

INTRO LAB

- safe introduction, lets player get used to mechanics of teleporting around + movement.
- Lean over and look through eyepieces to load next level.

CELL PADDOCK

- Player on surface of migratory breast cancer cell. User is approximately 100nm tall.
- Taken from genuine scan data, all the overall geometry is from the scan itself
- Colour, texture etc based on mix of consultation with scientists and design choices (many of these objects are smaller than the wavelength of light so can't really have "colour", but we make choices about that for the sake of clarity)
- 3 different internalisation processes
- (1) **Clathrin mediated endocytosis**: Nanoparticle engages with specific receptors that are on the surface of the cell, which activate other receptors and pull them in, a clathrin cage forms on the underside of the cell wall and a pit opens up, swallowing the nanoparticle.
- Certain receptors are more commonly expressed on the surface of cancerous cells, so targeting them can mean treatment more likely to end up in a cancer cell than another cell. Selective process. Scale limited (can't consume nanoparticles that are too large for instance)
- (2) **Caveolae**: Non-selective internalisation. Also quite small scale. Name comes from "Cave" which is what they effectively are. Little pits on the surface that if material gets inside them they will internalise.
- (3) **Macropinocytosis**: Non-selective internalisation. Cell wall forms "ruffles" which fold over themselves to draw in large quantities of interstitial fluid, and all that it contains. A 'dumb' internalisation method, but can be used for instance to internalise larger particles
- The relative scales of these different processes a focus of this work. A key strength of VR is its ability to show spatial/scale relationships intuitively, and the relative scale of these different processes is something that's easy to overlook when designing a new nanoparticle (no use building on that targets Clathrin mediated if it's 500nanometers across. Too big)
- "Arms" or "Trees" are dendrites, little protrusions that cells use to grab stuff, move etc.
- Receptors on surface are mix of **EGFR** (purple) and **integrin** (green/teal)
- Light blue spiky floaties are random dendrimers floating around (also man-made branching molecules)
- "Smoke" is atmospheric but also represents cellular respiration/internal/externalisation.
- Points of interest highlighted with beacons, become information panels when close.
- Live map on underside of controller.
- Tagged objects in scene.

CELL CATHEDRAL

- Inside cell.
- Start on nucleus (purple/blu) orange mitochondria, green lysosomes, blue endosomes
- Little particles inside lysosomes and endosomes represent cargo of these cells.
- Endosomes are internalising/transporting material, lysosomes are "stomachs" digesting the components inside

- Often good to indicate to people that they can teleport onto green grids, the one just in front of them to the right a little is good because it lets you teach them the controls, stick head in a mito + endosome
- Morphing/merging/splitting components frozen in time. Limitation of the data set (high spatial but no temporal resolution). VR again particularly good for showing these spatial relationships
- Taken from data from Rob Parton UQ
- Tagged objects with audio explanations + miniaturised cell on controller. Experimenting with showing data/info at different scales
- Freely explorable (try ducking head inside objects).
- Can teleport onto top and bottom of floating green platforms