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Carnival game mimics eye growth

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The motion of coins in a "Penny Pusher" carnival game is similar to the movement of cells in the eye's lens, as described in a new study published in *Investigative Ophthalmology & Visual Science* (*IOVS*). This new insight may help scientists understand how the eye maintains its precise shape—critical for clear vision—and how cataracts develop.

"If the size, shape or position of the eye is not carefully regulated, we simply will not see clearly," said author Steven Bassnett, PhD, of Washington University School of Medicine, Department of Ophthalmology and Visual Sciences. "However, the mechanisms that tightly control the growth of the eye remain largely unknown."

The recently published paper, The Penny Pusher: A Cellular Model of Lens Growth, describes how Bassnett's group studied mouse eyes for almost four years to learn more about how the eye's growth is regulated. During that time, they tracked where cells were multiplying on the surface of the eye's lens, the spherical, crystal clear portion of the eye just behind the iris (the colored ring near the eye's surface).

Experiments revealed that cells were primarily multiplying in a narrow line on the lens' surface. As new cells formed, they pushed their neighboring cells towards the lens' equator. Cells already at the equator were then pushed away from the surface and into the center of the lens.

This sequence of cellular motion—where the addition of new cells push existing cells down into the center of the lens—is similar to the movement of coins in the Penny Pusher carnival game. In the game, a

player adds coins to a moving, elevated platform covered in other coins, causing coins at the far edge to fall onto a lower, larger platform and eventually to where the player can collect them.

"We made a physical model of the lens equator using layers of pennies to simulate the division and migration of the lens cells. Our Penny Pusher model looked very similar to [the carnival game]," said Bassnett.

Not only does the Penny Pusher model offer new insight into the regulation of the eye's shape, it suggests a possible mechanism for the development of cataracts. A cataract happens when the lens goes from crystal clear to cloudy, blurring one's vision.

According to the researchers, if a narrow line of cells on the lens' surface are forming new cells, then those relatively few cells could have a massive effect on the clarity of the lens. "We are currently examining whether mutations in the DNA of individual lens cells can be transmitted to large numbers of lens cells, potentially influencing the clarity of the tissue and resulting in cataract," explained Bassnett.

The researchers involved in this study believe that future success in this area of research could one day be credited to a seemingly unrelated carnival game.

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