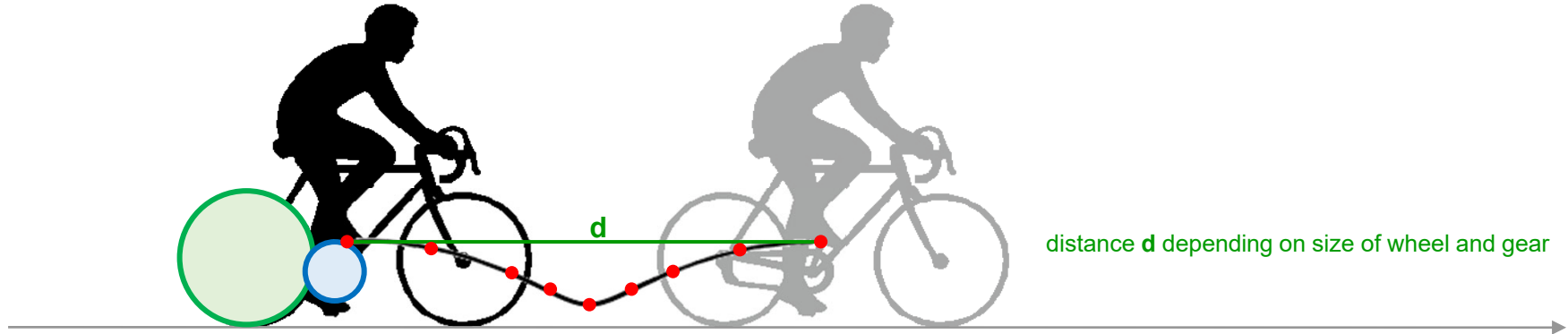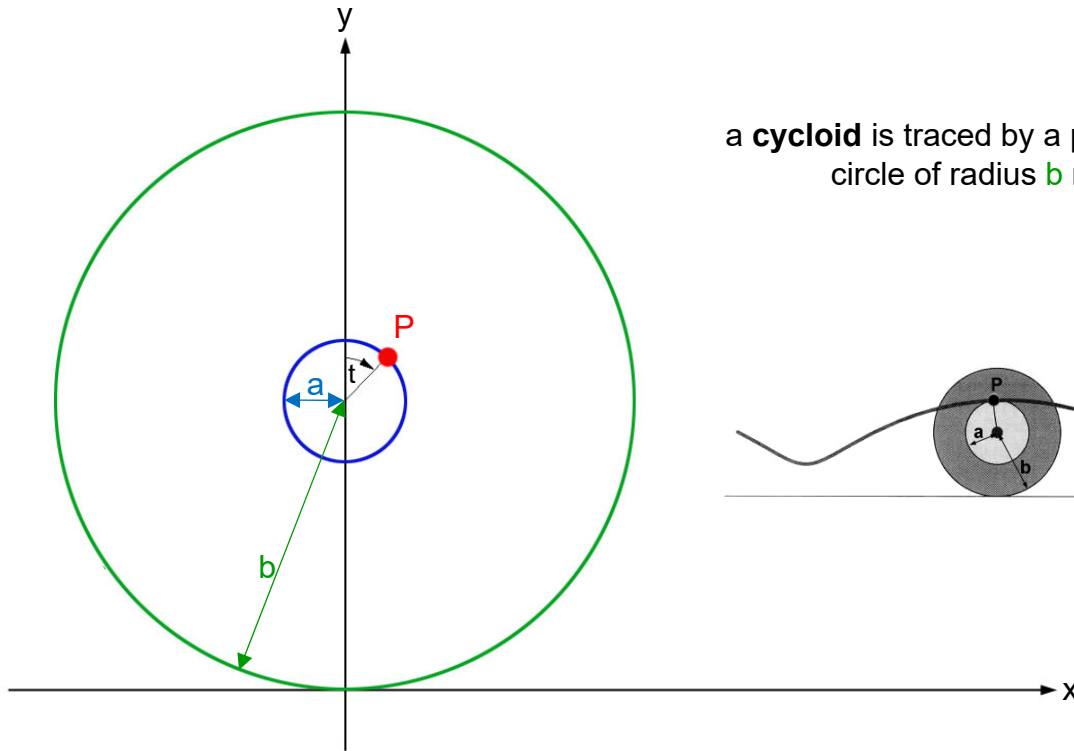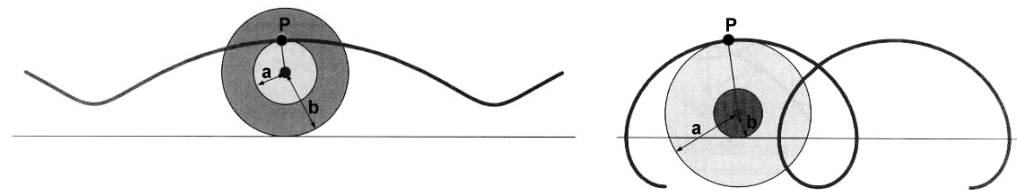# Cycloid
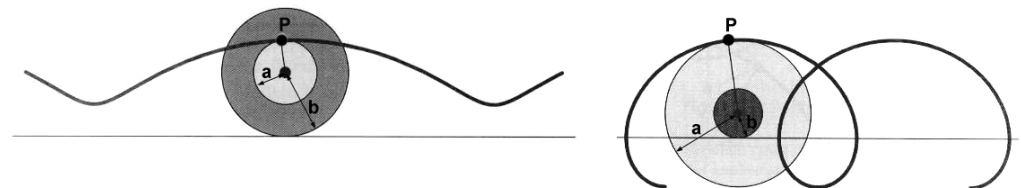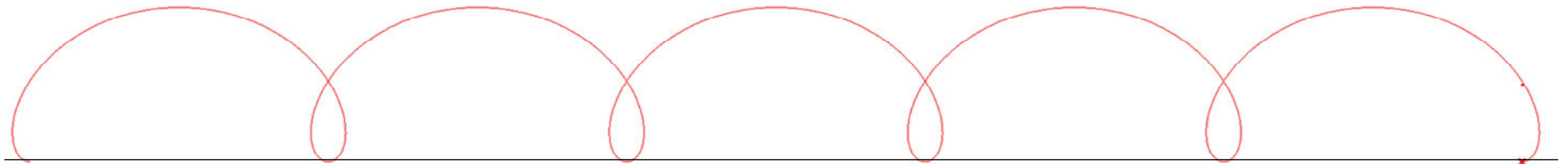

distance **d** depending on size of wheel and gear

a **cycloid** is traced by a point P on a circle of radius a when a concentric circle of radius b rolls without slipping along a straight line

A"DS Aalto University
Design of Structures

Toni Kotnik, Professor of Design of Structures

Parametric Design
Associative Geometry
12.1.2021

Cycloid

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Parametric Design
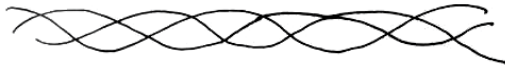Associative Geometry
8.6.2020

I used a solid disc and a dot marked on it. As the disc rotated the dot recorded a series of 'bouncing' arcs.
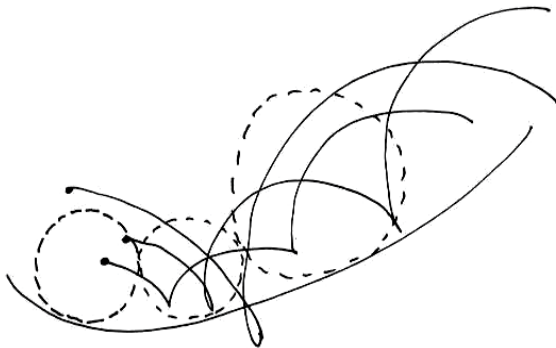
These are called cycloids.

Depending on the location of the holes, different traces occur. Some are symmetrical and regular, others erratic. If the light source is external to the disc but attached to it, then wild possibilities arise.

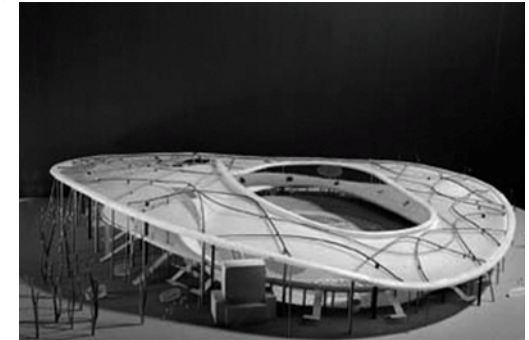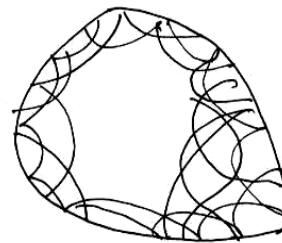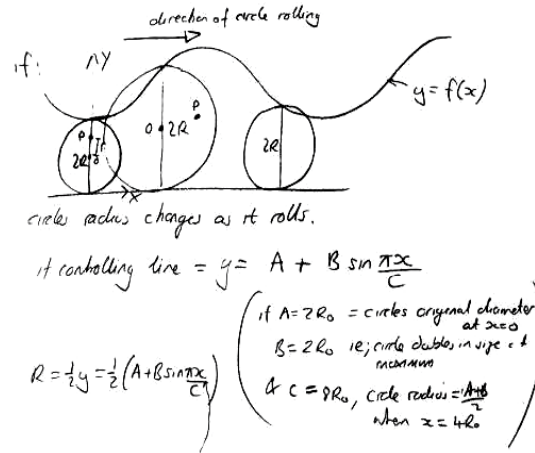The trace becomes highly erratic.

Overlapping arcs of different radii materialise, but the centre aperture does not get defined.

I liked this lack of definition to the inner edge and thought it in keeping with the generality of random energies; the architects thought otherwise, they preferred the inner edge to be defined as an unbroken rim.

That restriction was put in as another boundary condition and this gave impetus to the final strategy.

circle with varying R:

direction of circle rolling

if:

$y = f(x)$

circle radius changes as it rolls.

if controlling line $= y = A + B \sin \frac{\pi x}{C}$

$R = \frac{1}{2}y = \frac{1}{2}\left(A + B\sin\frac{\pi x}{C}\right)$

if $A = 2R_0$ = circles original diameter at $x = 0$

$B = 2R_0$ ie; circle doubles in size at maximum

& $C = 8R_0$, circle radius $= \frac{A+B}{2}$ when $x = 4R_0$

Königs Architekten / Peter Kulka / Cecil Balmond: Stadium, Chemnitz, Germany, 2002

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