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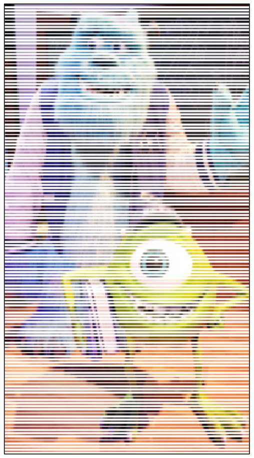
The Science of Pixar

At the Oregon Museum of Science and Industry (OMSI)



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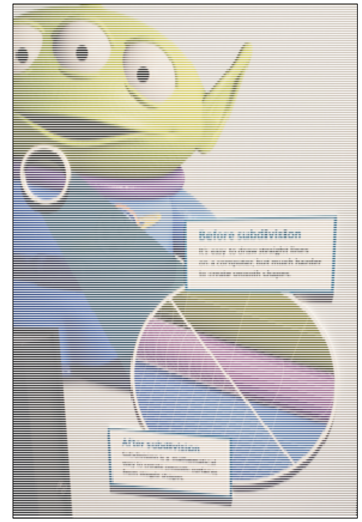

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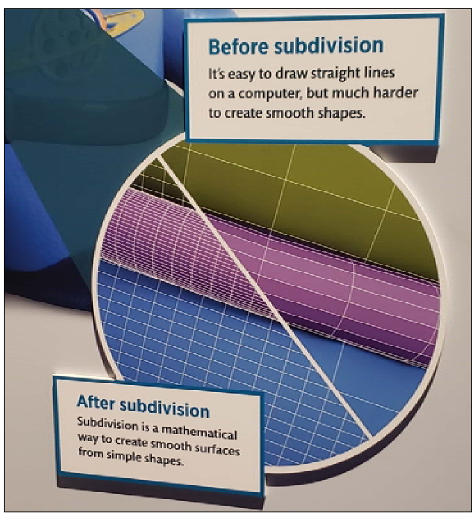

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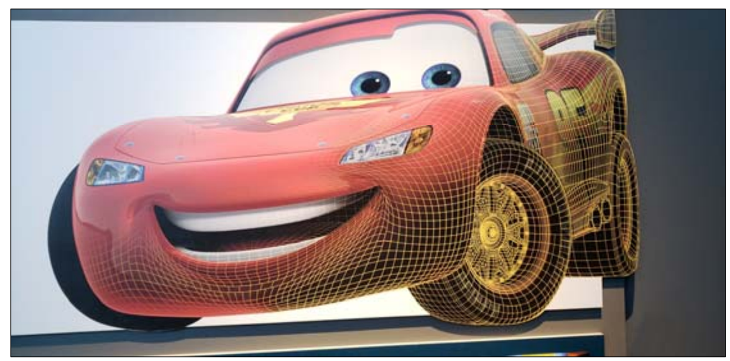

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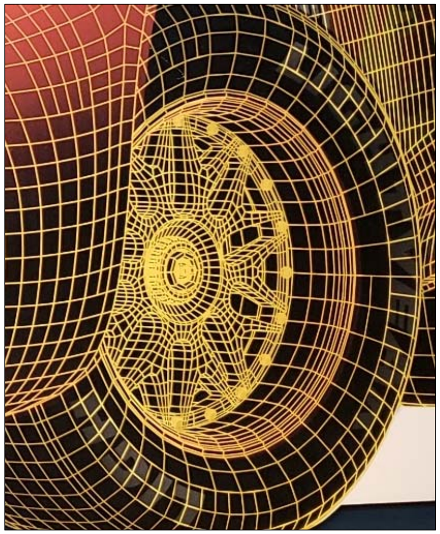

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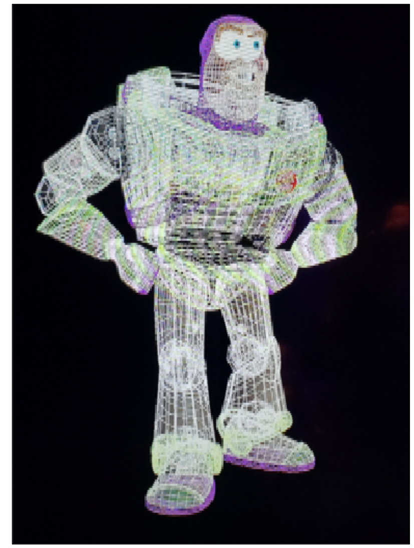

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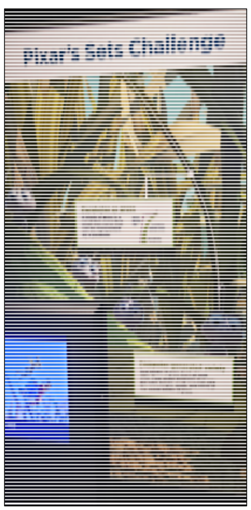

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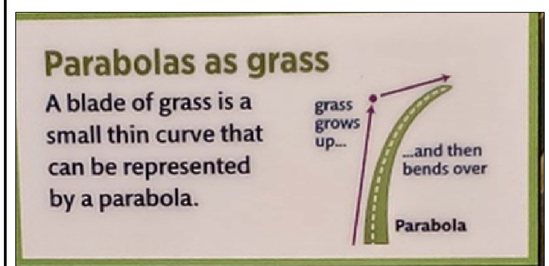

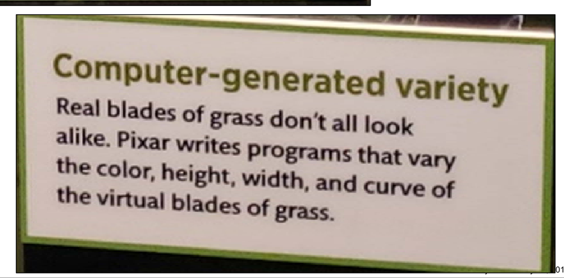

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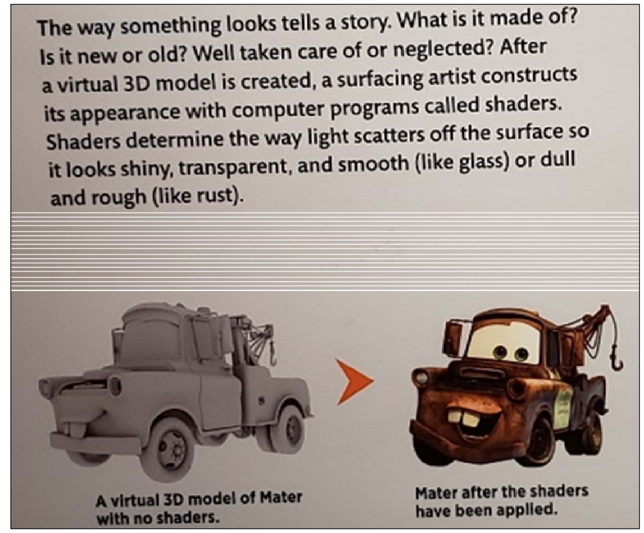

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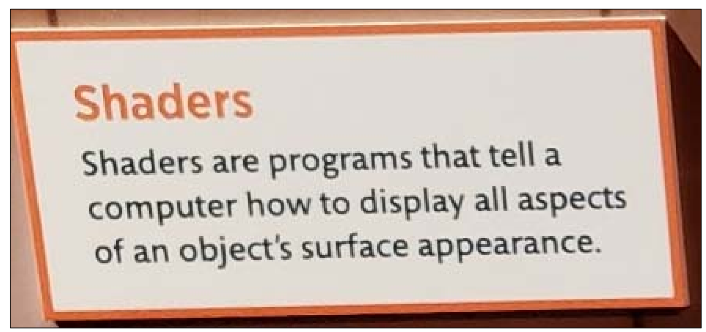

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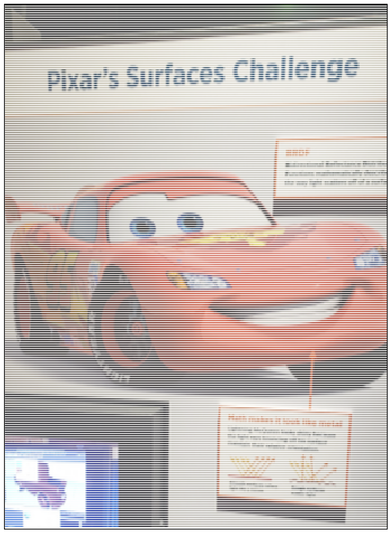

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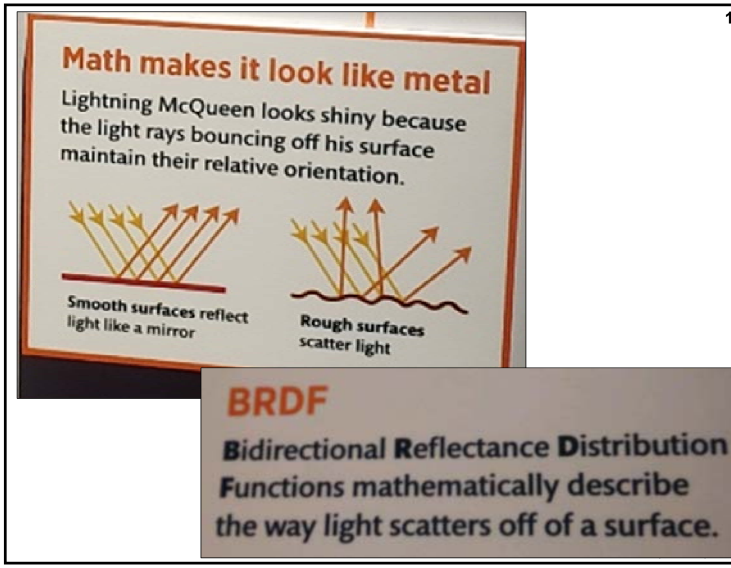

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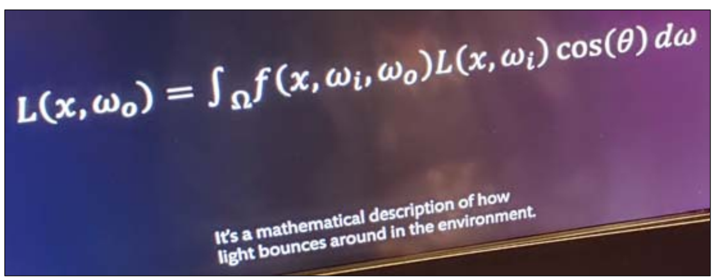

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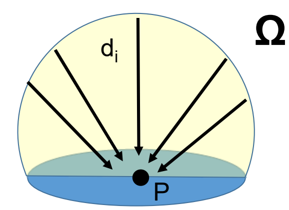
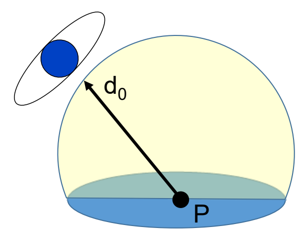
The Rendering Equation

Light Arriving



$$L(P, d_0, \lambda) = E(P, d_0, \lambda) + \int_{\Omega} L(P, d_i, \lambda) f(\lambda, d_i, d_0)(d_i \cdot \hat{n}) d\Omega$$

Light Departing



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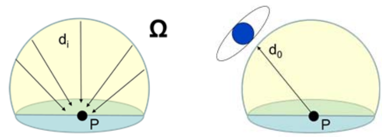
The Rendering Equation



$$B(x, d_0, \lambda) = E(P, d_0, \lambda) + \int_{\Omega} B(x, d_i, \lambda) f(x, \lambda, d_i, d_0)(d_i \cdot \hat{n}) d\Omega$$

In plain language, this is a simultaneous-equation energy balance:

"The light shining from the point P is the reflection of the incoming light directed to the point P from all of the other points in the scene."

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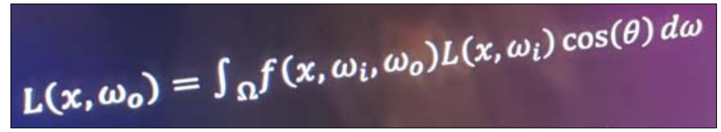

$$L(x, d_0, \lambda) = E(P, d_0, \lambda) + \int_{\Omega} L(x, d_i, \lambda) f(x, \lambda, d_i, d_0)(d_i \cdot \hat{n}) d\Omega$$

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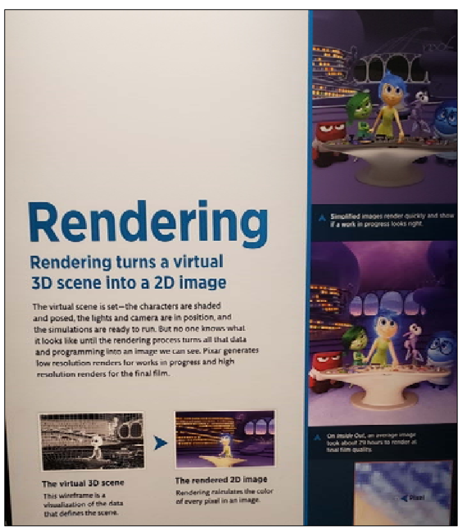

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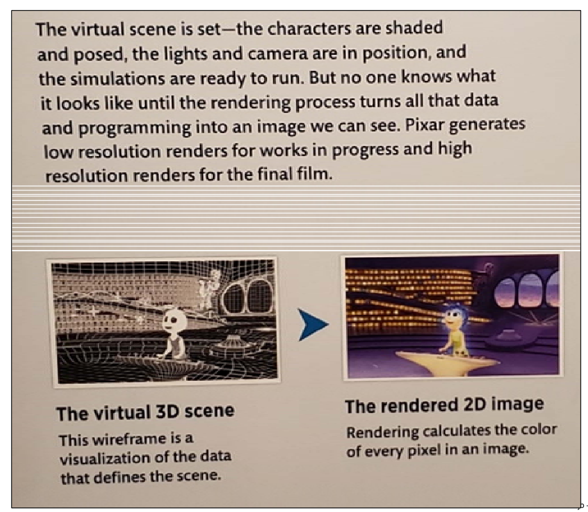

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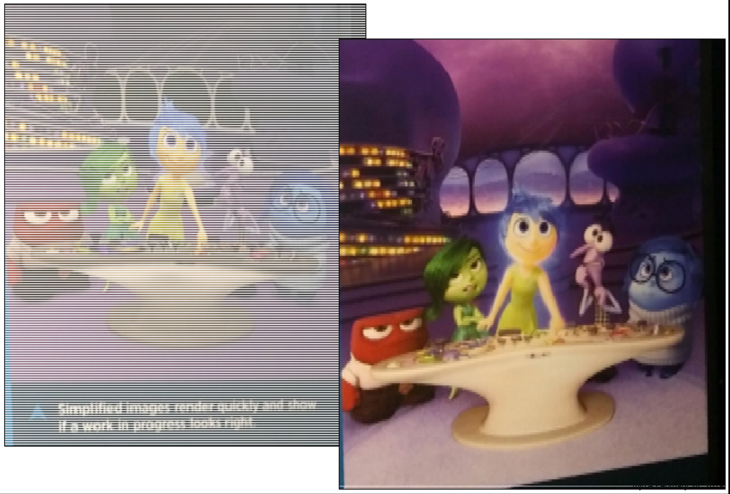

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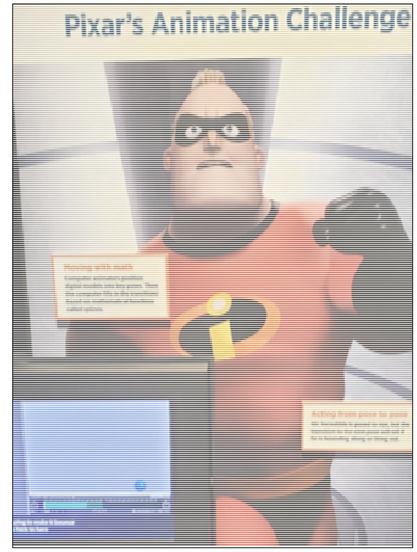

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Moving with math

Computer animators position digital models into key poses. Then the computer fills in the transitions based on mathematical functions called splines.

Acting from pose to pose

Mr. Incredible is posed to run, but the transition to the next pose will tell if he is bounding along or tiring out.

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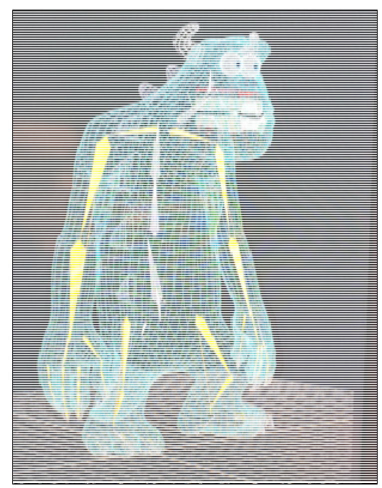

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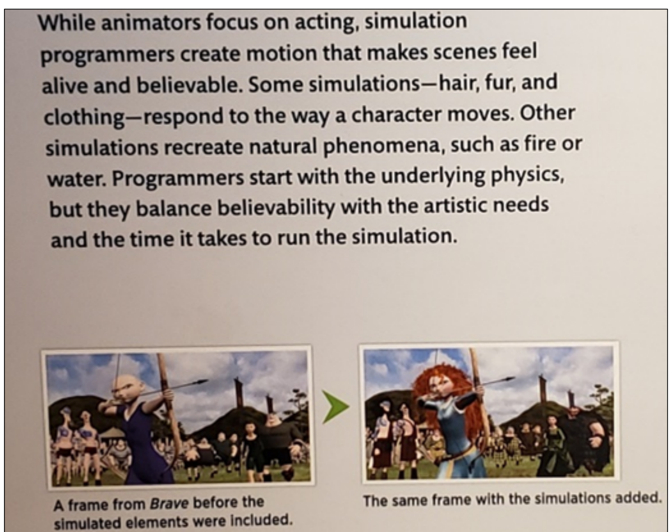

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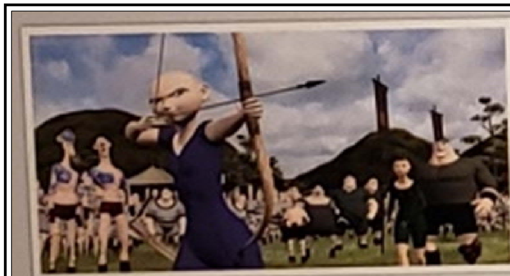

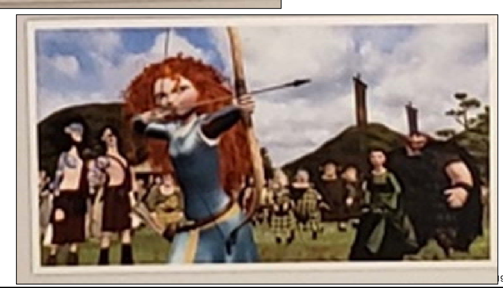

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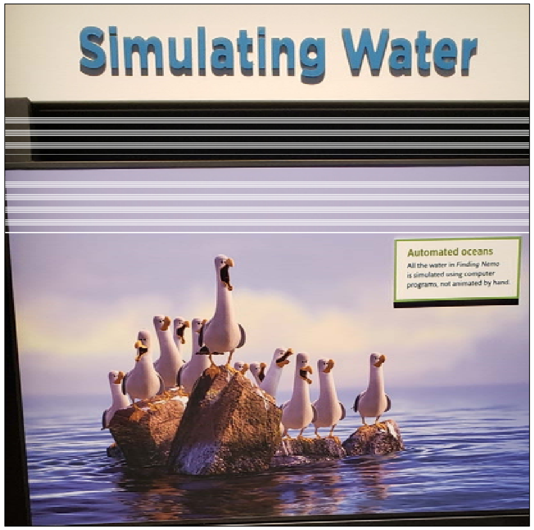

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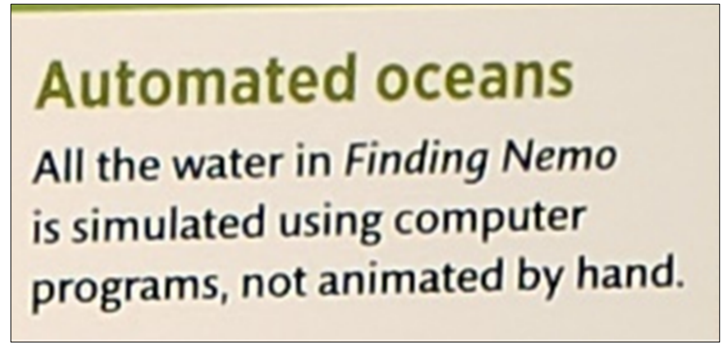

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