NanoCrafters

BITS Pilani, India

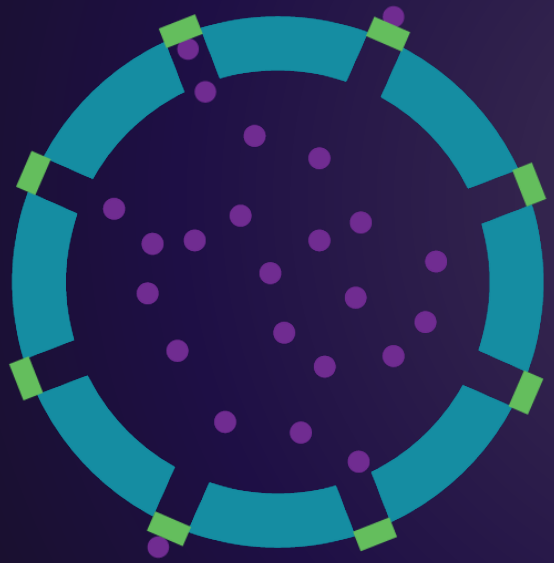
Applicable everywhere

Universal Biosensor Design

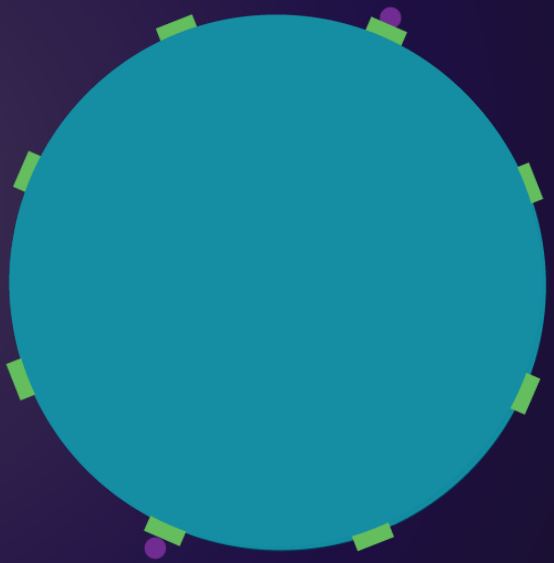
Use biological elements for sensing

BASIC DESIGN

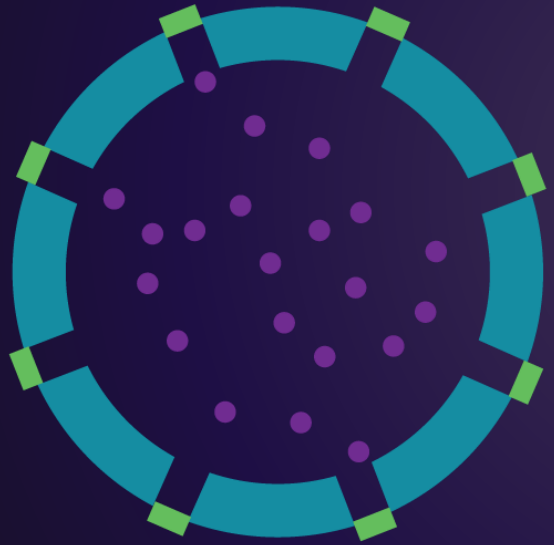
Cross section



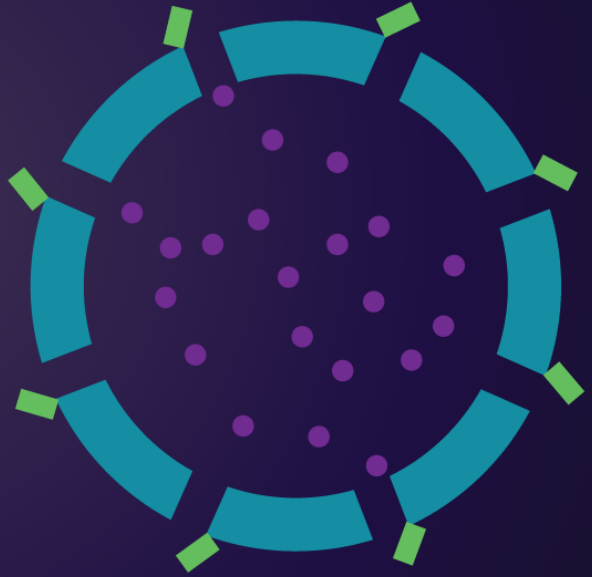
Outer Surface

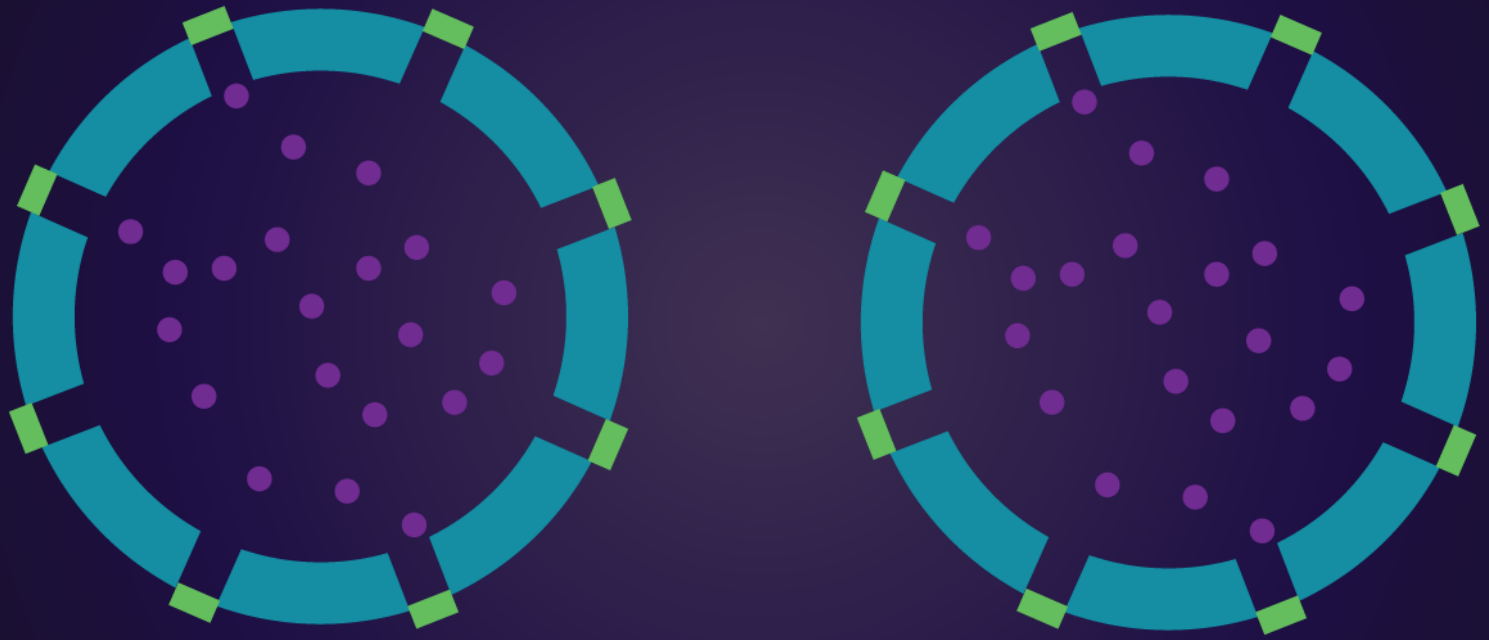


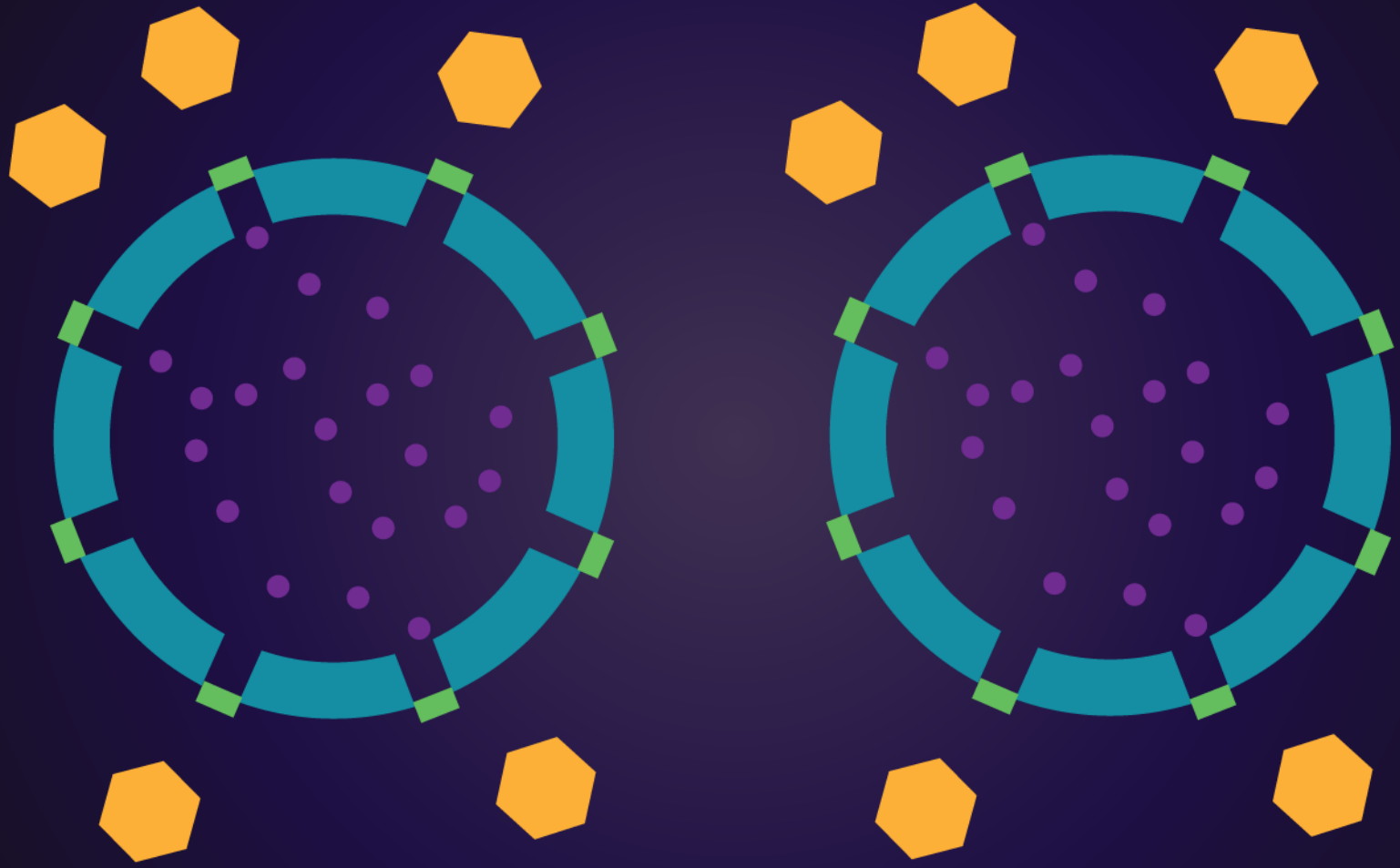
Target absent

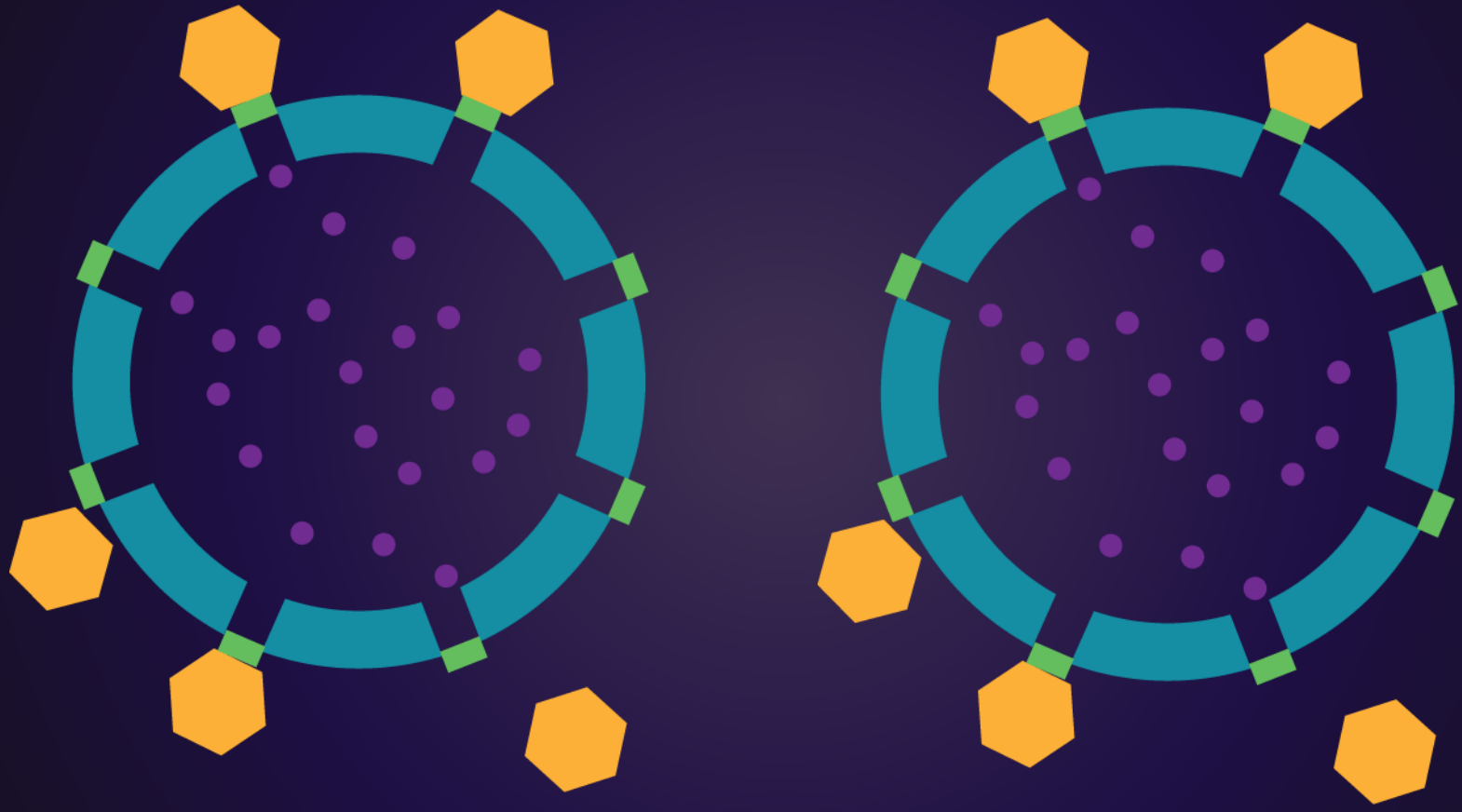


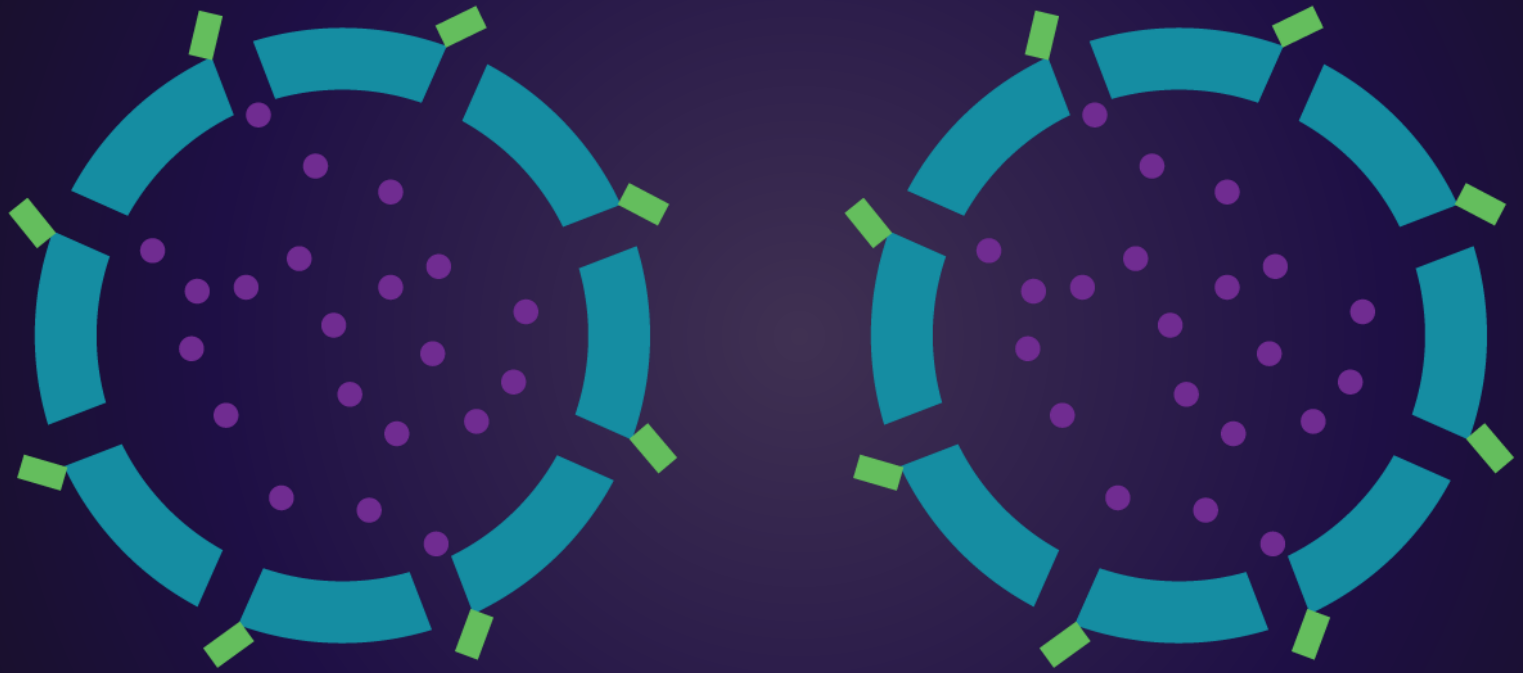
Target present

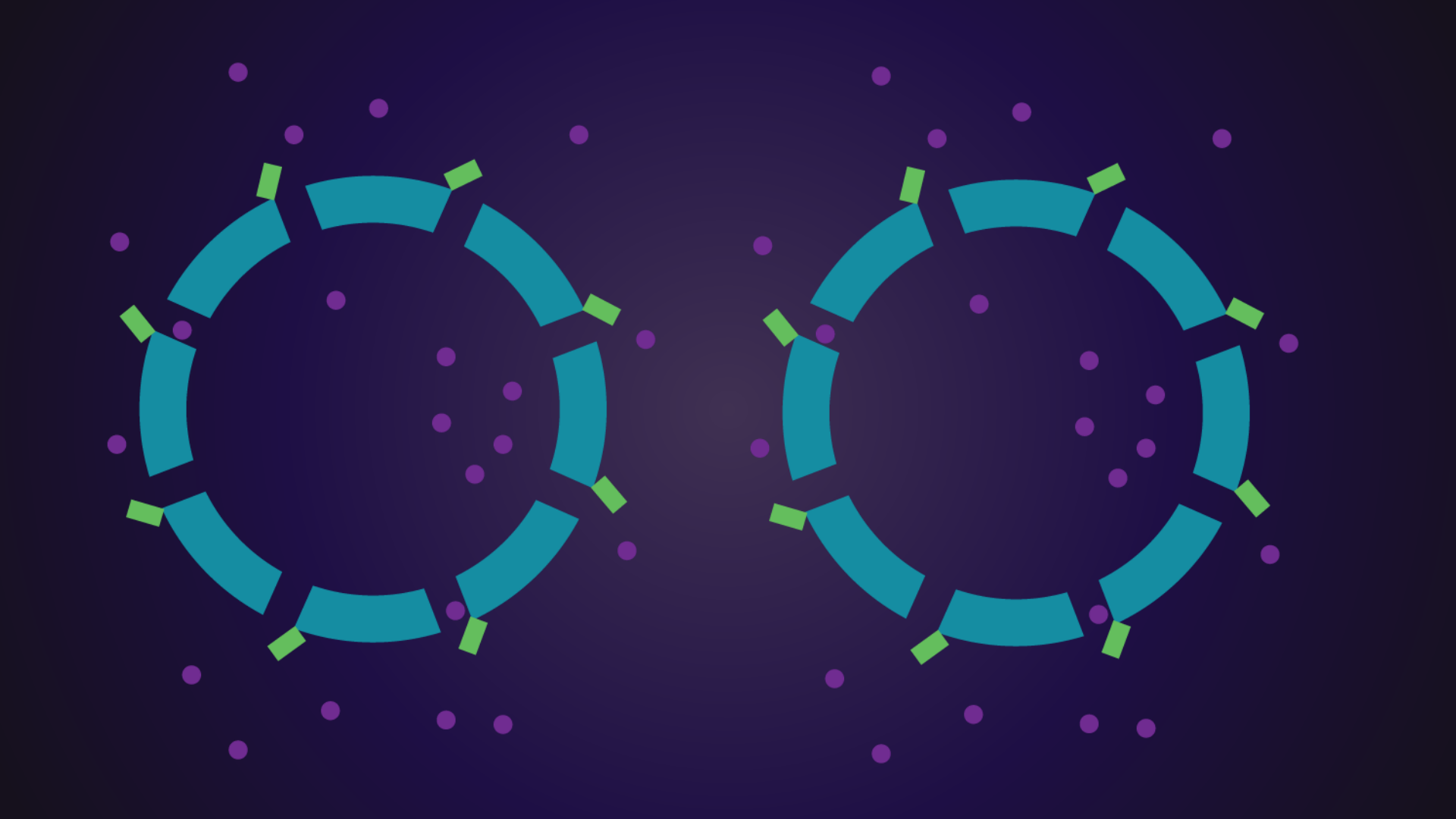






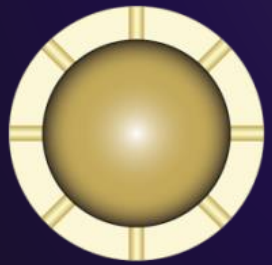






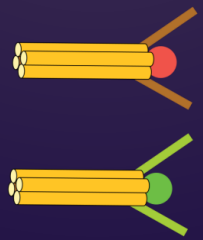
Stable

Mesoporous Silica Nanoparticle



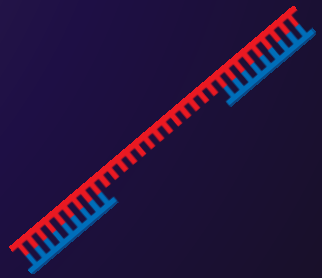
Reliable & Easy

Signalling Moleules



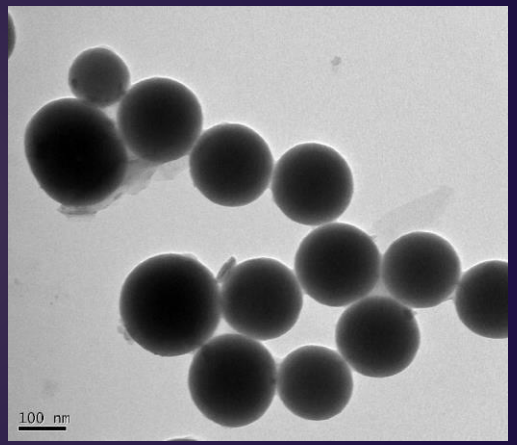
Robust & Programmable

Gating Modules



NANOPARTICLE CORE SiO_2

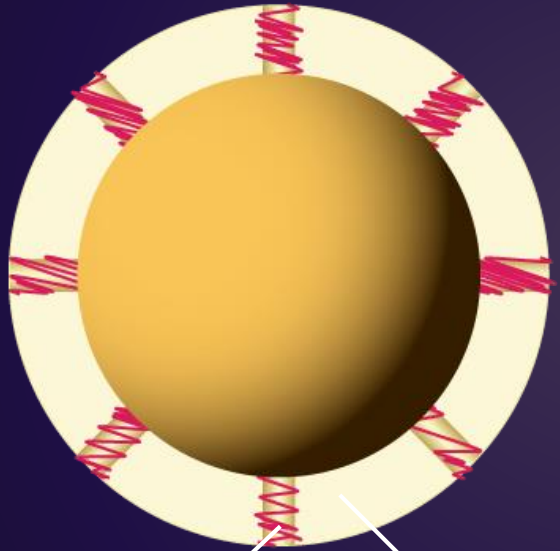
TEM



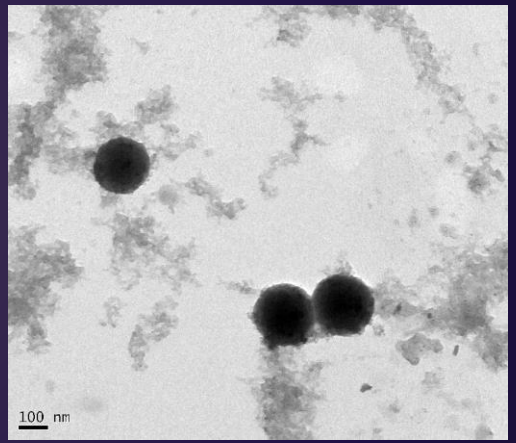
Stober's Process

220nm particles synthesized

MESOPOROUS LAYER FORMATION

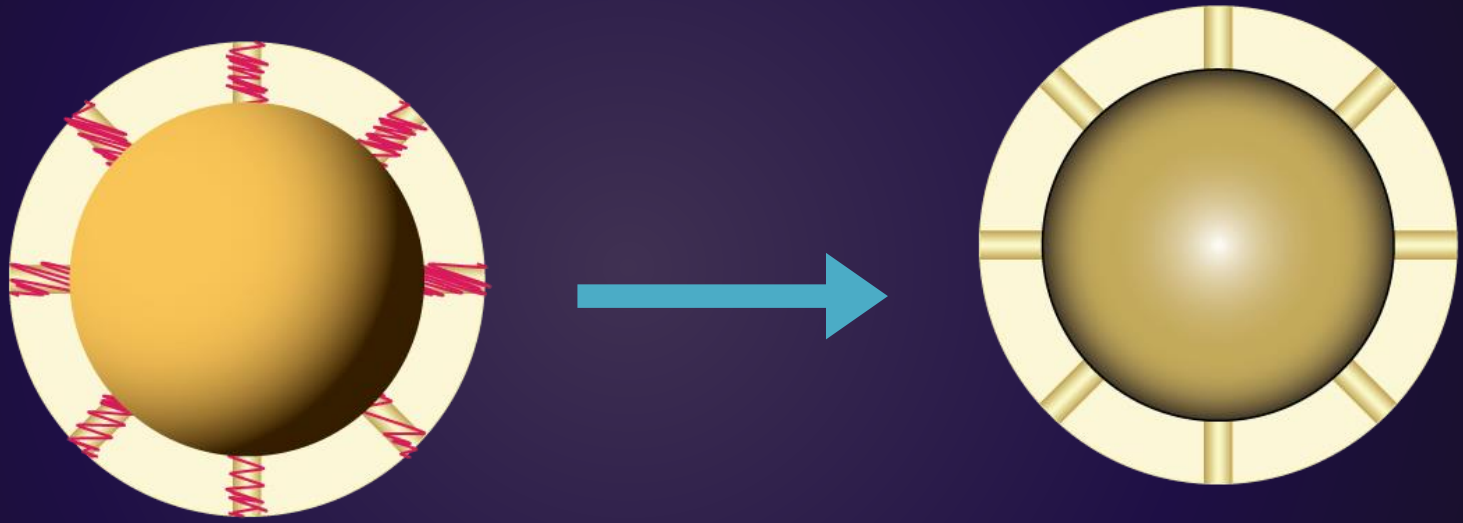


TEM

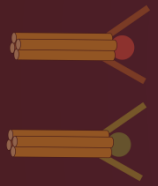


200nm particles synthesized

ETCHING



HMSN FORMATION: STAGES

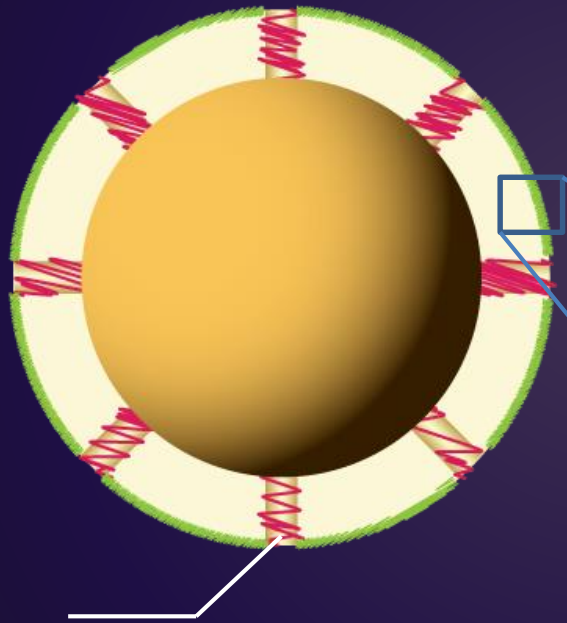


Solid silica nanoparticle ✓

Mesoporous Layer Formation (MSN) ✓

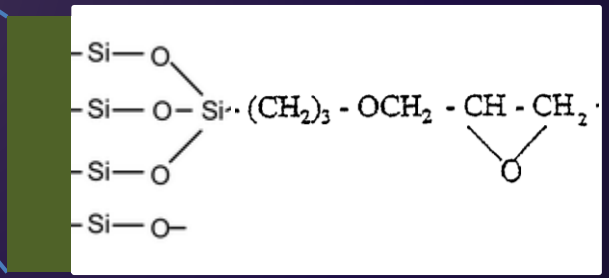
Etching process ✗

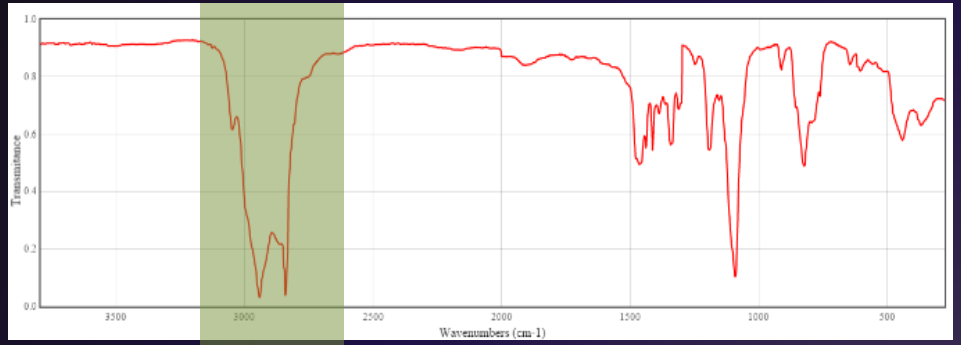
SURFACE BLOCKING



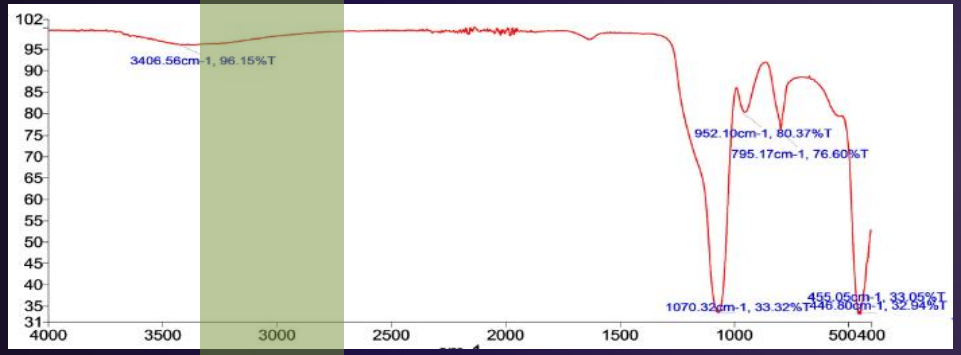
CTAB

GOPS = 3-Glycidyloxypropyltrimethoxysilane

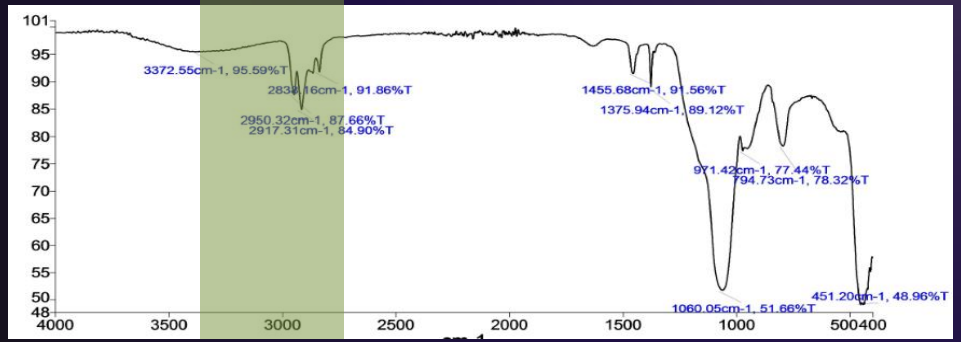




GOPS - characteristic IR Fingerprint (Positive Control)

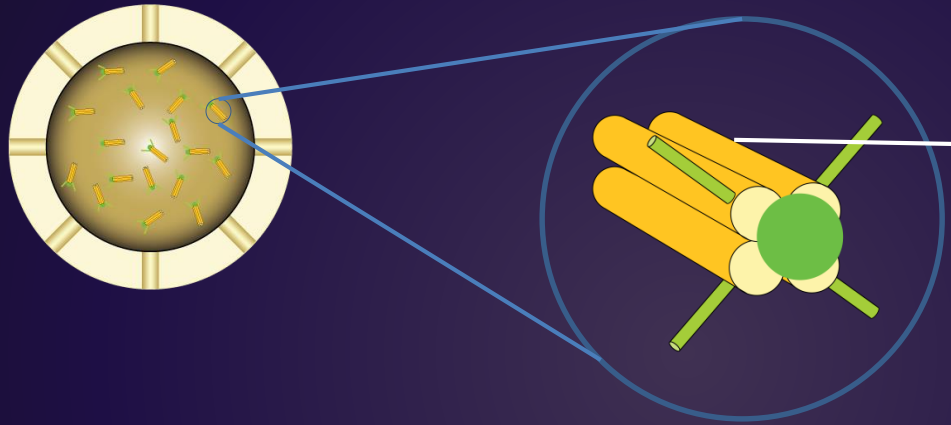


FTIR of Unblocked



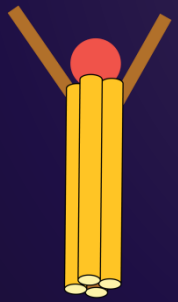
FTIR of GOPS blocked Sample (Test)

SIGNALING MOLECULES

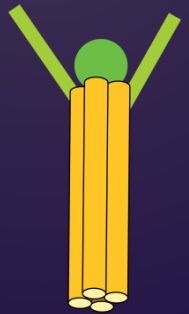


DNA Origami

4 DNA Helices
&
a fluorophore

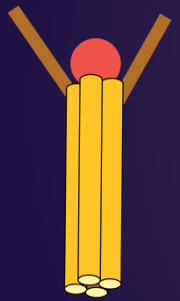


Rhodamine

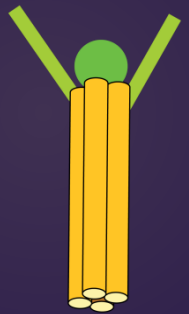


Fluorescein

SIGNALING MOLECULES



Rhodamine

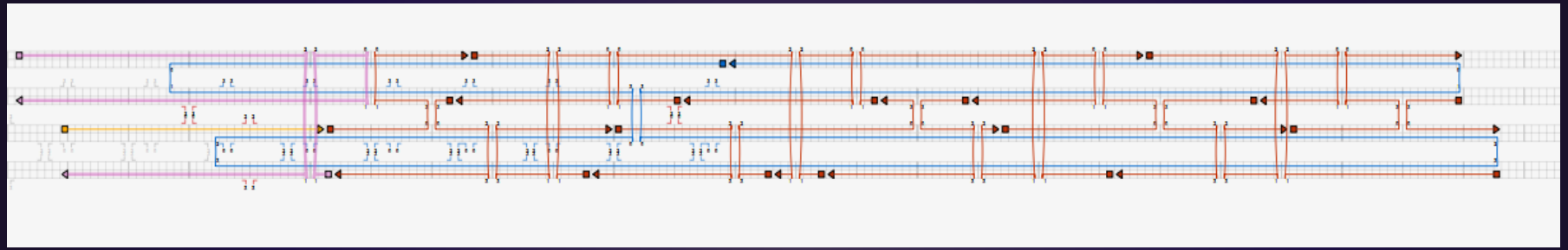


Fluorescein

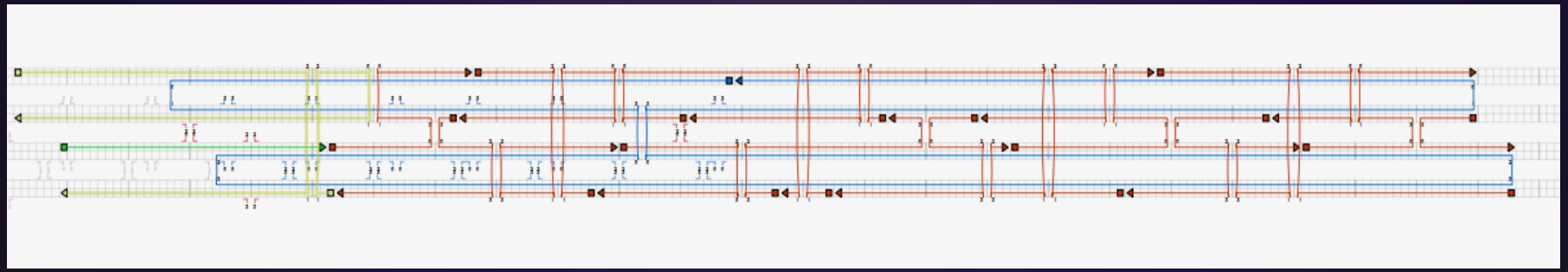
Flourescent
Resonant
Energy
Transfer

CADNANO DESIGNS

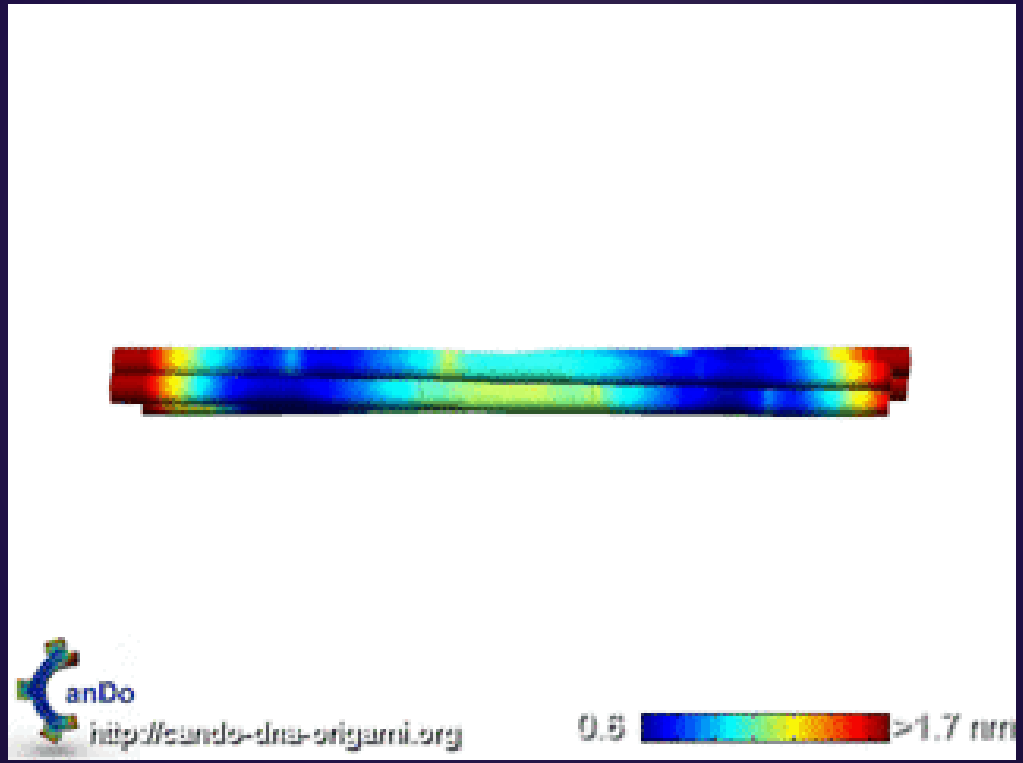
Rhodamine tagged Origami



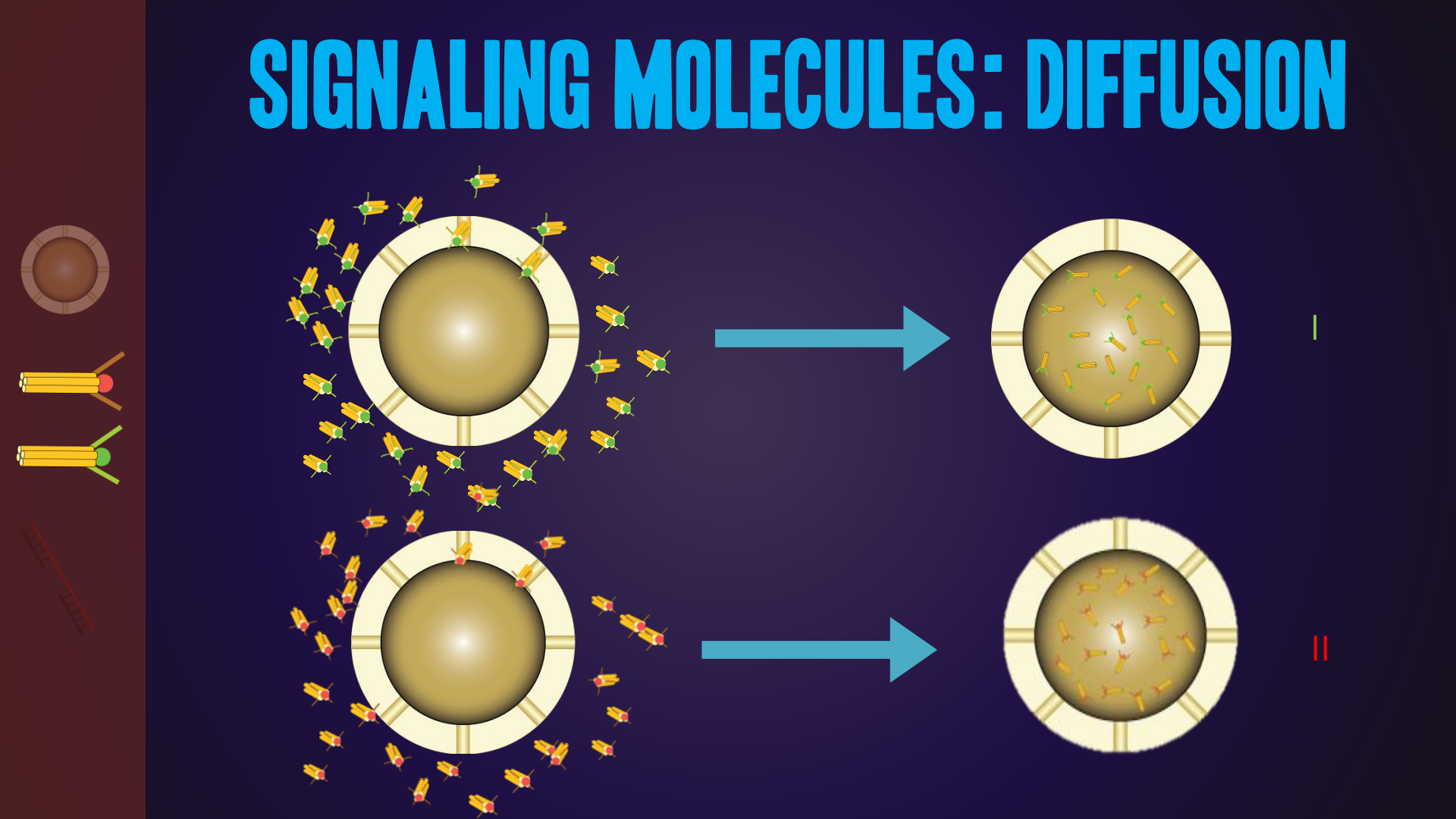
Fluorescein tagged origami



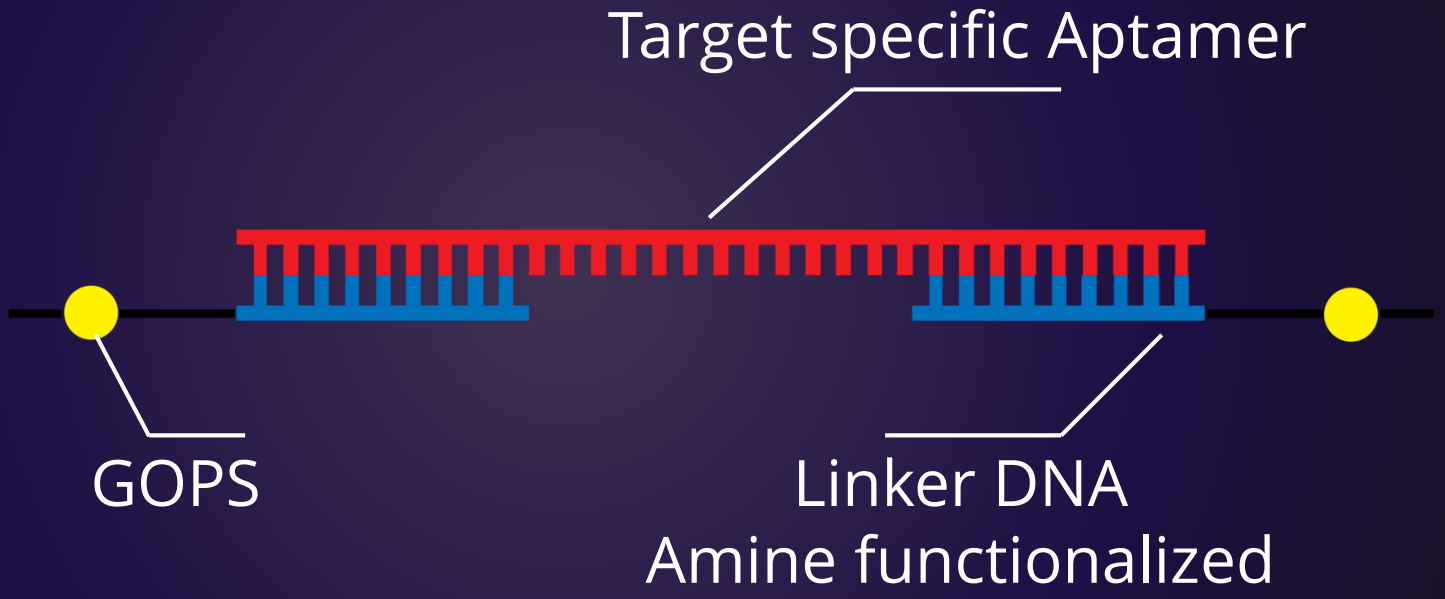
CANDO SIMULATION



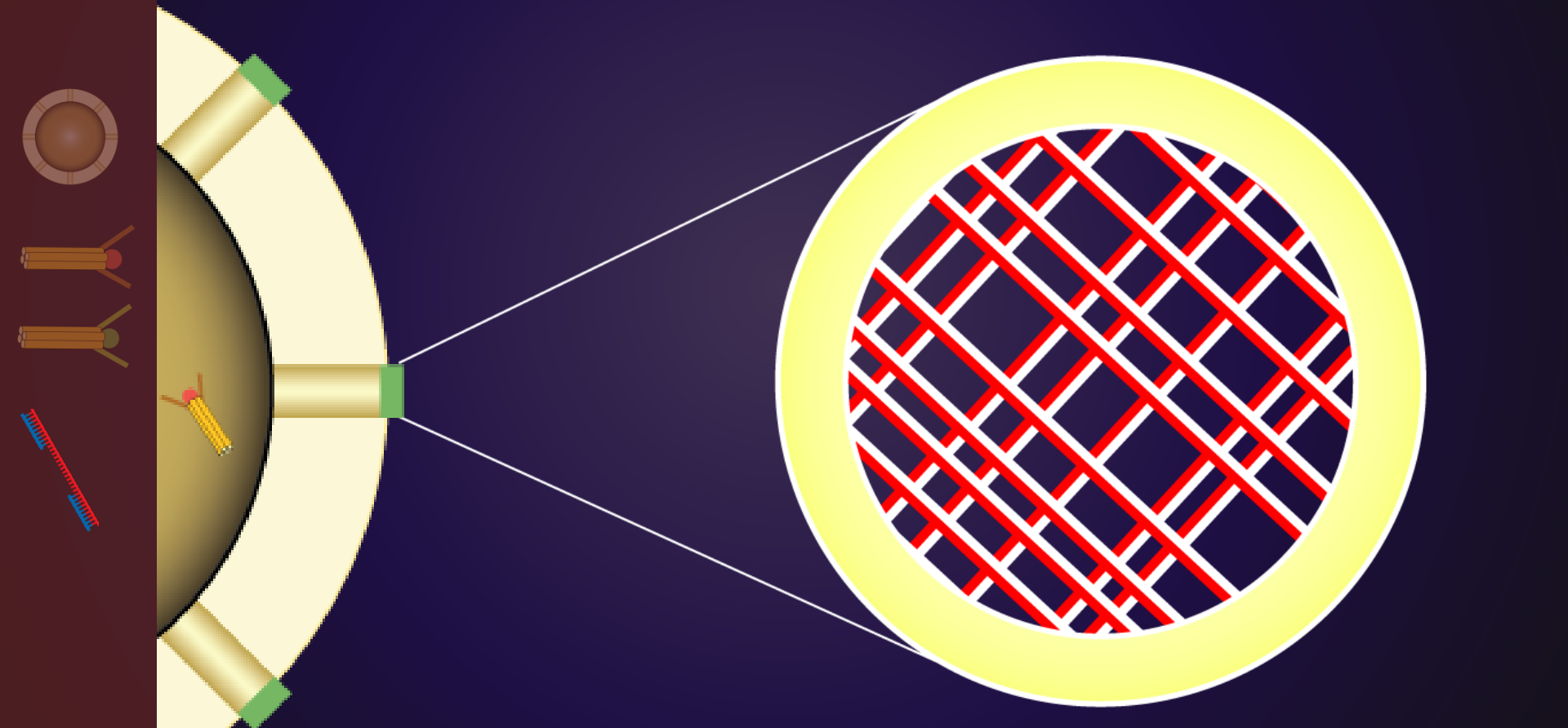
SIGNALING MOLECULES: DIFFUSION



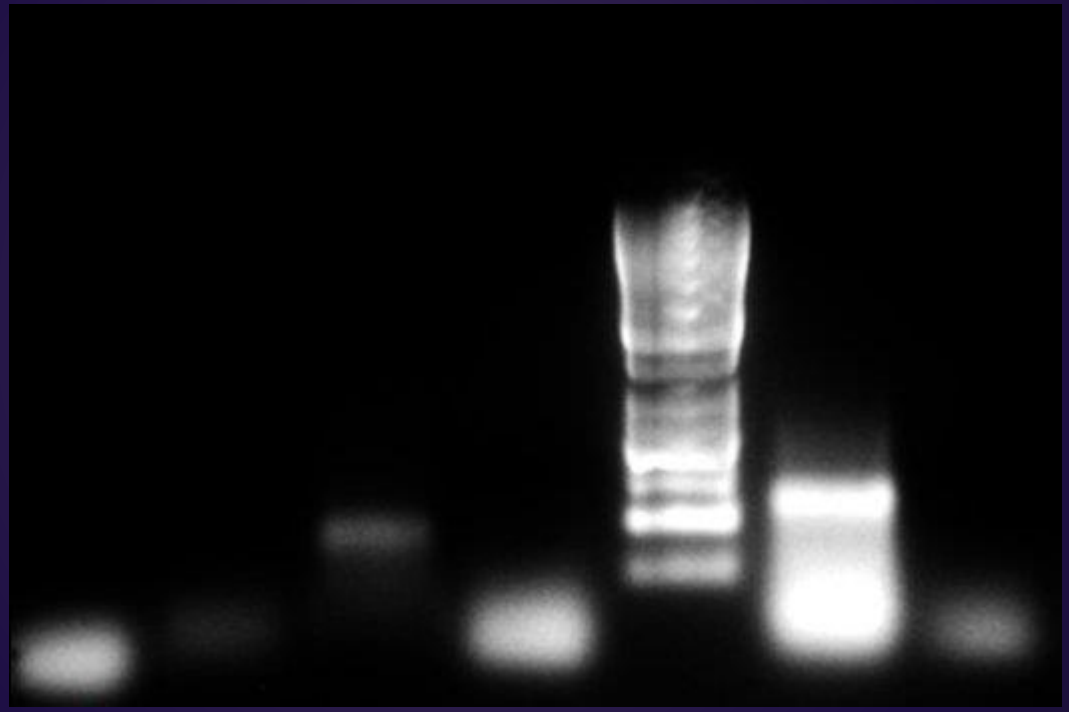
GATING MODULE



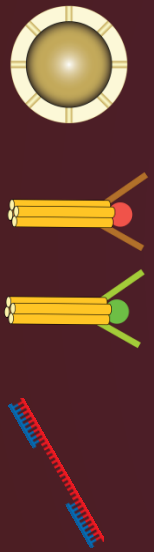
GATING MODULE: ATTACHMENT

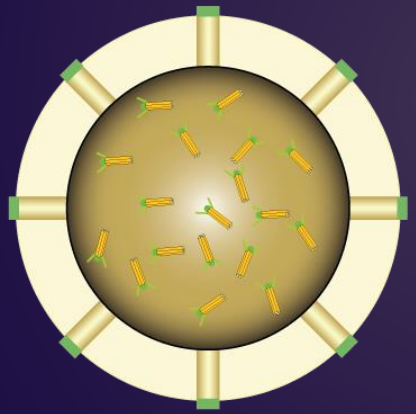


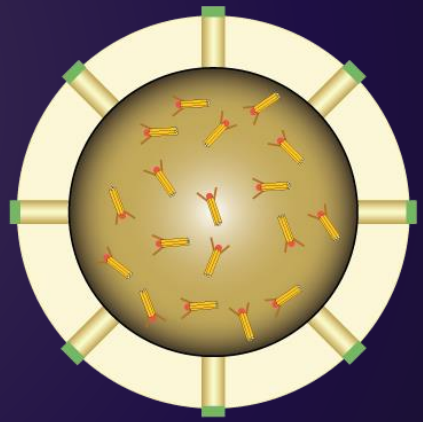
FUNCTIONING OF GATING MODULE



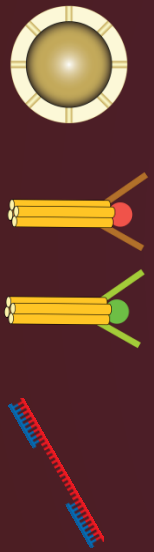
SENSORS IN SAMPLE SOLUTION

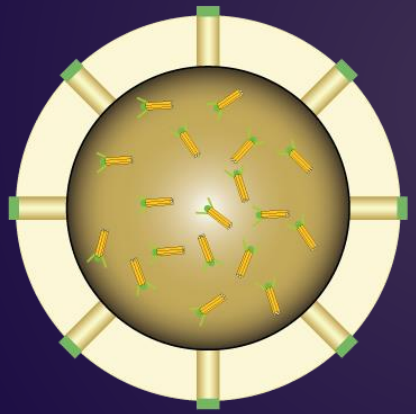


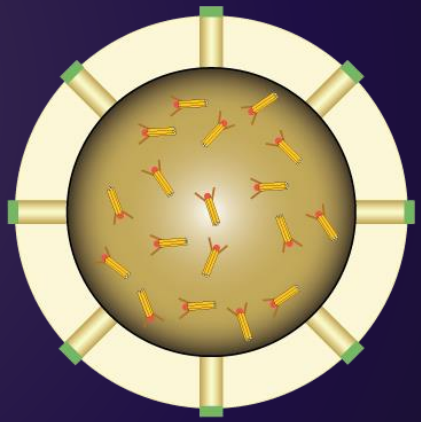




TARGET ABSENT

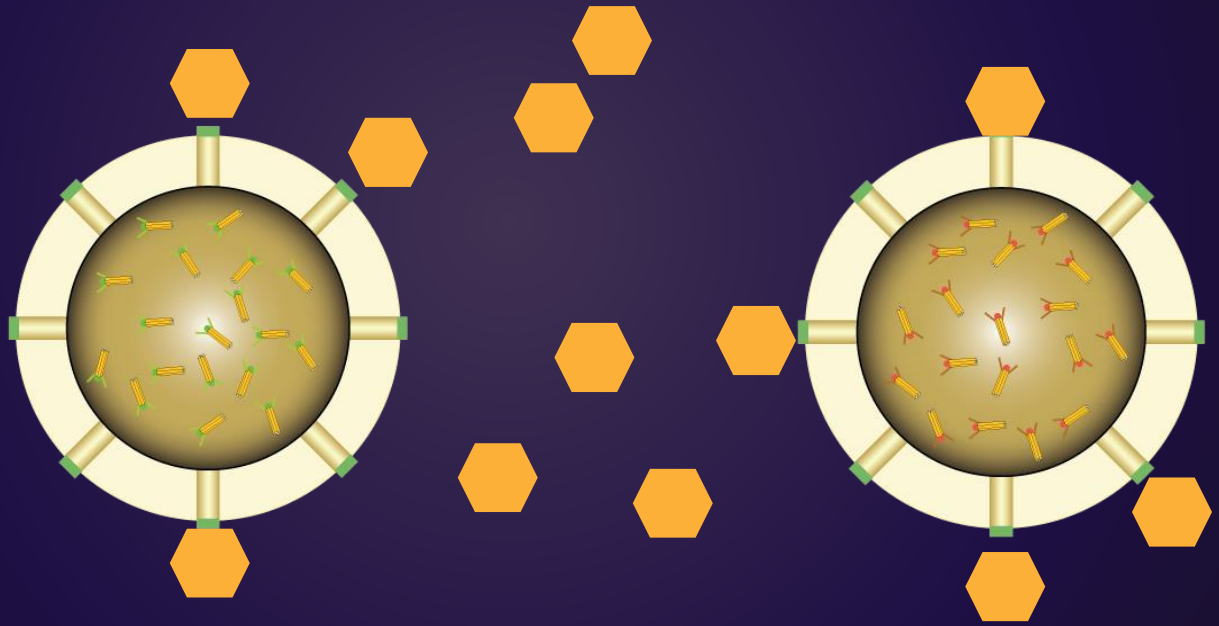




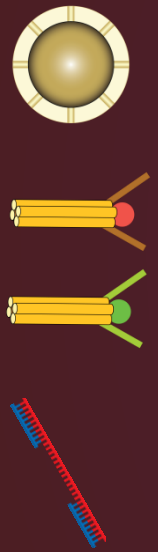


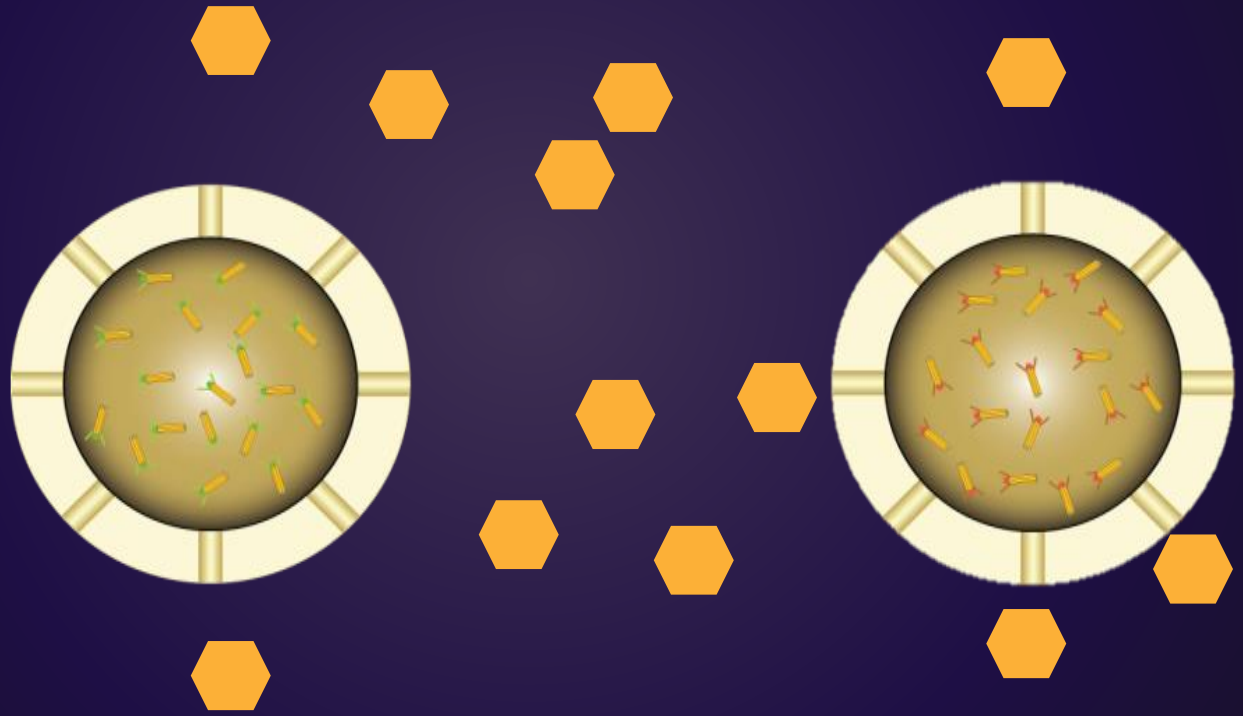
We detect emission in both Cy3 and Cy5 channels

TARGET PRESENT

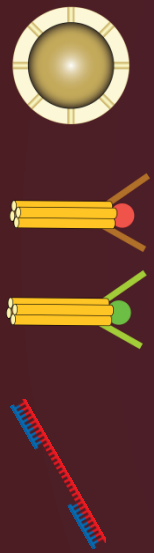


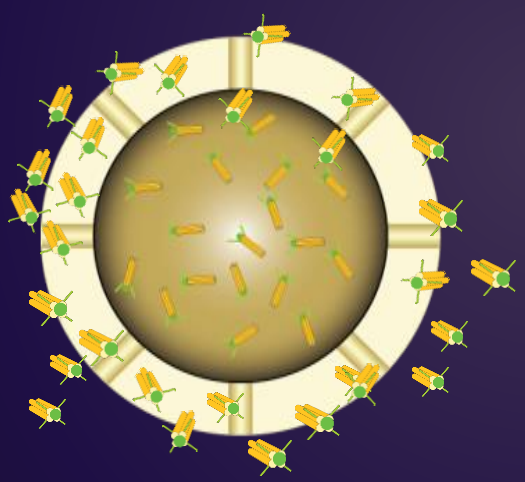
GATES OPENED BY TARGET

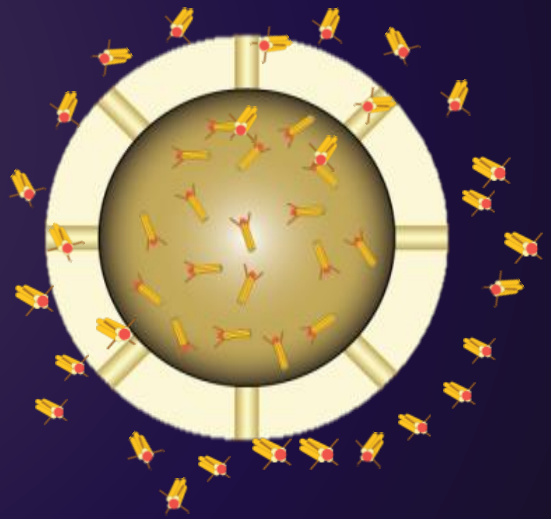




SIGNALLING MOLECULES DIFFUSE OUT

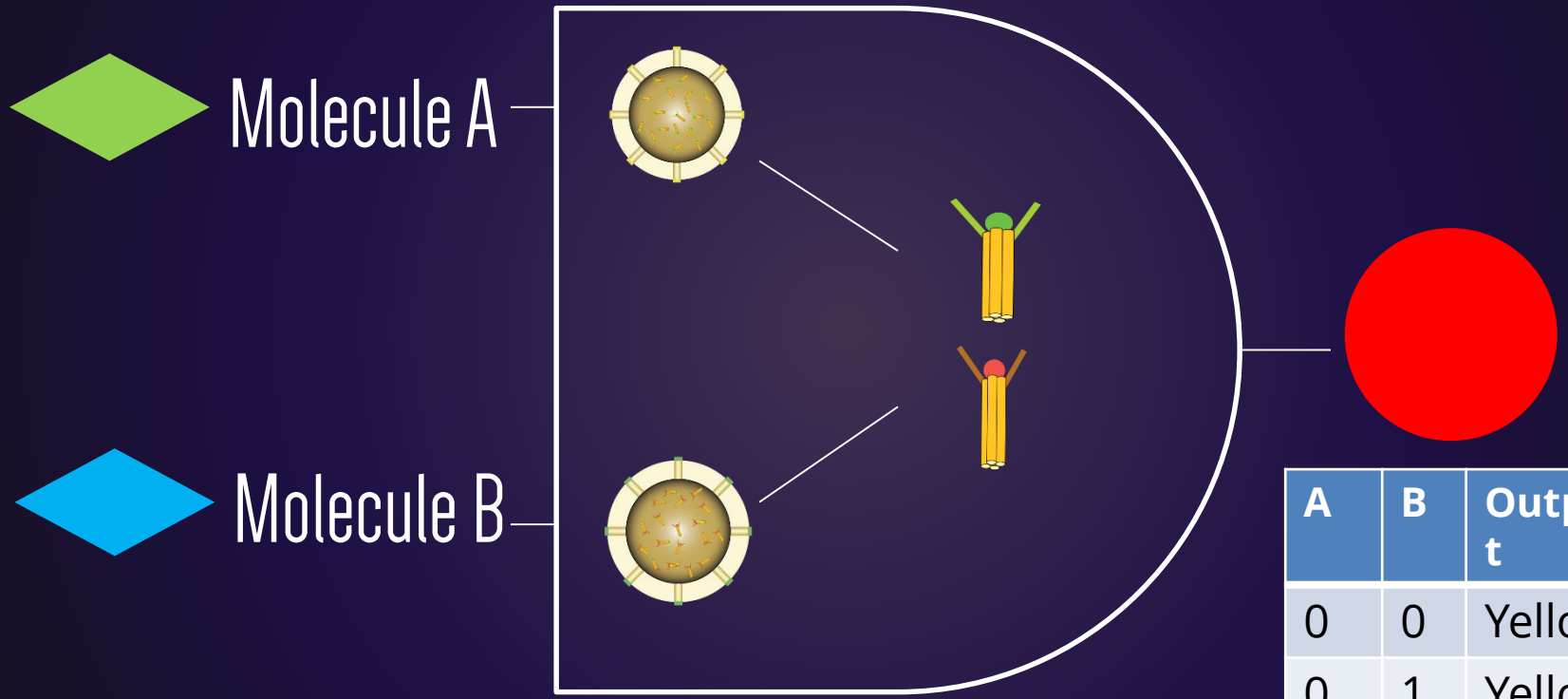






We detect emission only
In Cy5 channel

PROGRAMMABLE BIOSENSORS

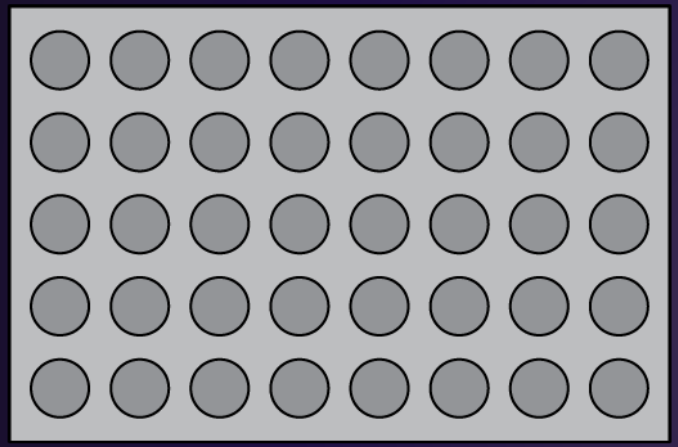


AND based Biosensor

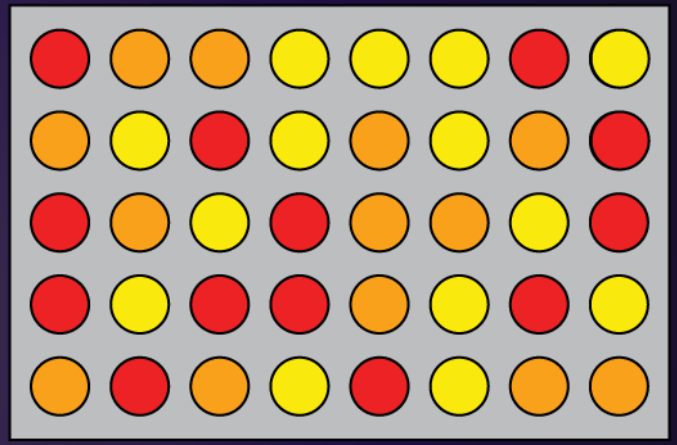
A	B	Output
0	0	Yellow
0	1	Yellow
1	0	Yellow
1	1	Red


HIGH THROUGHPUT BIOSENSING

HIGH THROUGHPUT SENSING



Arrayed biosensors.
Each cluster has a number of particles sensing for a given target



Post – FRET analysis

HIGH THROUGHPUT SENSING APPLICATION

Therapeutic Target Testing

Water Sample Screening

SPONSOR

METAHELIX

Germinating Hope

Metahelix Life Sciences Limited

A TATA Enterprise

BITS Pilani

Pilani Campus

Department of Biological Sciences


THANK
YOU
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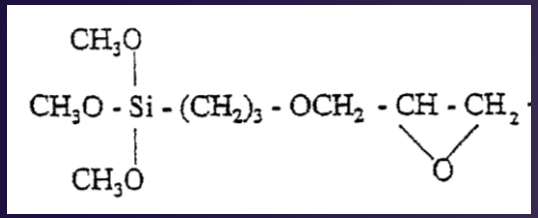
BIYAN
SHUKRIA
TINGKI
YAQHANYELAY
TASHAKKUR ATU
SUKSAMA
EKHMET
MEHRBANI
GRAZIE
MAAKE
KOMAPSUMNIDA
PALDIES
BOLZIN
MERCI
GOZAIMASHITA
EFCHARISTO
JUSPAXAR
SPASSIBO
SNACHALHUYA

Gating Module



+ NH_2-Oligonucleotide