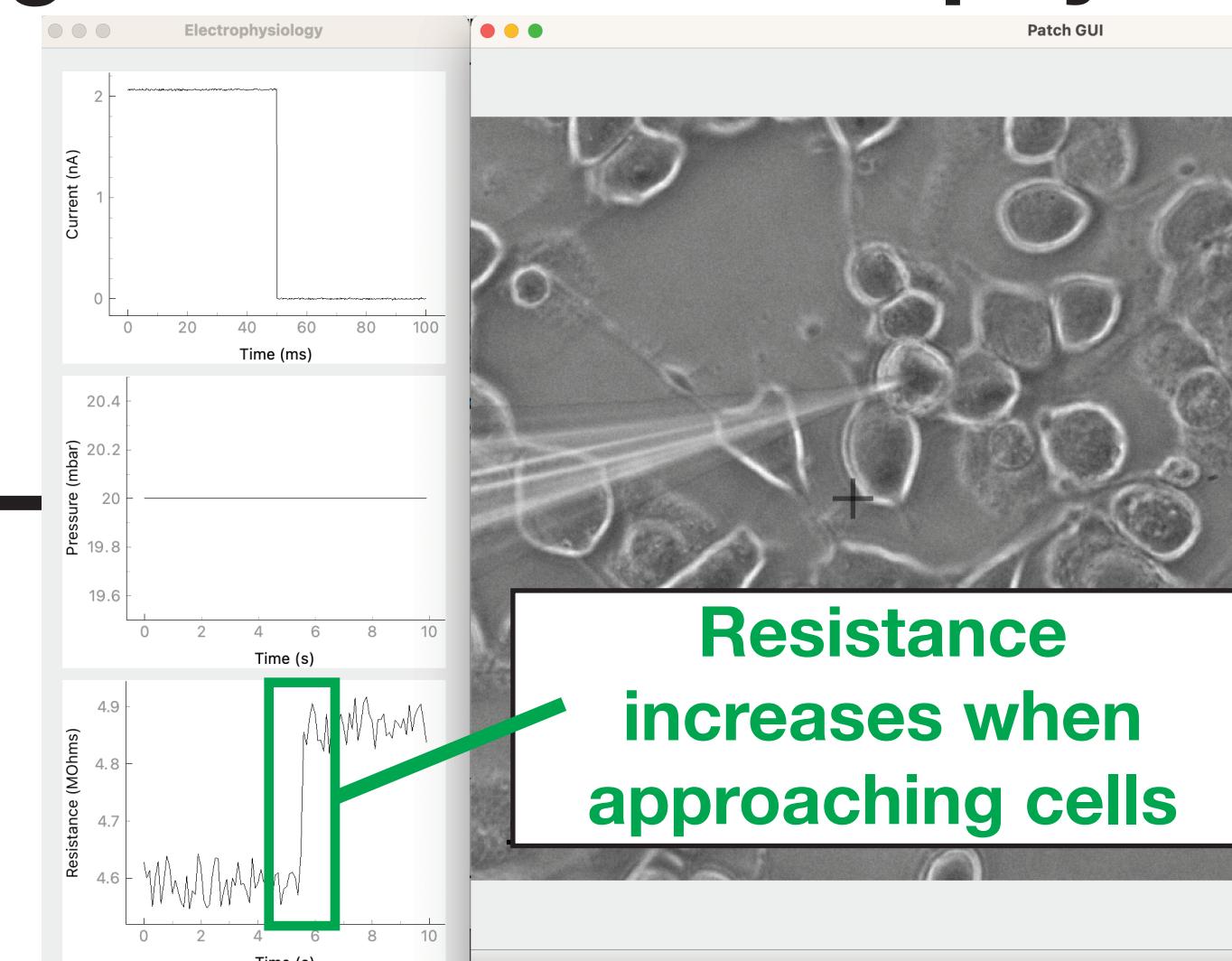


- Patch clamping is an important technique for investigating the electrical properties of individual cells
- The equipment for patch clamping is often large, expensive, and limited in availability making training a large number of students difficult
- We introduce a video game which simulates patch clamping, providing an accessible learning tool for students interested in exploring this technique

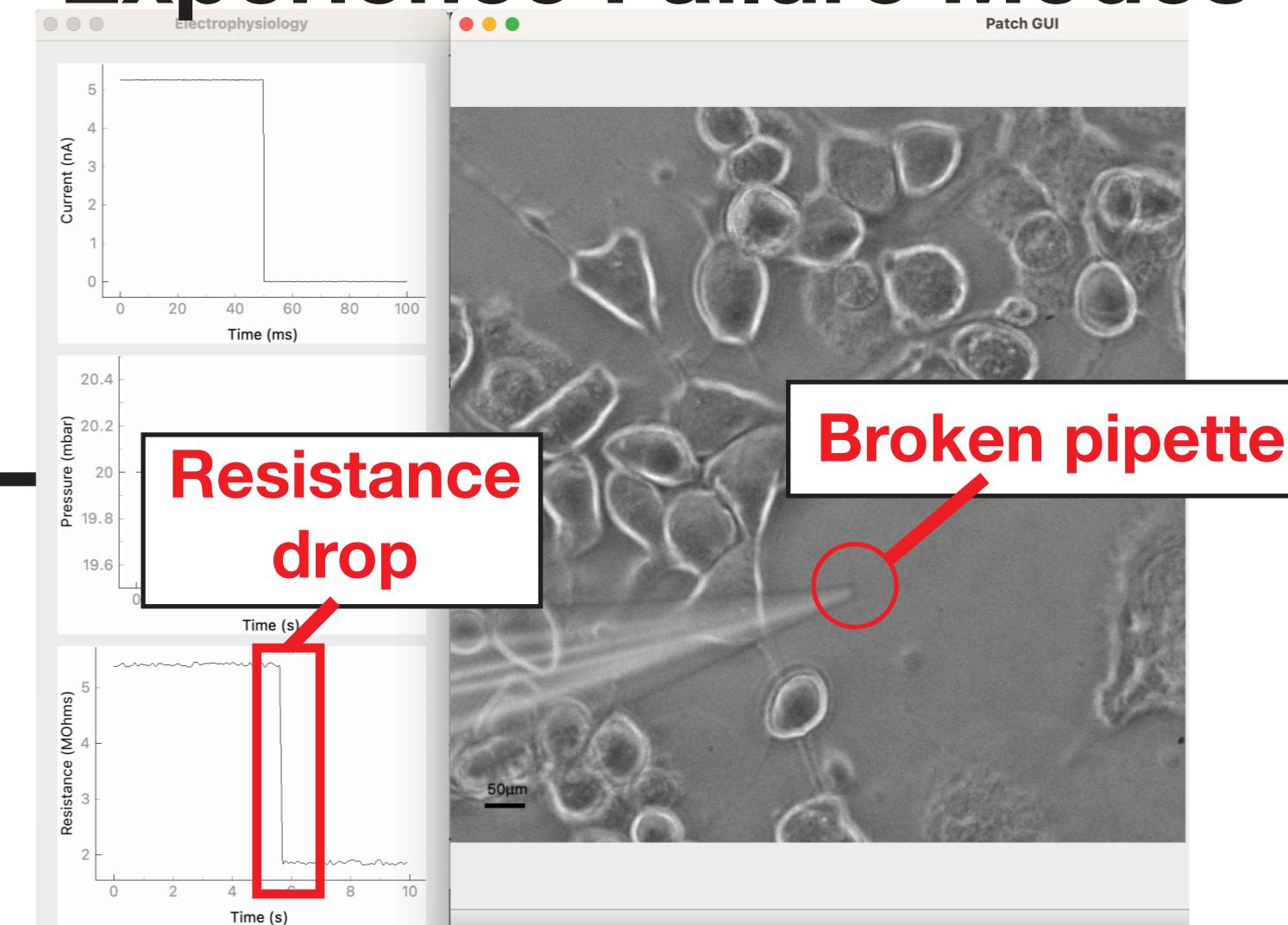
### Tutorial Window - Learn about Patching and using the Simulator



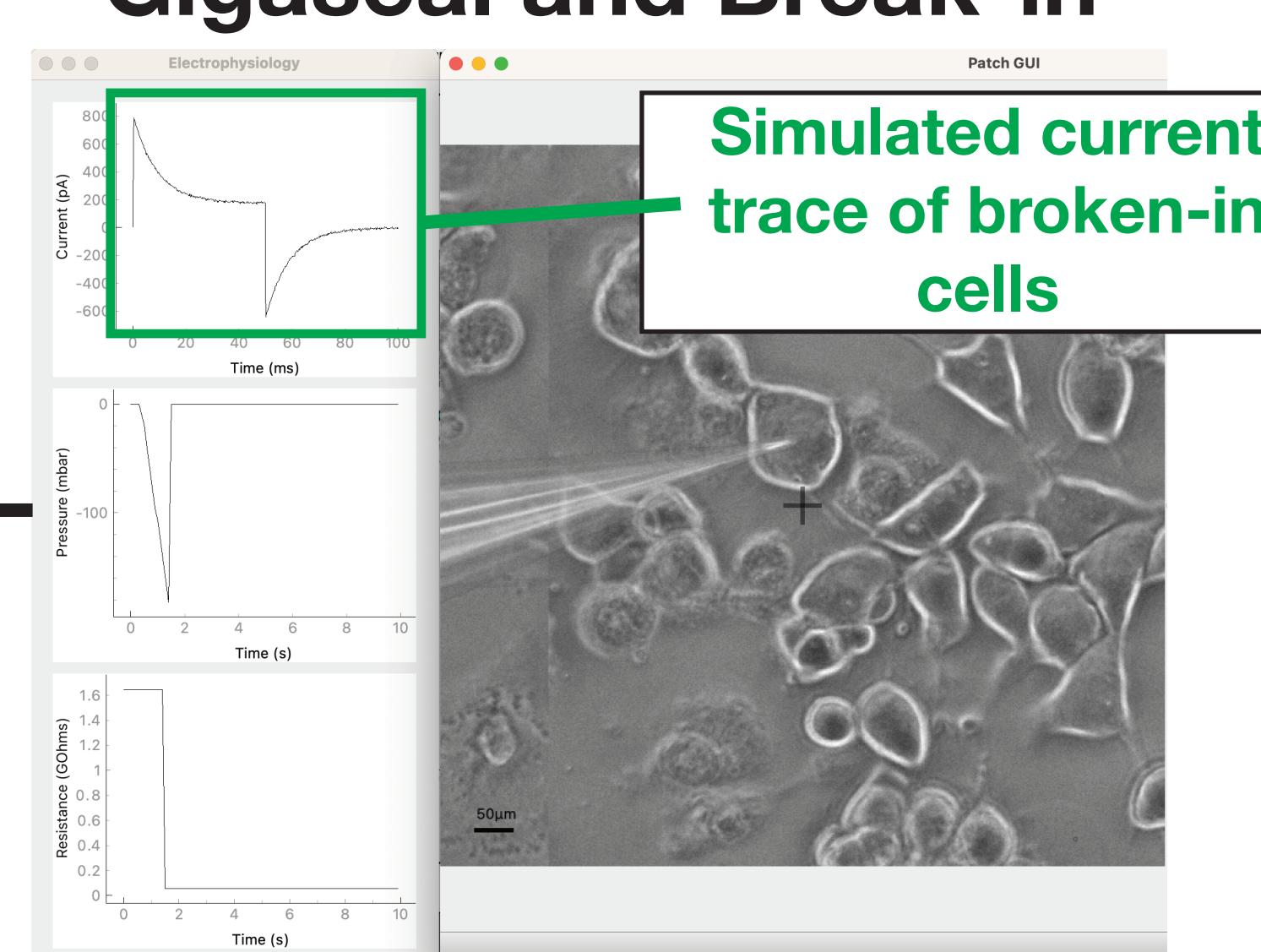
### Target Cells and See Ephys Data



### Experience Failure Modes



### Gigaseal and Break-in

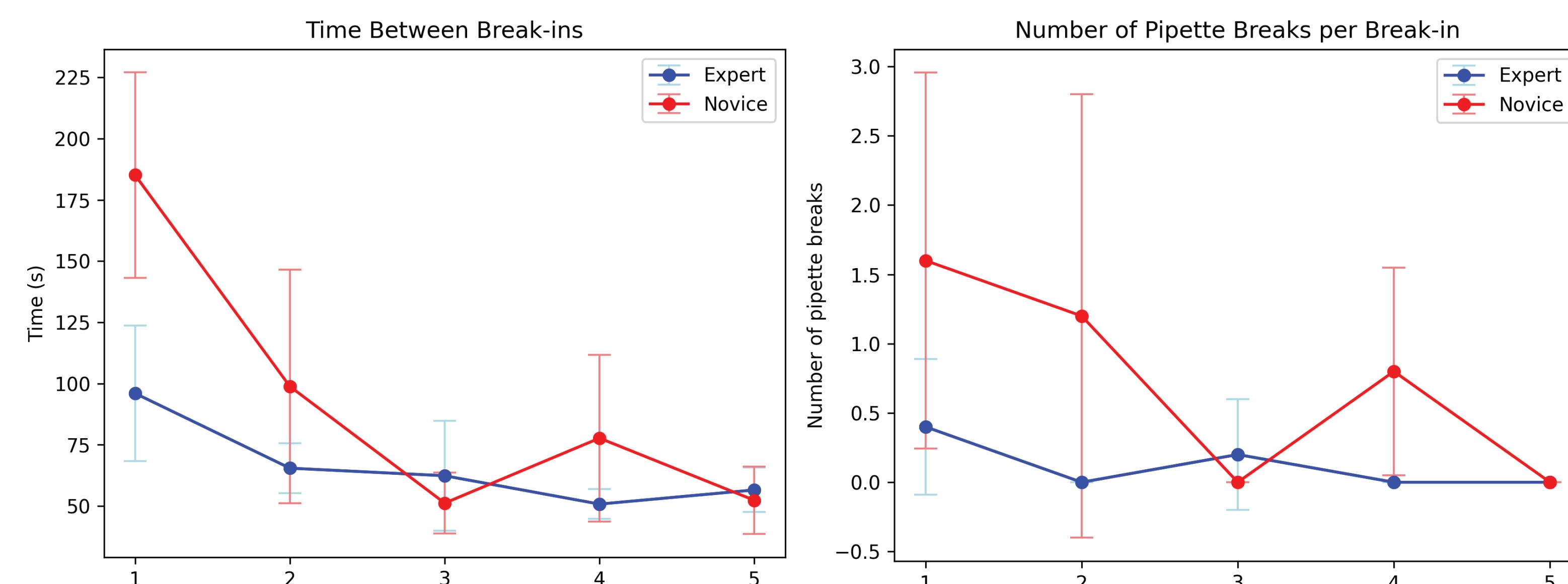


## User Testing

Five experienced patch-clampers ("experts") and five students unfamiliar with the technique ("novices") were selected

- 1) Users were given two minutes to explore the tutorial to learn about patch-clamping and the simulator
- 2) Users then asked to obtain break-ins of five cells
- 3) Recorded patching events like obtaining a gigaseal or breaking a pipette, and when they occurred to gauge user performance

## Results



Time until break-in

Number of crashes

After repeated trials, users become more proficient: reducing crashes by ~50% and breaking into cells roughly twice as quickly in both groups

## Conclusions

- Users patched more quickly and crashed fewer pipettes on later attempts
  - Improved ability to recognize changes in resistance and current response graphs
  - More familiarity with the simulation and controls
  - Users no longer needed to reference the tutorial
- Expert users perform significantly better than novices
  - Familiarity with patch clamping appears to be transferrable between a real rig and video game

