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Does Gravity Gravitate?

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Earth, Moon.

Earth $\sim 10^{-8}\ M_E$

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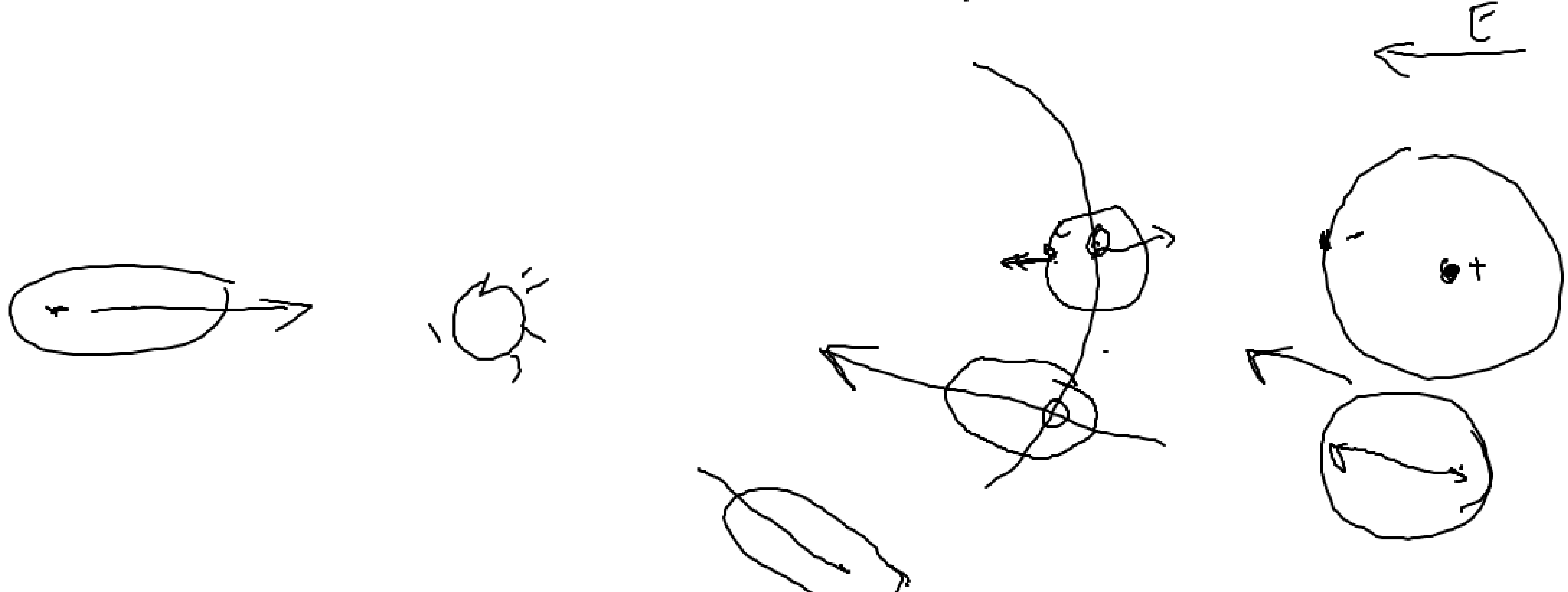
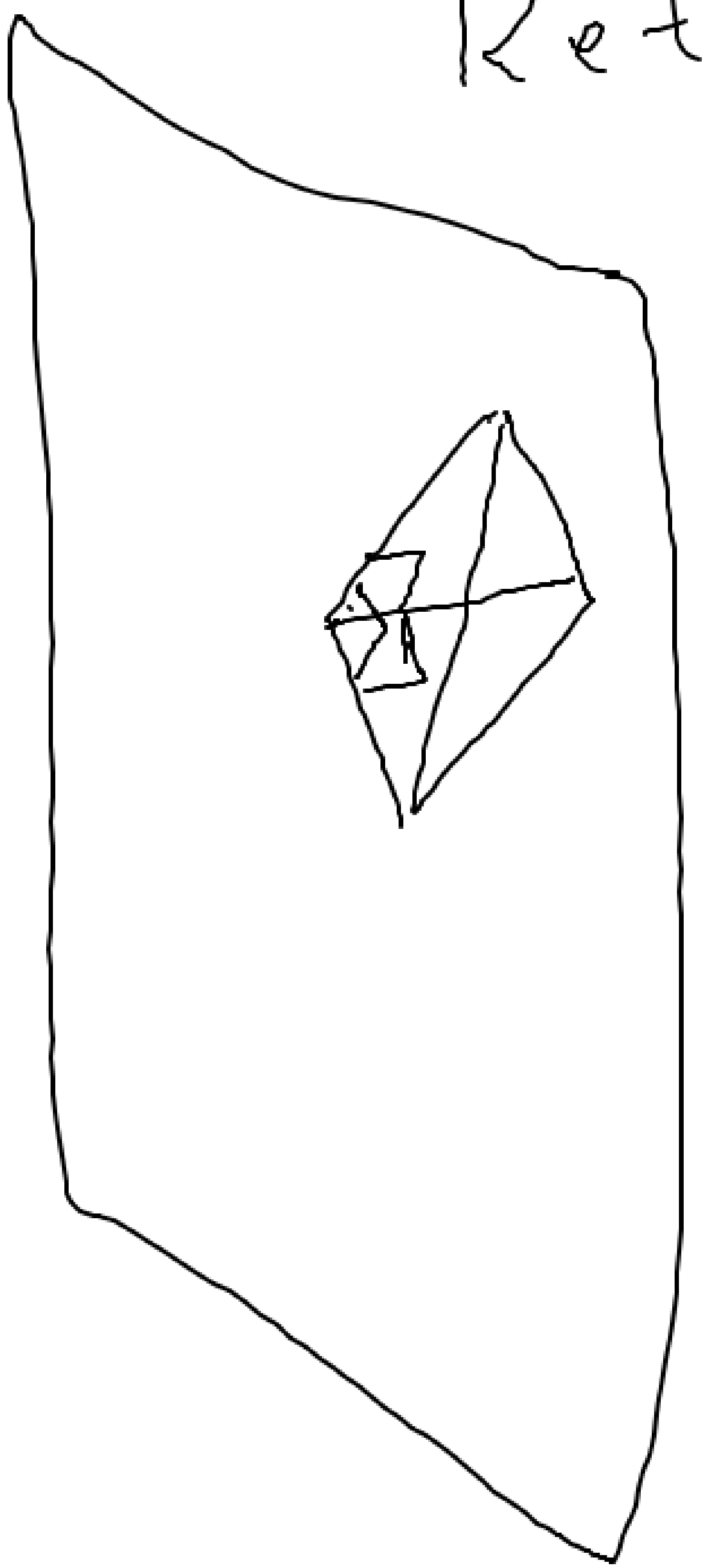
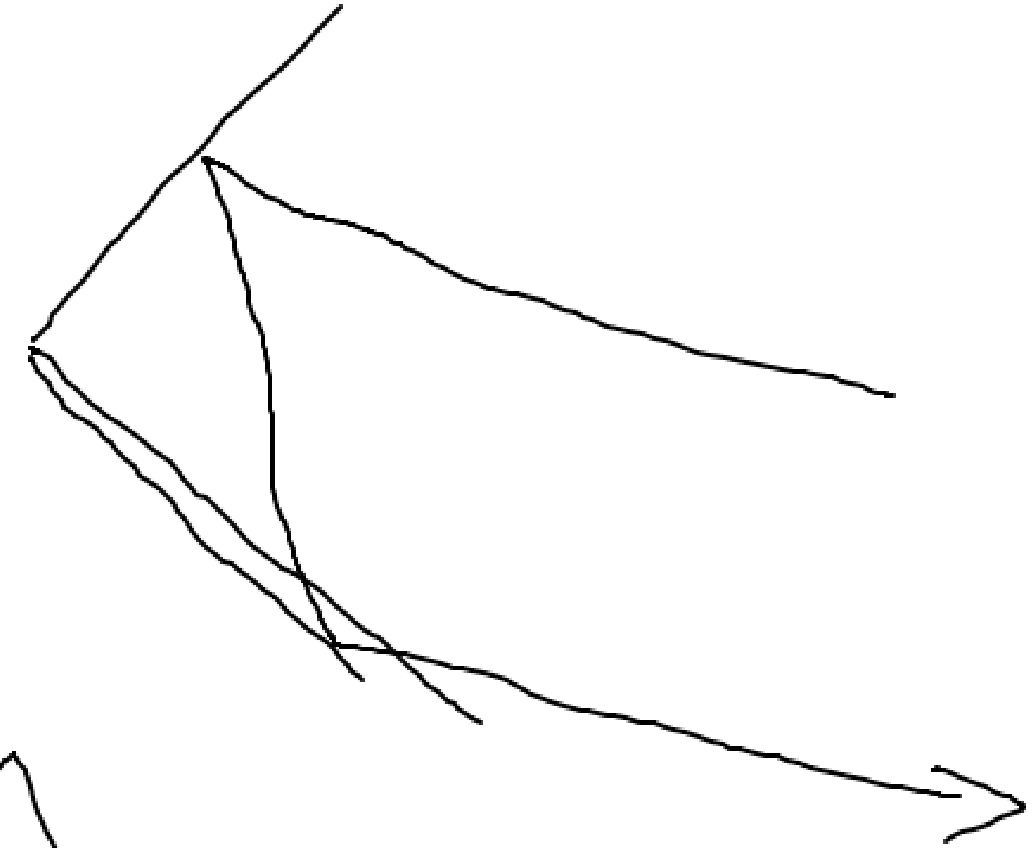
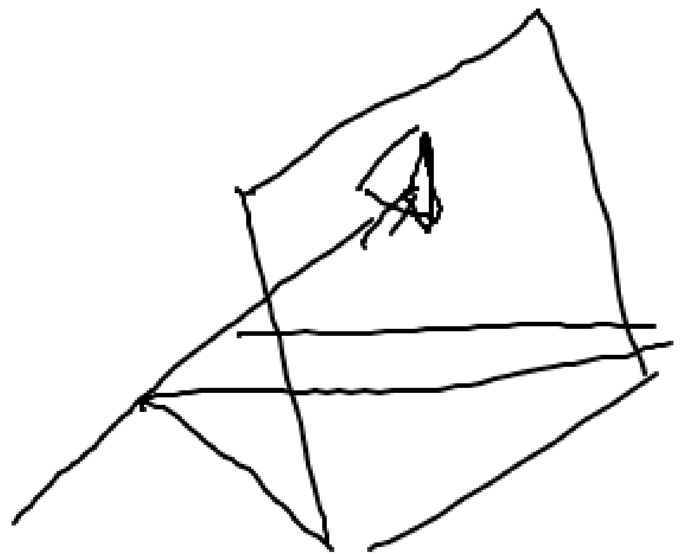


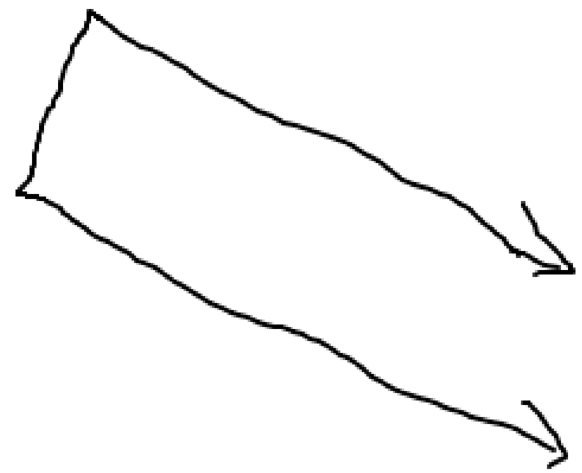
Retro reflectors.

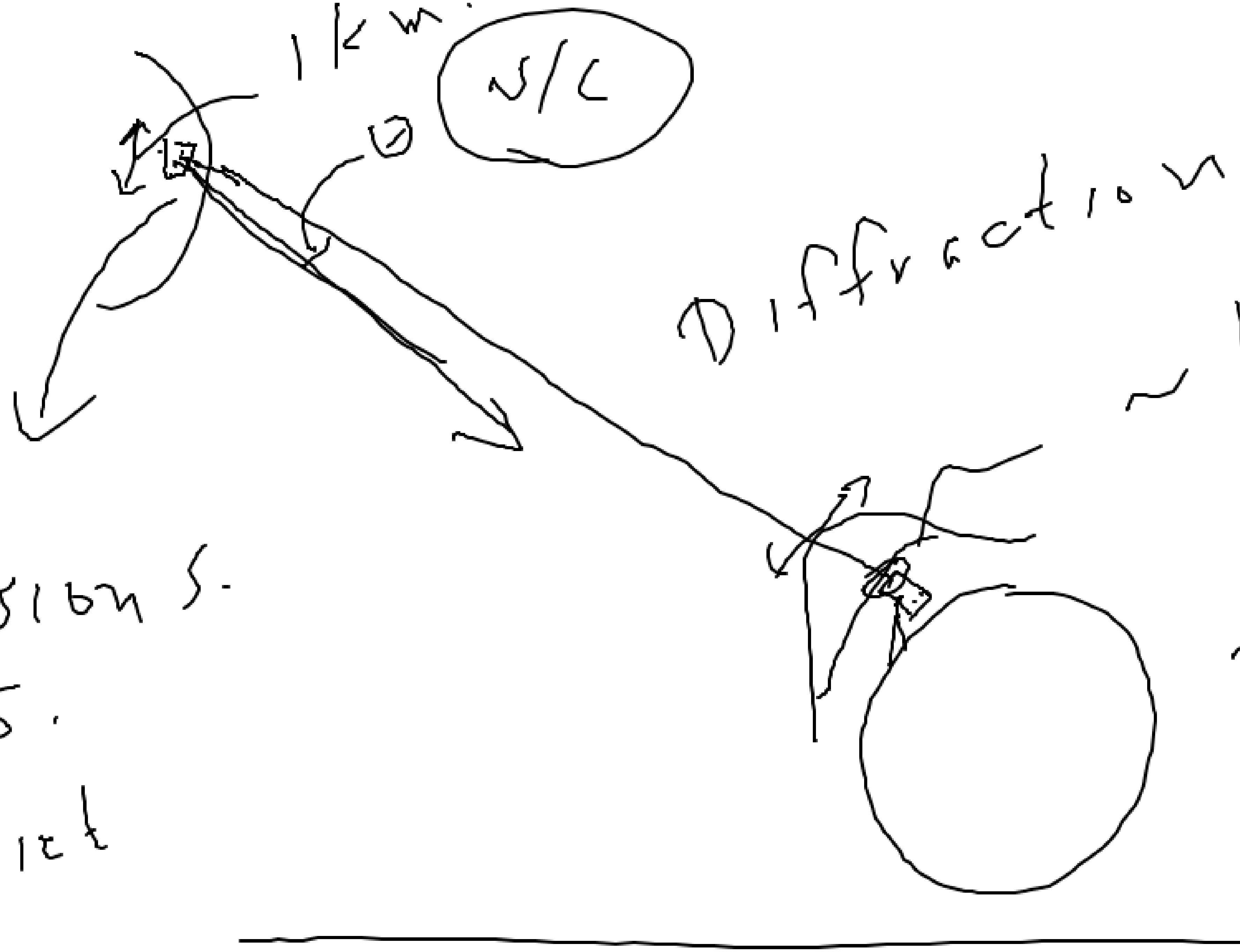


Appolo
prog









~10 photons/burst

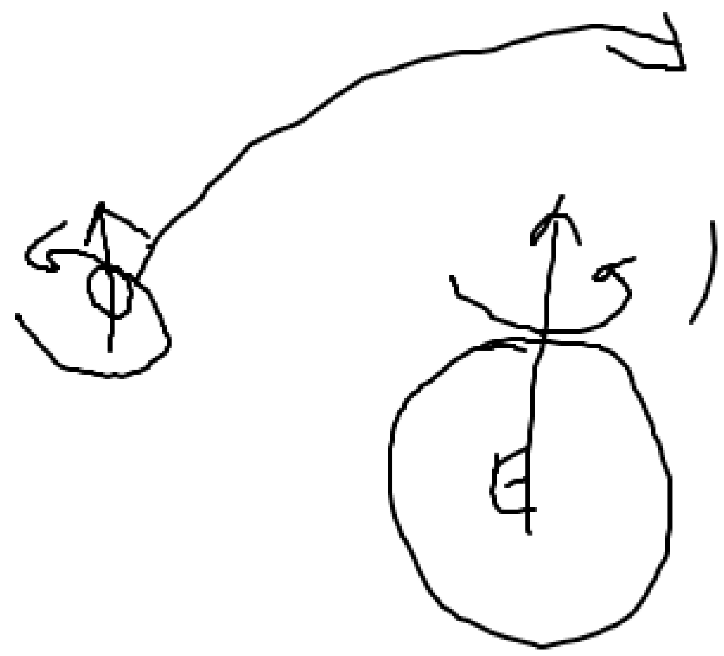
~1cm

1mm

5 missions.

3 U.S.

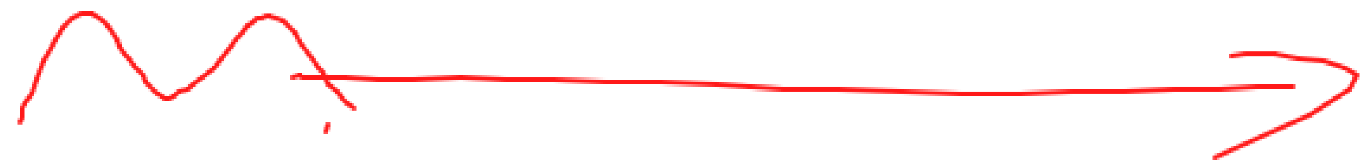
2 Soviet



~~GRAVITY WAVES.~~

GRAVITATIONAL WAVES.

1916 EINSTEIN



Linearized Eqns.

$$g_{\mu\nu} = \eta_{\mu\nu} + \underbrace{h_{\mu\nu}}_{\text{small}} \qquad \eta_{\mu\nu} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$$

h^2 an highe $= 0$

$\mu, \nu = 0, 1, 2, 3$

$i, j = 1, 2, 3.$

$$h^{\mu}{}_{\nu} = \eta^{\mu\rho} h_{\rho\nu} \qquad g^{\mu}{}_{\nu} = \delta^{\mu}_{\nu}$$

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Einsteins Eqns. (Free).

$$\bar{h}_{\mu\nu} = h_{\mu\nu} - \frac{1}{2} h^\rho{}_\rho \eta_{\mu\nu}$$

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$$+ \partial_\rho \partial_\lambda \bar{h}^{\rho\lambda} \eta_{\mu\nu} \Big)$$

$$x^\mu \mapsto x^\mu + \zeta^\mu \qquad \zeta_\mu = \eta_{\mu\nu} \zeta^\nu$$

$$h_{\mu\nu} \longrightarrow h_{\mu\nu} + \partial_\mu \zeta_\nu + \partial_\nu \zeta_\mu$$
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We can choose ξ^μ so that

$$\partial_\rho \bar{h}^\rho{}_\nu = 0$$

$$G_{\mu\nu} = -\frac{1}{2} \Box \bar{h}_{\mu\nu} \qquad \left(\partial_t^2 - \nabla\cdot\nabla\right) = \Box$$

$$\Box \bar{h}_{\mu\nu} = 0 \implies$$ waves with vel. light

$$\Box A_\mu = 0$$

$$\underline{\partial_\alpha \bar{h}^\alpha{}_\nu = 0} \qquad \underline{\partial_\mu A^\mu = 0}$$

$\partial_\alpha \bar{h}^\alpha{}_\nu \longrightarrow \partial_\alpha \bar{h}^\alpha{}_\mu + 2\Box \xi_\mu$

If $\Box \xi^\mu = 0$ then the coord condition remains satisfied.

Use coord freedom to get rid of, $\bar{h}^\alpha{}_\alpha = 0$ $h_{0i} = 0$

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via various coord transf.

NEXT TIME

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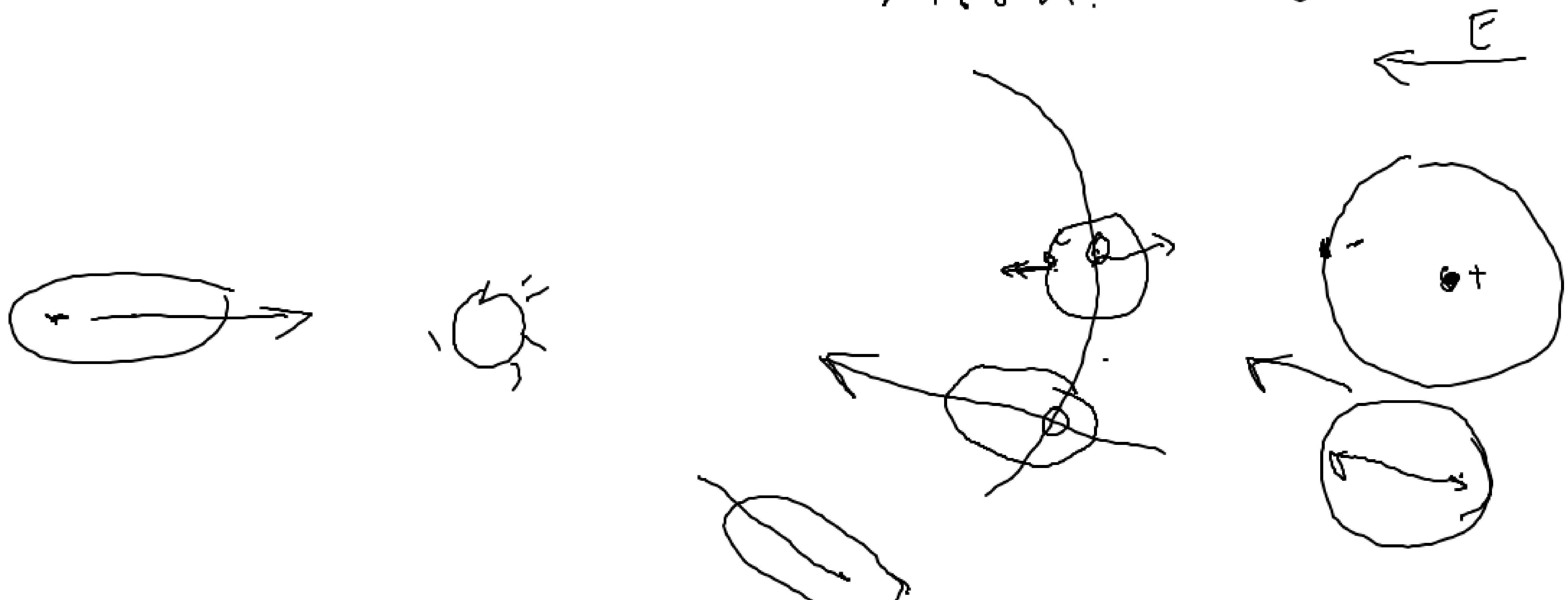

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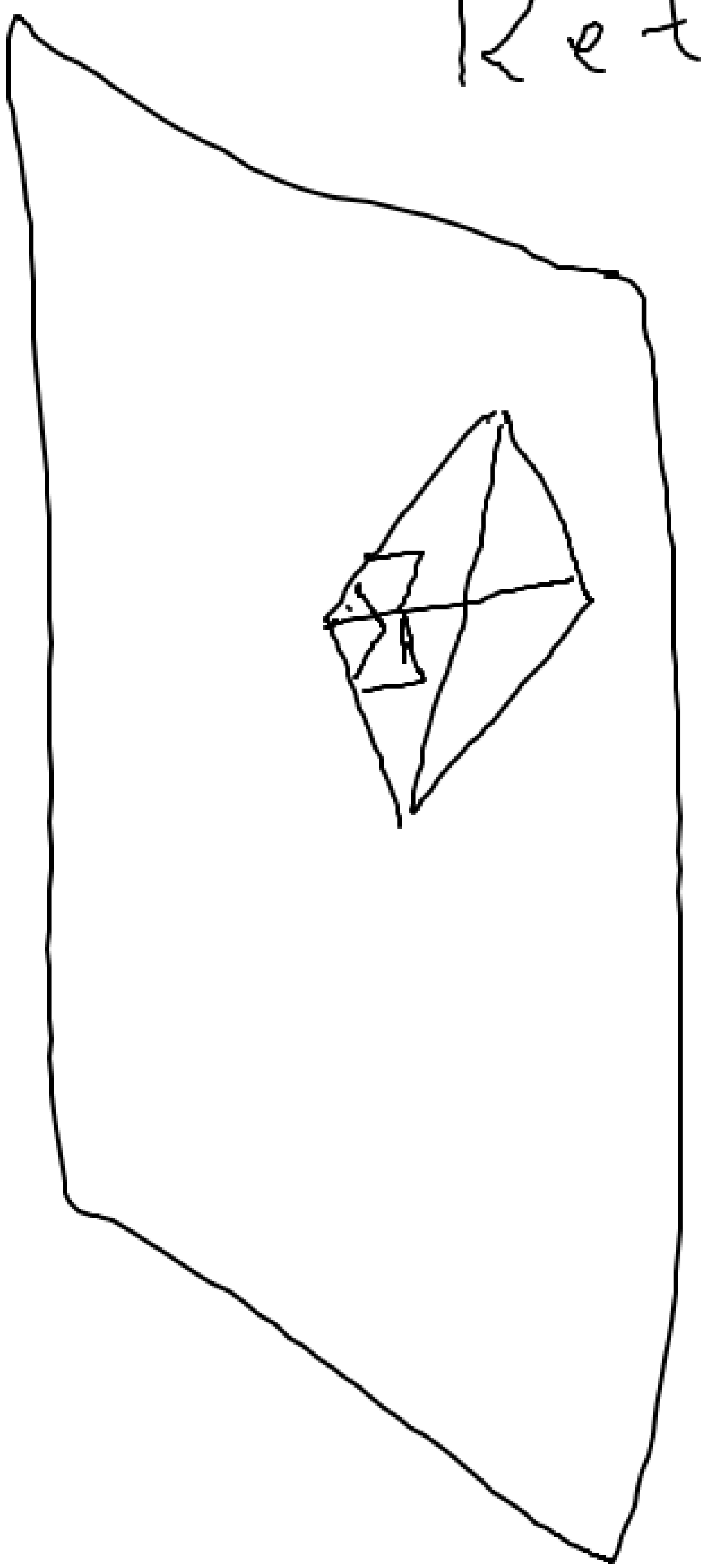
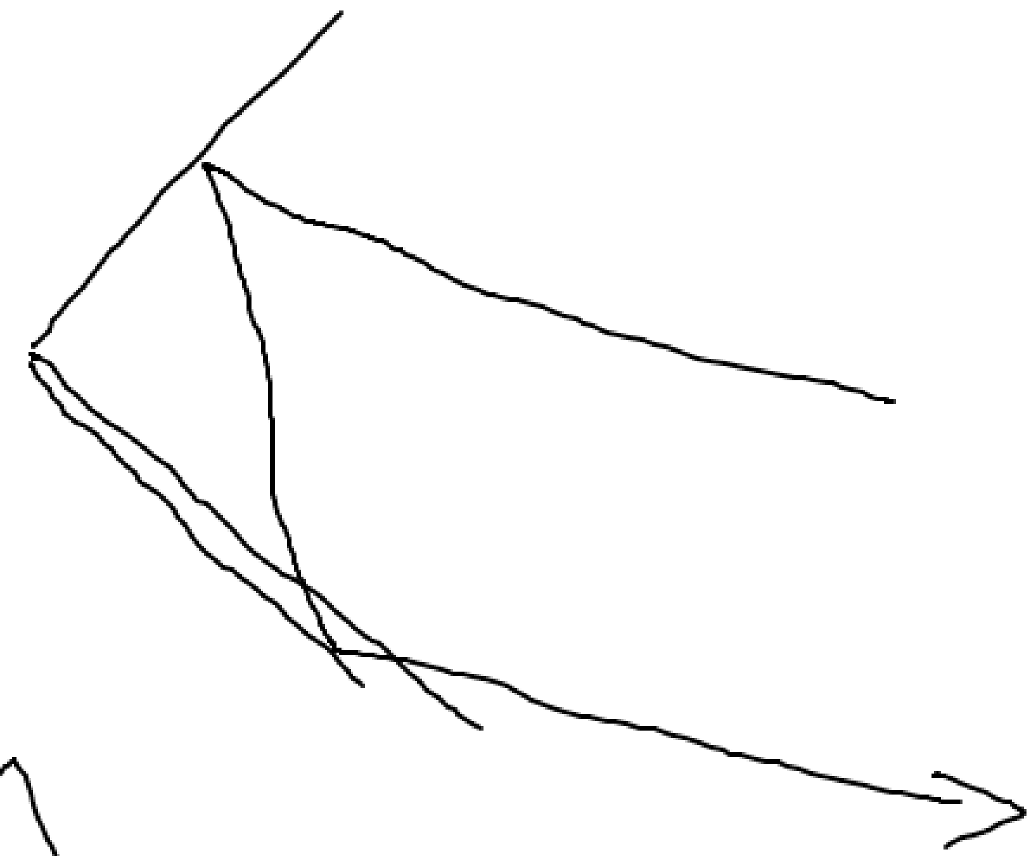
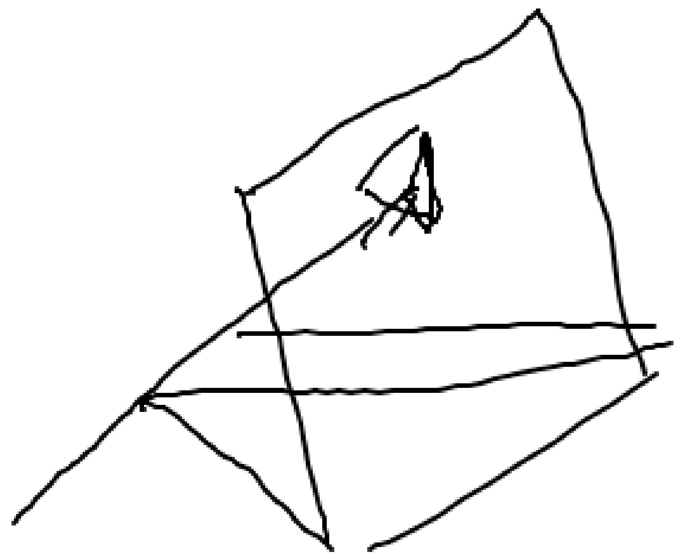
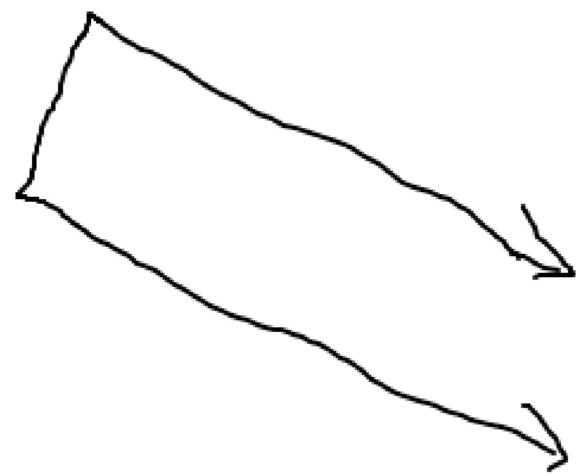
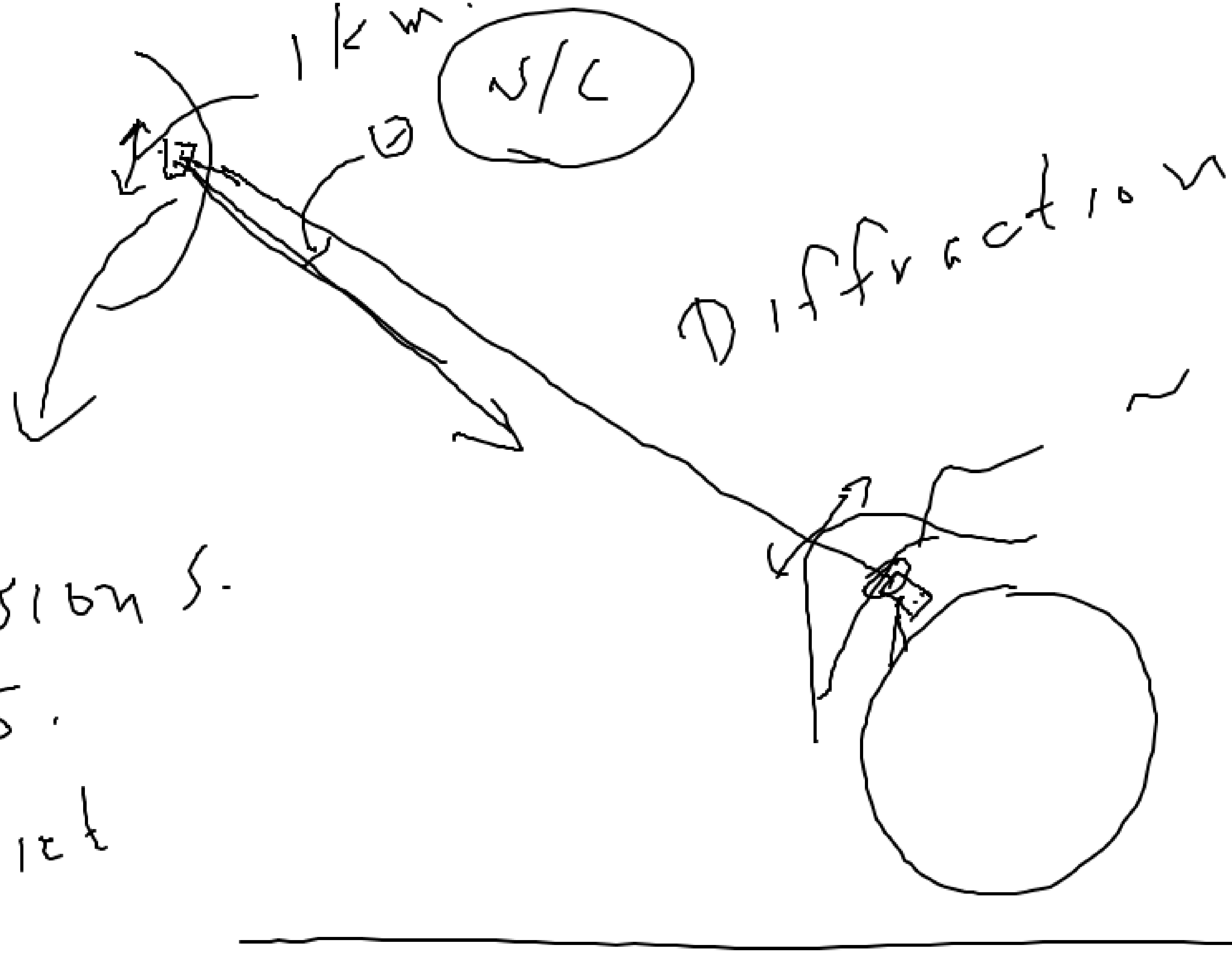


Appolo prog









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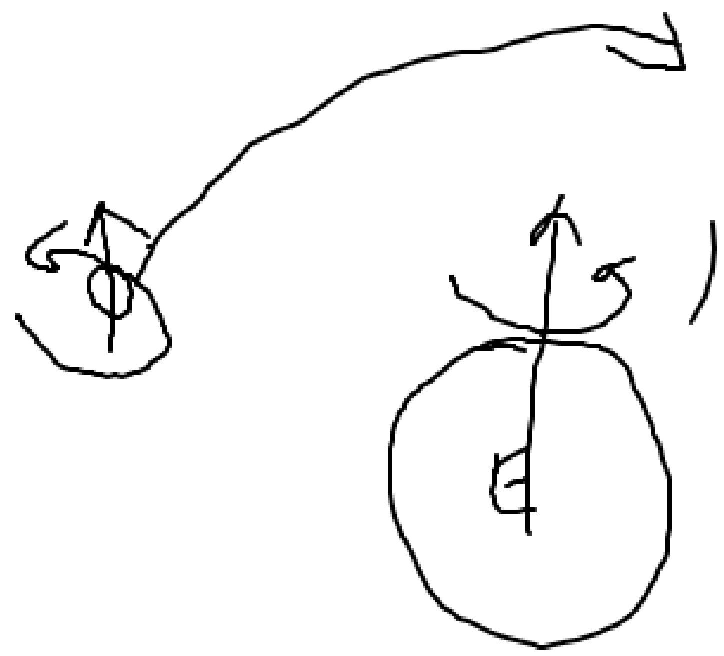

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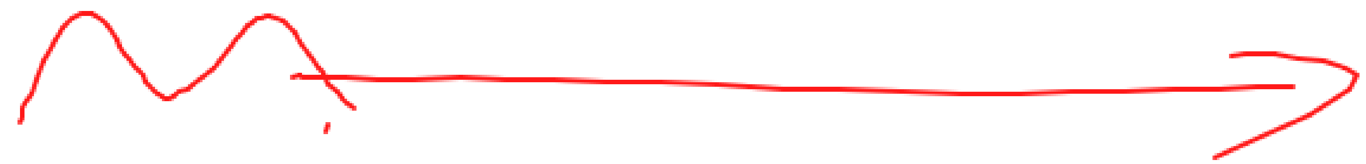

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