iGEM 2010

iGEM 2010 Workshops

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igem.org

Saturday

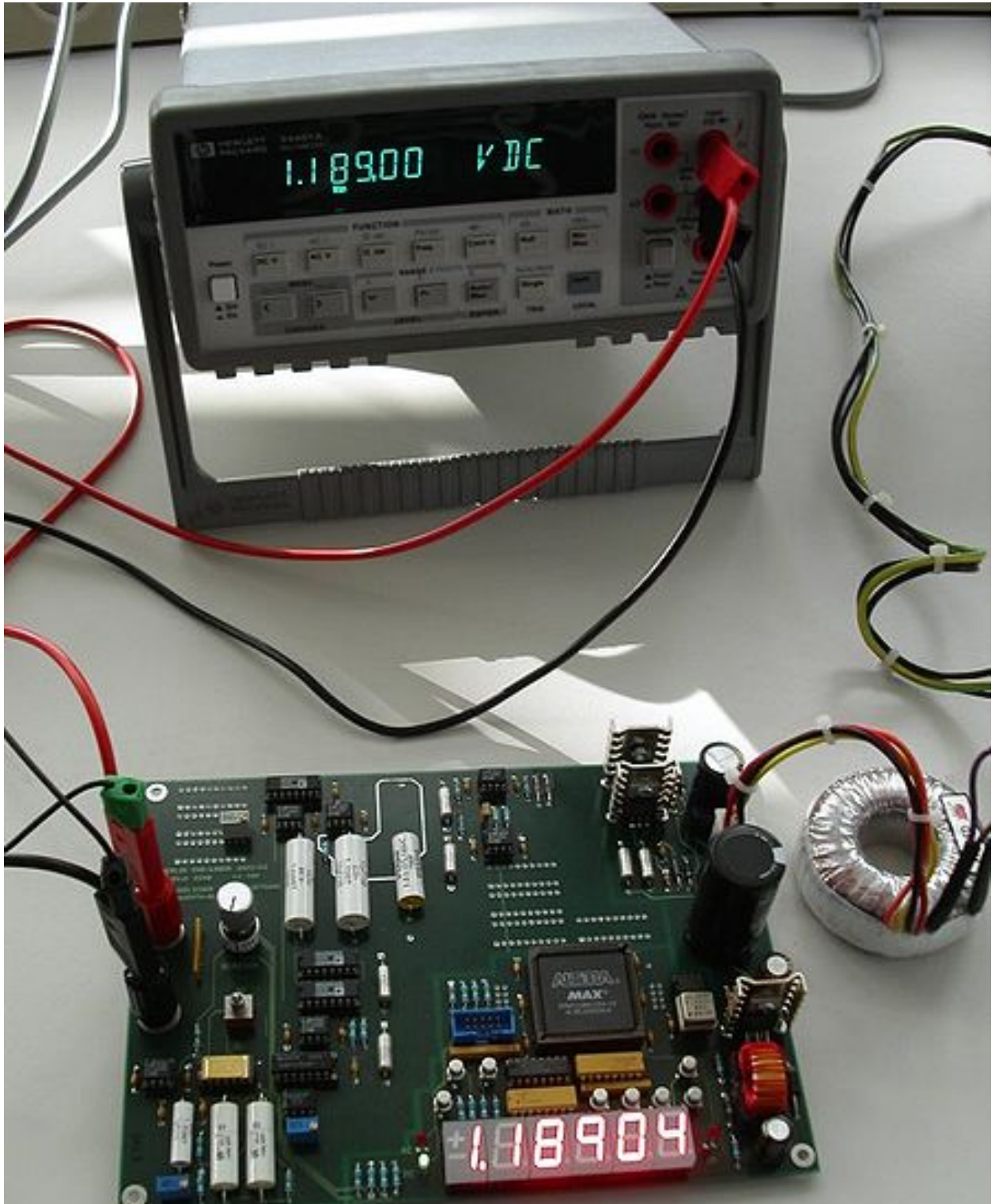
Duration	Event
0:45	**Breakfast / registration**
0:30	**Welcome**
0:45	**Synthetic Biology based on parts**
1:30	**Team introductions**
1:00	**Lunch**
	iGEM in a day (or two):
	Coming up w a project
0:30	ideas, navigating literature
	Navigating registry
0:20	search tool
0:45	catalog/curation/categories/tables
0:10	registry stars
0:30	**Break**
	Finding parts
0:20	dna distribution
0:20	browse / search / QC information / availability
	Making parts
0:20	adding basic parts
0:20	adding composite parts

Sunday

Time	Duration	Event
9:00 AM	0:30	**Breakfa**
		iGEM in a day (or two) continue
		Assembling of par
9:30 AM	0:20	standard asser
9:50 AM	0:20	plasmids
10:10 AM	0:20	proteins, linearized b
10:30 AM	0:30	**Devices / categori**
11:00 AM	0:20	**Measuring parts**
		Sending parts & a
11:20 AM	0:10	review adding a
11:30 AM	0:10	favorites
11:40 AM	0:10	shipping parts to R
11:50 AM	0:10	sequencing / pub
12:00 PM	1:00	**Lunch**
		iGEM 2010:
1:00 PM	0:30	software too
1:30 PM	0:30	requirements / safety
2:00 PM	1:00	iGEM 2011 and f
3:00 PM		**End**

- 2010 130 Teams, Jamboree at MIT November 6-8
- 2011 180 (?) Teams,
  - Regional Jamborees in October
  - World Championship at MIT (Nov. 5-7)
  - Regional iGEM Headquarters

- iGEM Labs and Courses
  - Sign up at ung.igem.org
- iGEM Society, Institution, Foundation
- iGEM Alumni Association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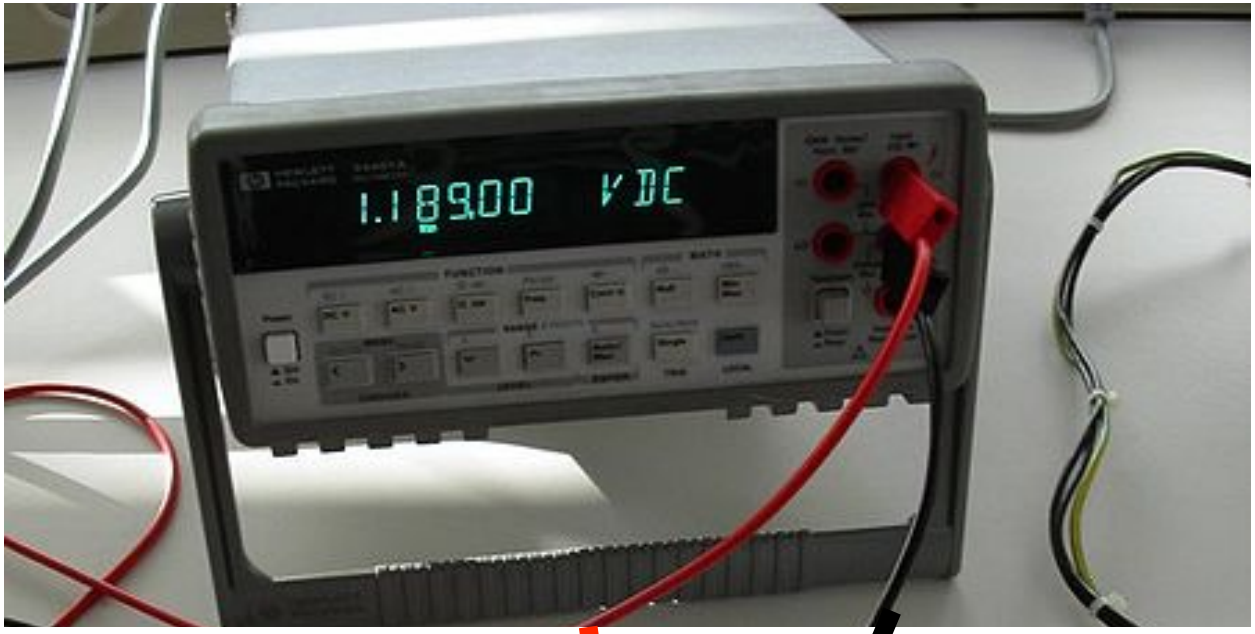
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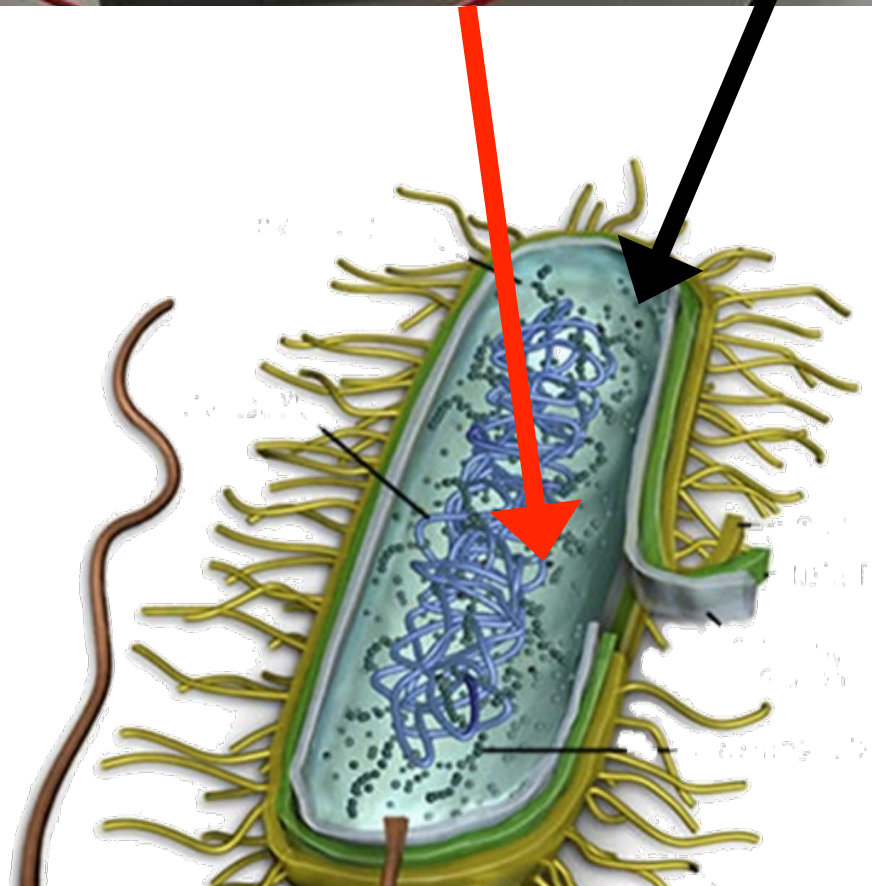
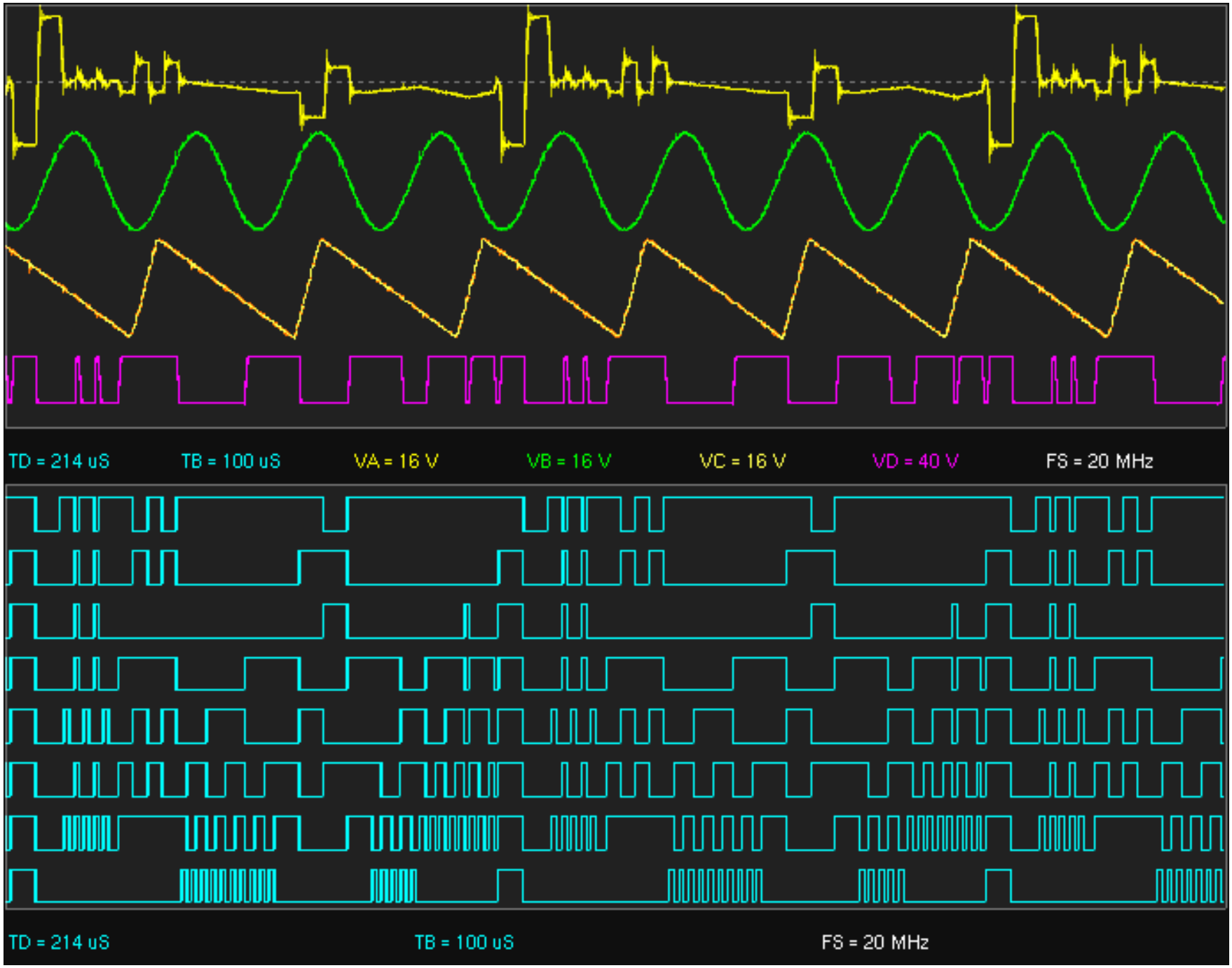
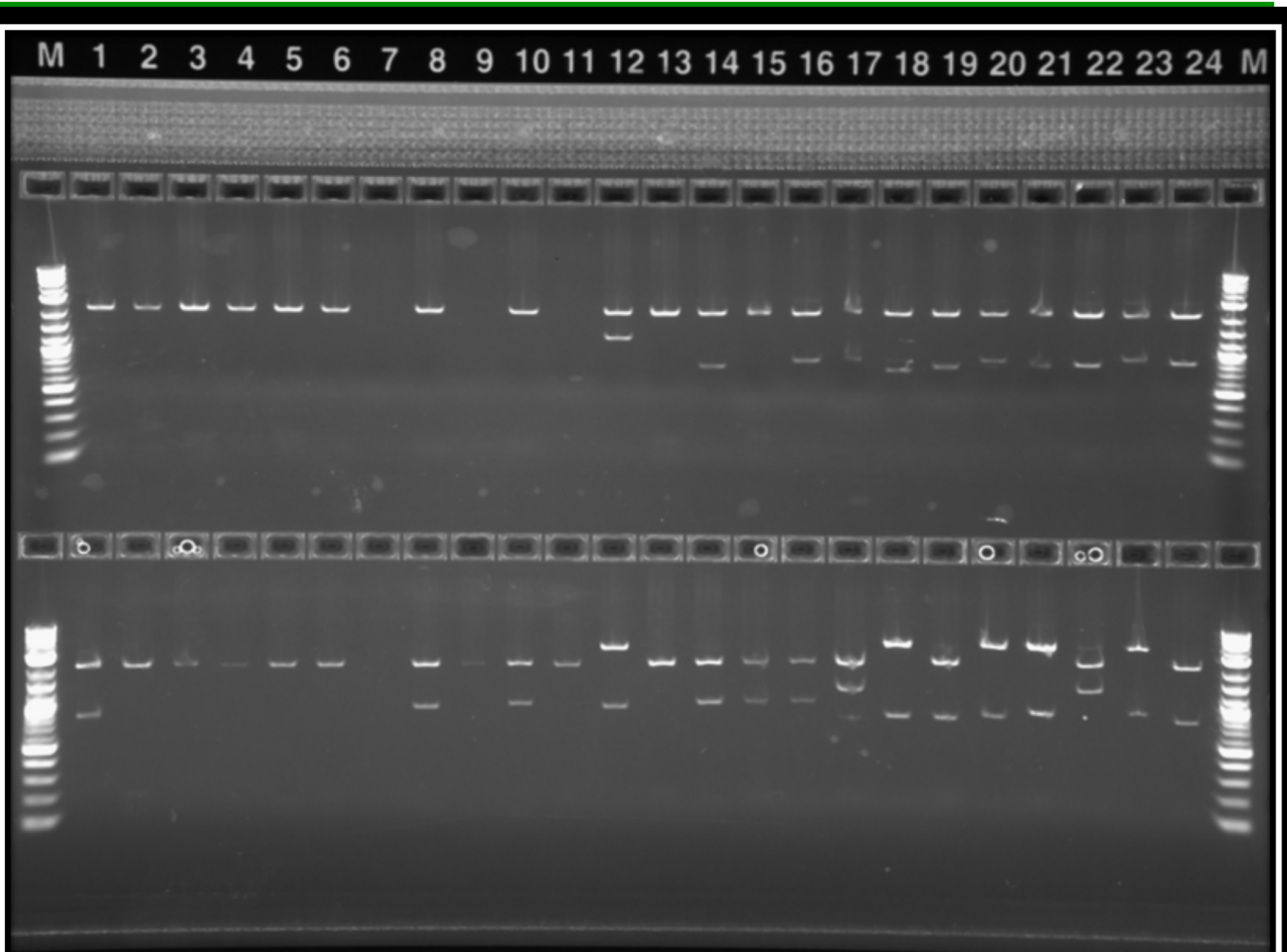
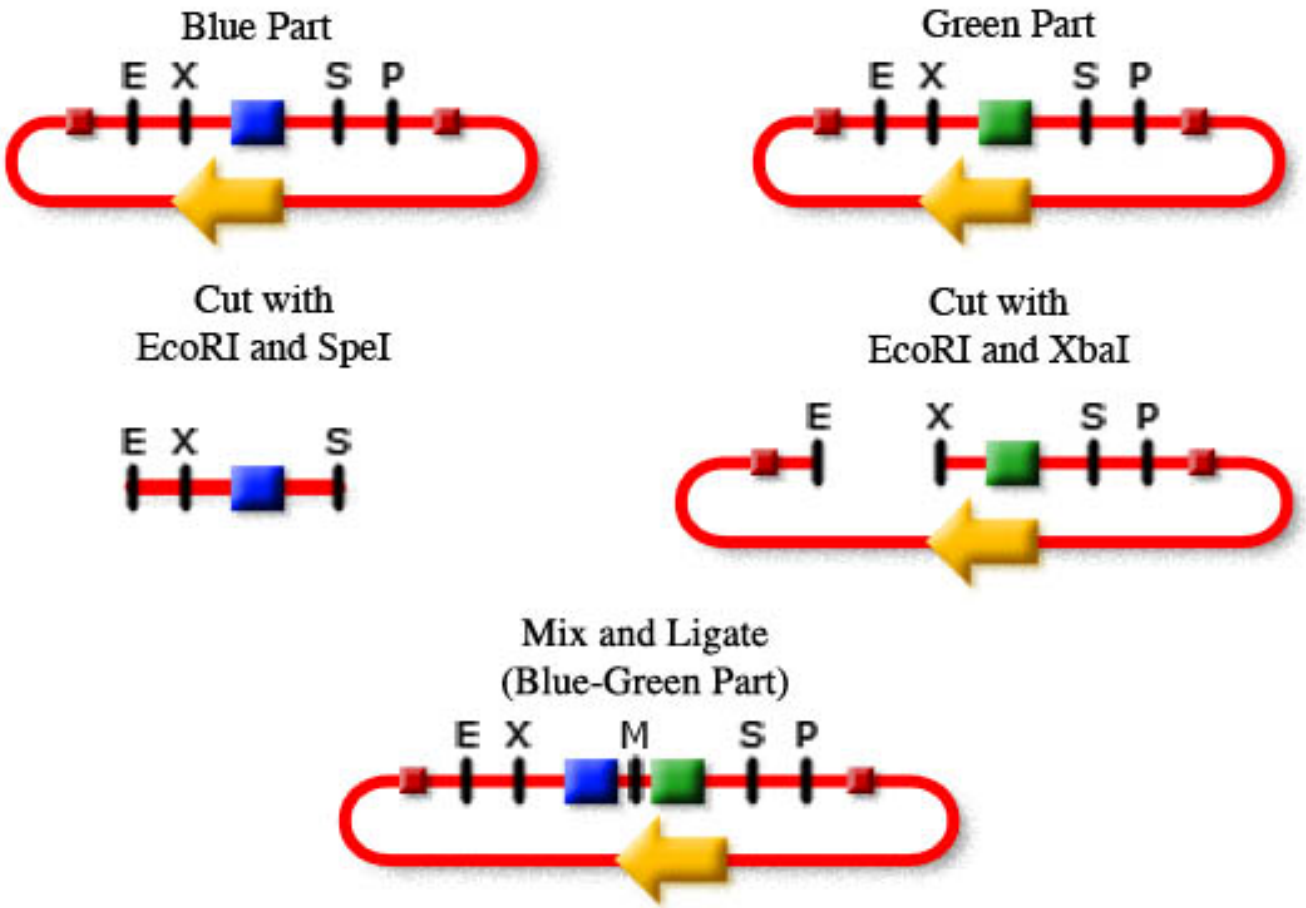
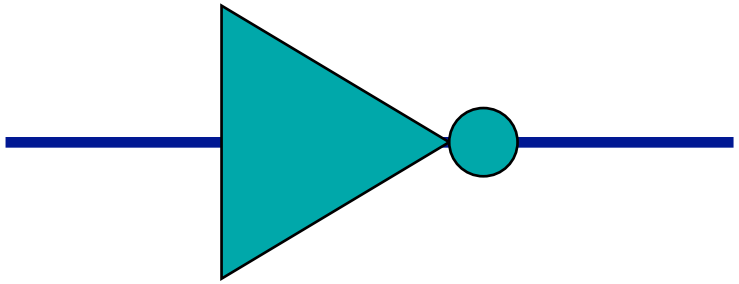


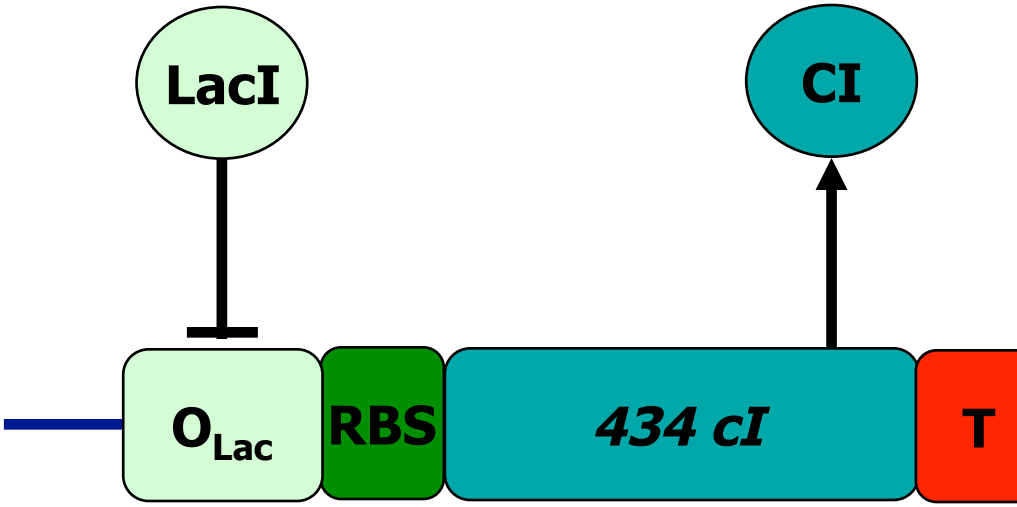

TD = 214 uS
TB = 100 uS
VA = 16 V
VB = 16 V
VC = 16 V
VD = 40 V
FS = 20 MHz
TD = 214 uS
TB = 100 uS
FS = 20 MHz


M 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 M

oBrick Standard Assembly






LacI
CI
O Lac
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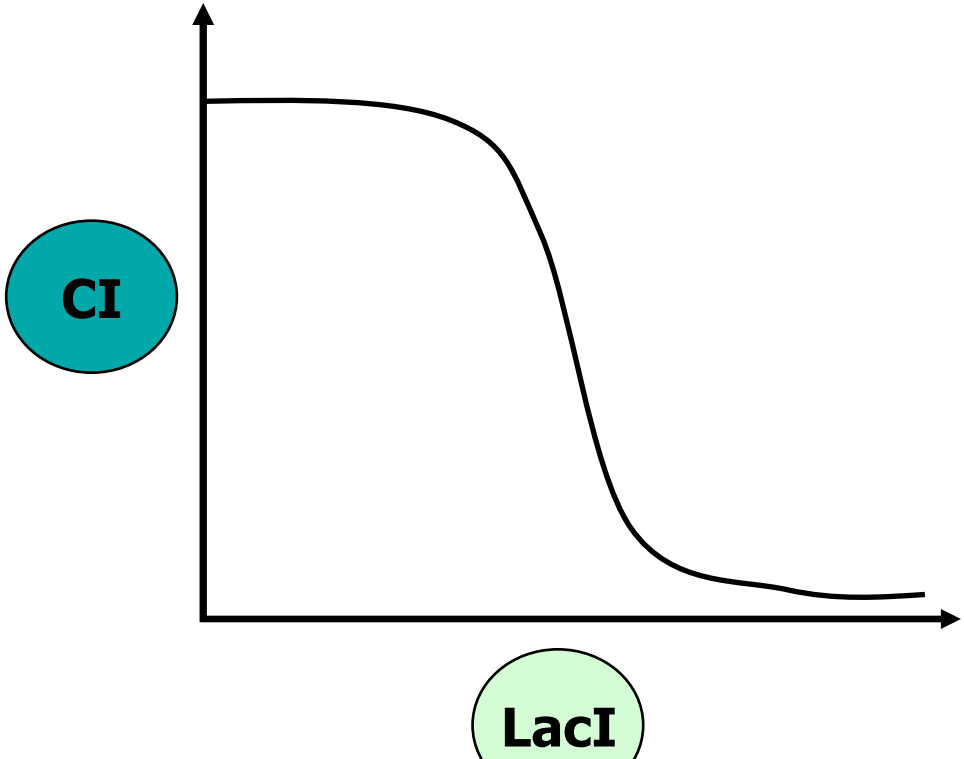
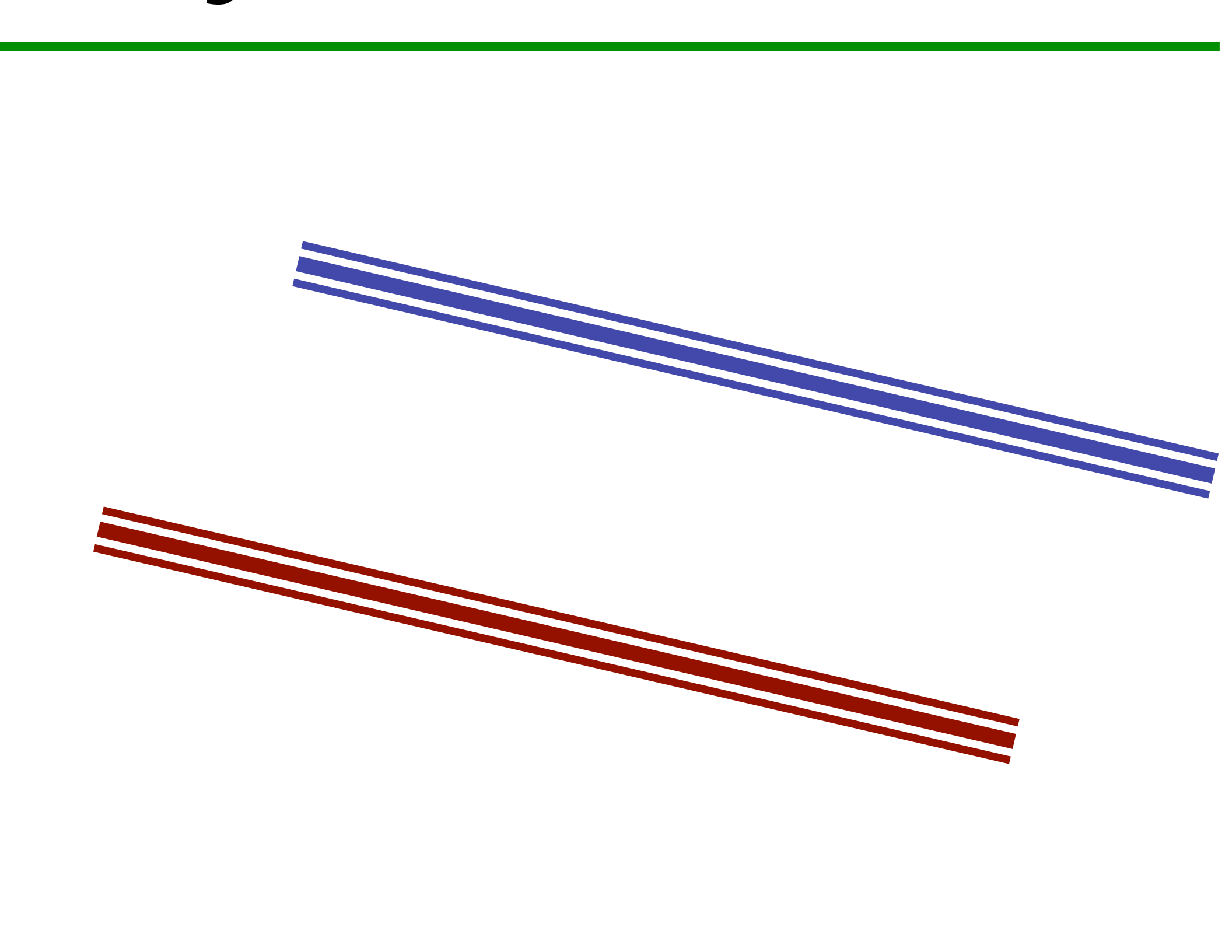
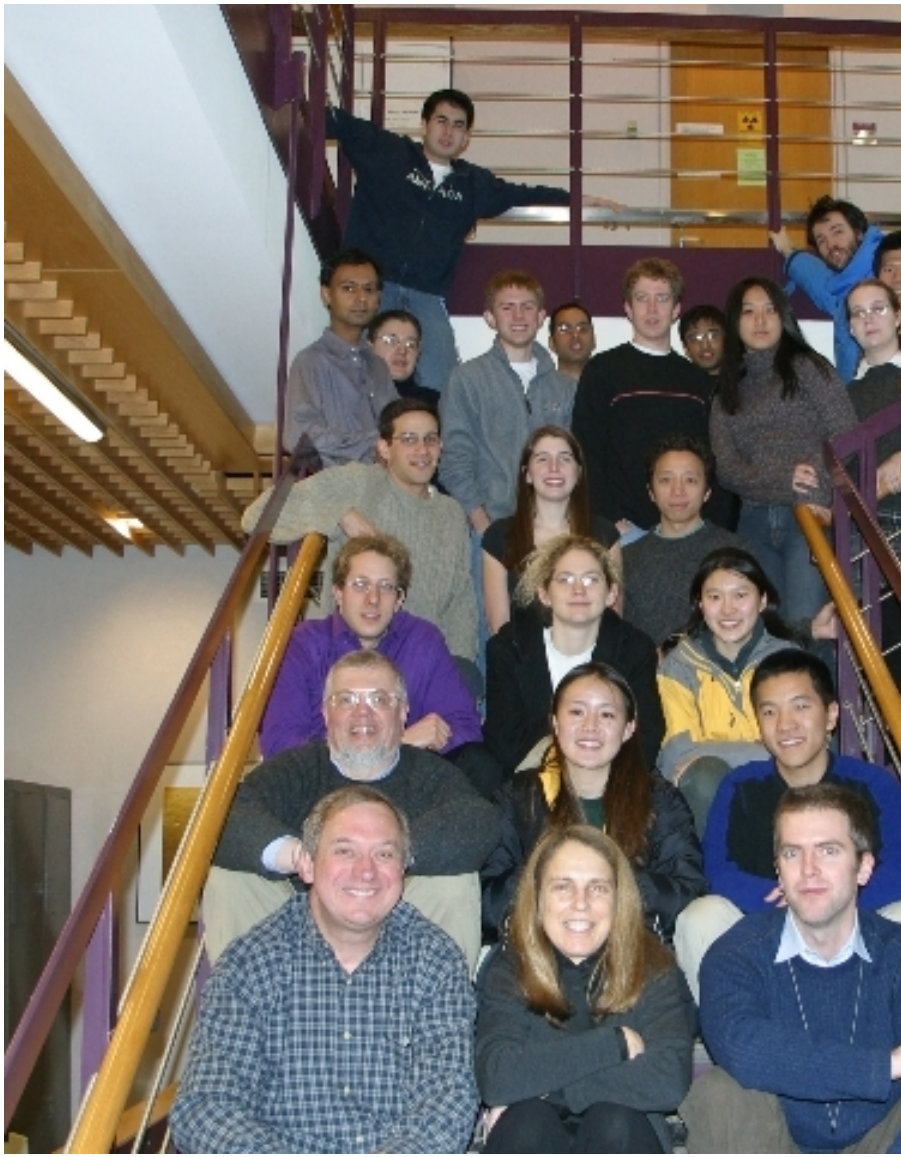
T

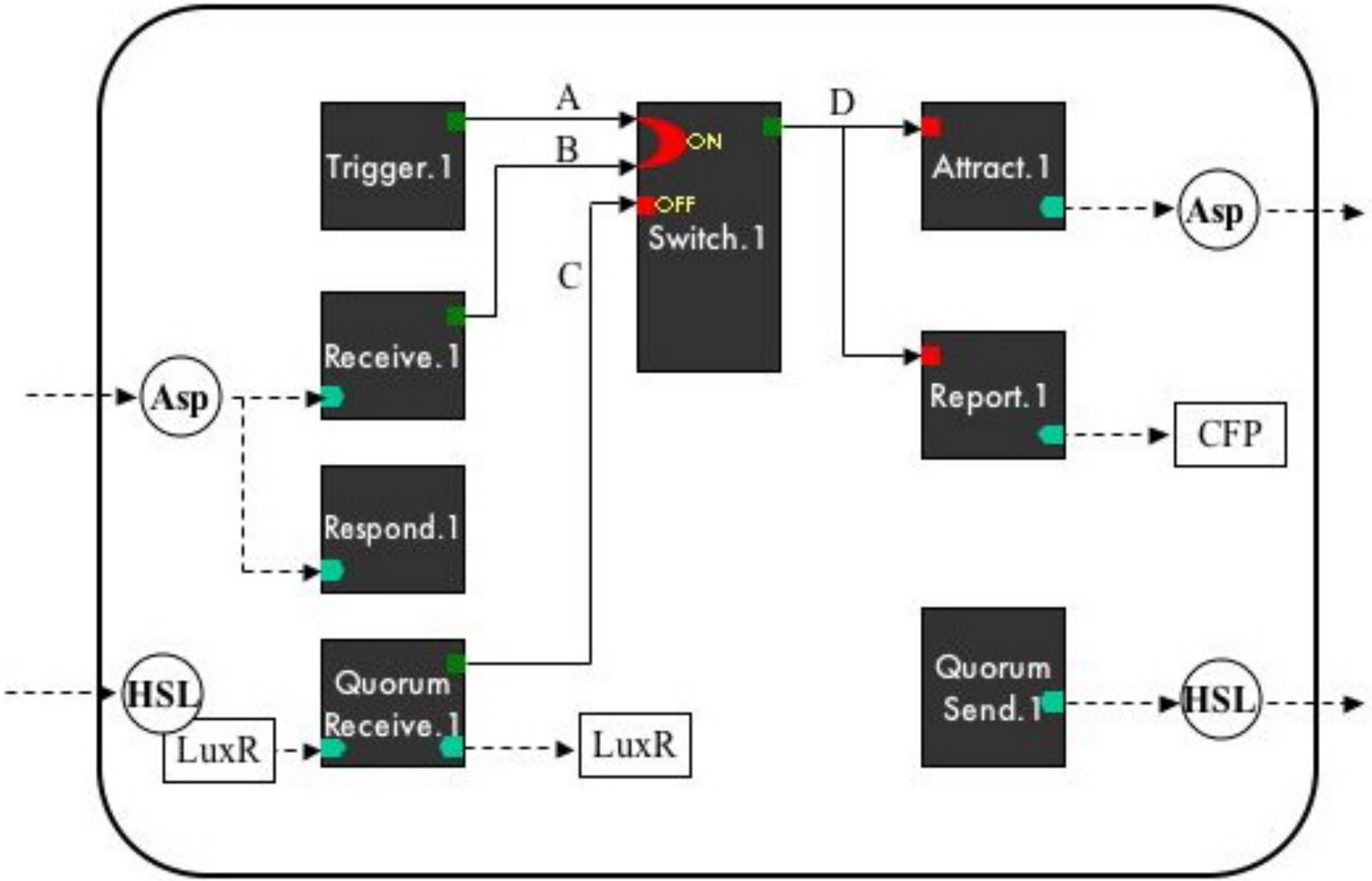

CI
LacI

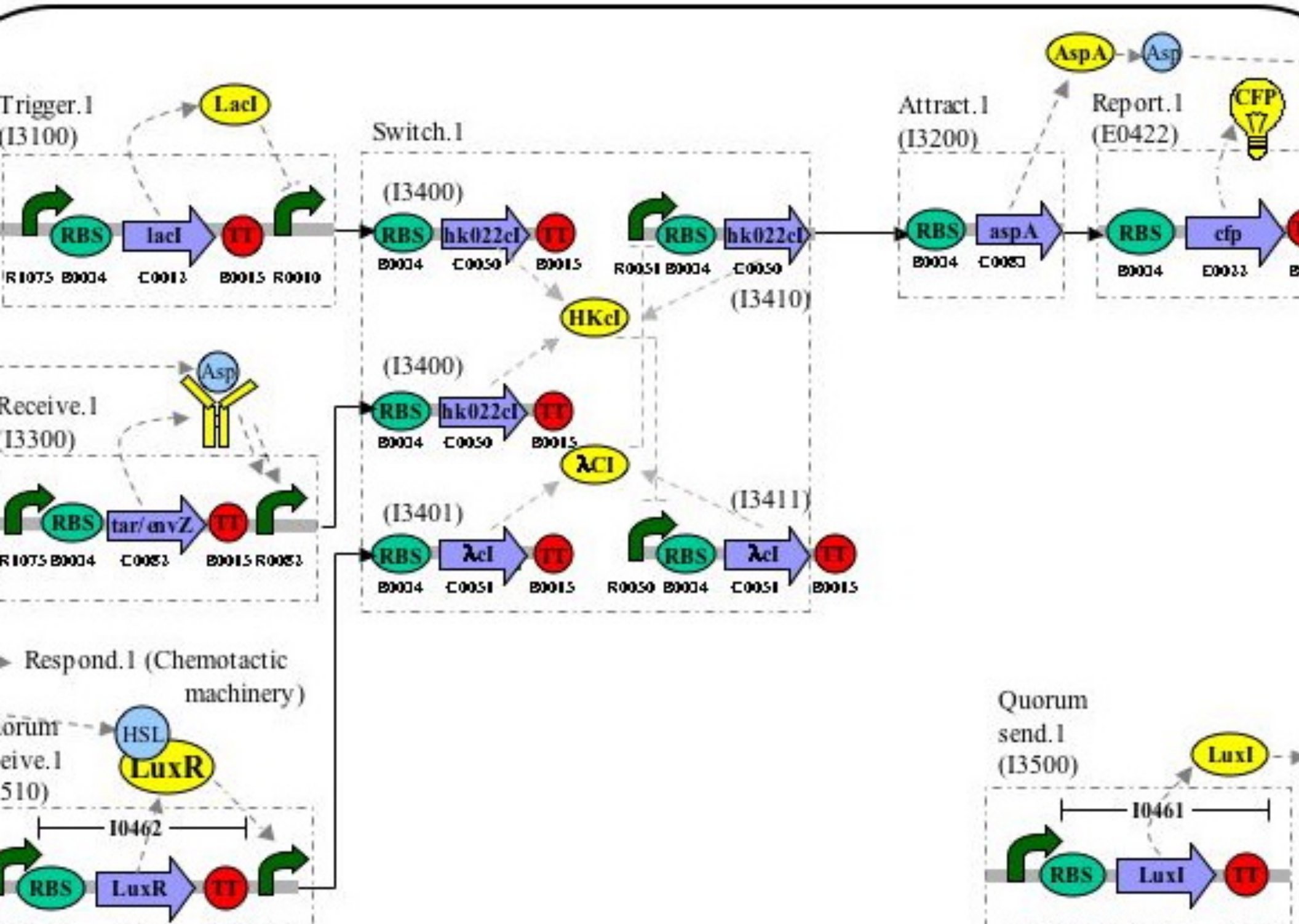


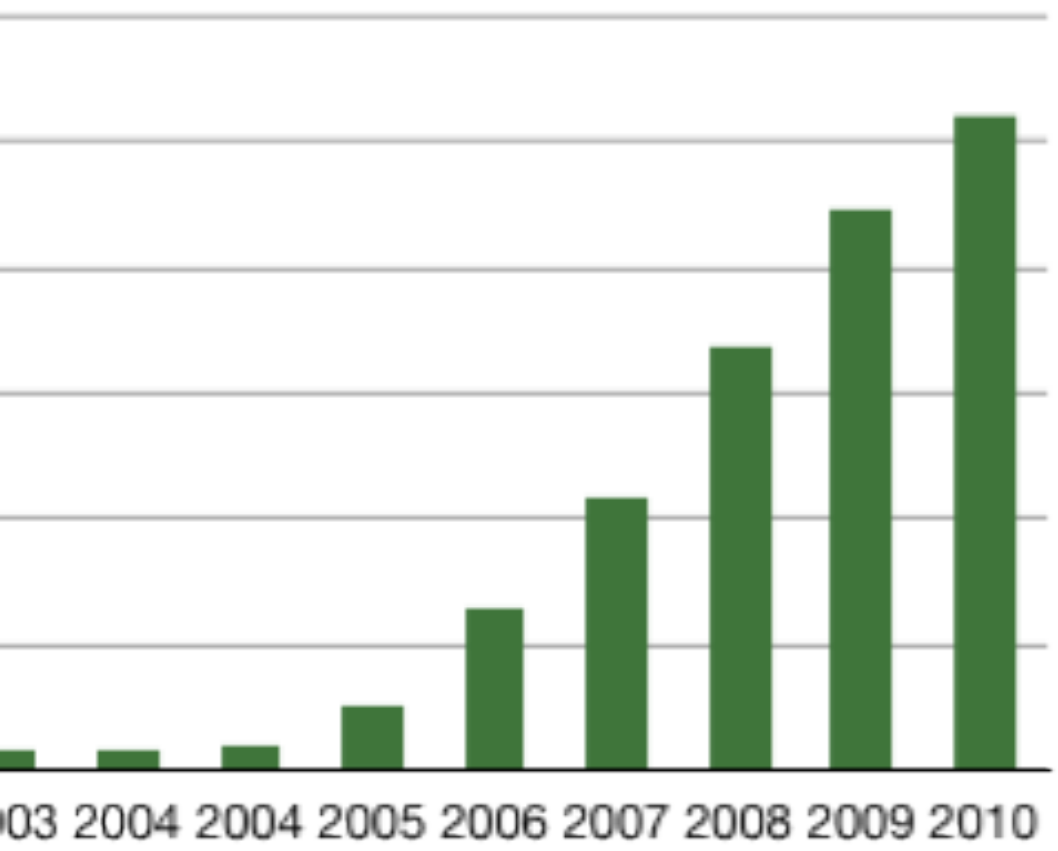
Can simple biological systems be built from standard, interchangeable parts and operated in living cells?

Or, is biology so complex that each case is unique?




A
B
C
D
ON
OFF
Trigger.1
Switch.1
Attract.1
Asp
Receive.1
Asp
Report.1
CFP
Respond.1
HSL
Quorum
Receive.1
LuxR
LuxR
Quorum
Send.1
HSL


Trigger.1
(I3100)
LacI
RBS
lacI
TT
R1075 B0034 C0012 B0015 R0010
Switch.1
(I3400)
RBS
hk022cI
TT
B0034 C0050 B0015
R0051 B0034 C0050
HKcI
(I3410)
(I3400)
RBS
hk022cI
TT
B0034 C0050 B0015
λCI
(I3401)
RBS
λcI
TT
B0034 C0051 B0015
R0050 B0034 C0051 B0015
(I3411)
Attract.1
(I3200)
AspA
Asp
RBS
aspA
B0034 C0083
Report.1
(E0422)
CFP
RBS
cfp
B0034 E0022
Receive.1
(I3300)
Asp
RBS
tar/envZ
TT
R1075 B0034 C0083 B0015 R0083
Respond.1 (Chemotactic
machinery)
HSL
LuxR
I0462
RBS
LuxR
TT
Quorum
send.1
(I3500)
LuxI
I0461
RBS
LuxI
TT



iGEM Scale and Growth

Year	Teams	Jamboree	T
IAP	4	20	
2004	5	70	
2005	13	120	
2006	32	360	
2007	54	570	
2008	84	825	1
2009	112	1100	1
2010	130	1300	1
2011	180	1800	2
2012	250	2500	3

Asia	38
Europe	38
US	38
Canada	10
Latin America	4
Africa	1

Small sample of team budgets

<$20K

$20K

$30K

$40K

$50K

>$50K


TKO
PENN STATE
SCOTLAND

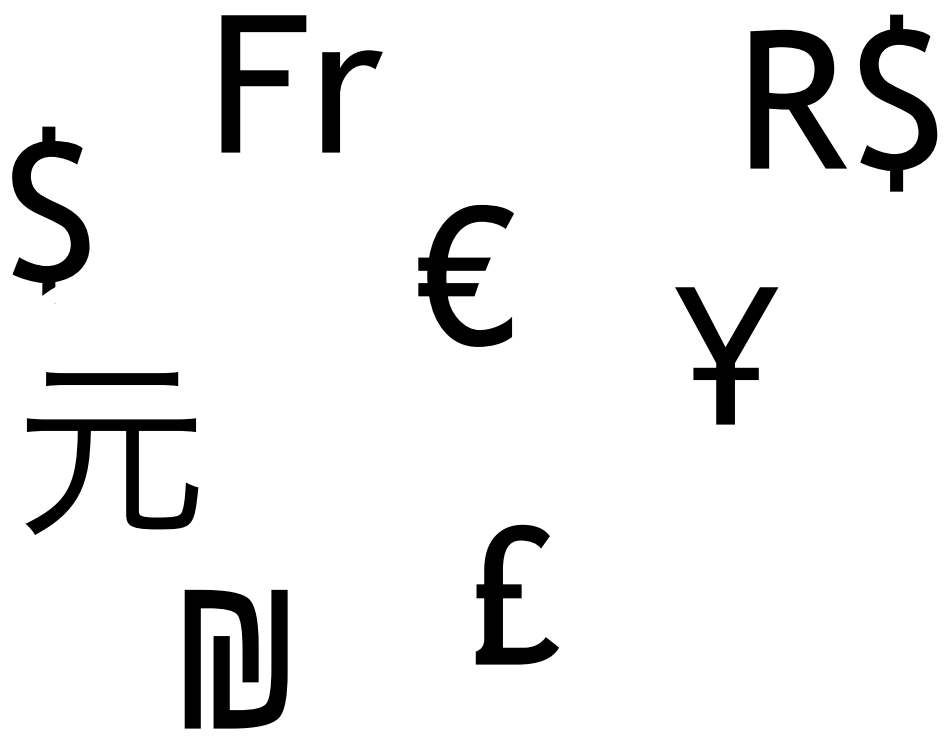

DUKE
DELFT
MINNESOTA


MASSACHVSETTS INSTITVTE OF TECHNOLOGY

iGEM Philosophy: Get and Give

Teams are expected to use the parts, ideas, and experience of teams in previous years.

Teams are expected to contribute their parts, ideas, and experiences.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iGEM Teach the Teacher Workshop
iGEM
无烟 教学楼

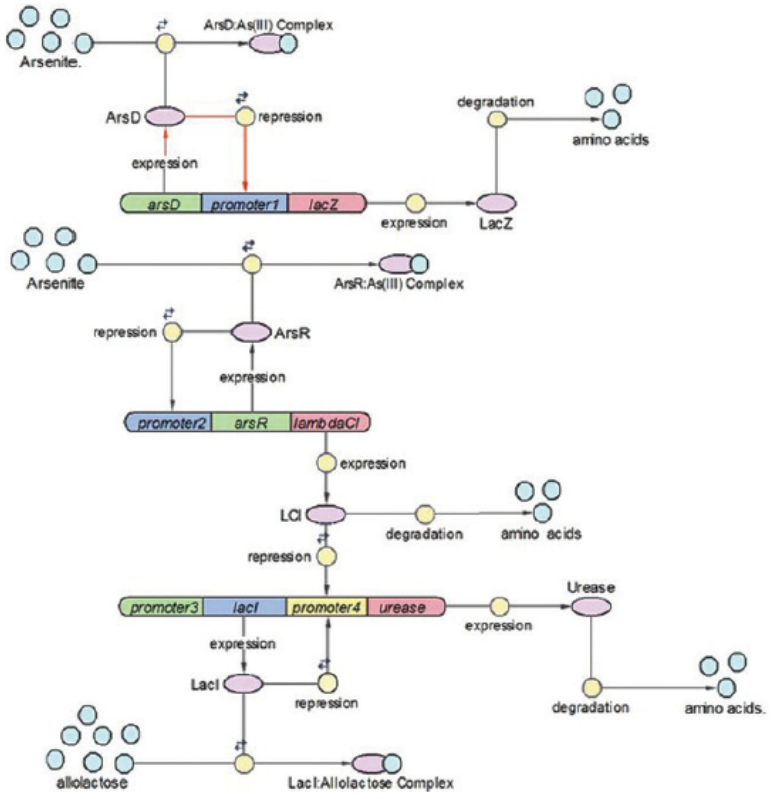

EXPRESS BOX - SMALL
EXPRESS BOX - SMALL
EXPRESS BOX - SMALL
EXPRESS BOX - SMALL
EXPRESS BOX - SMALL

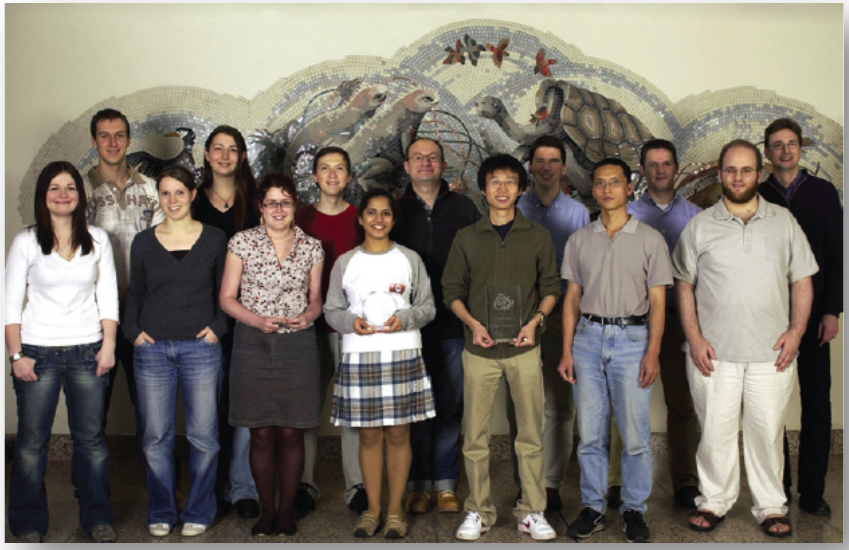

123
Shout
About YGEN

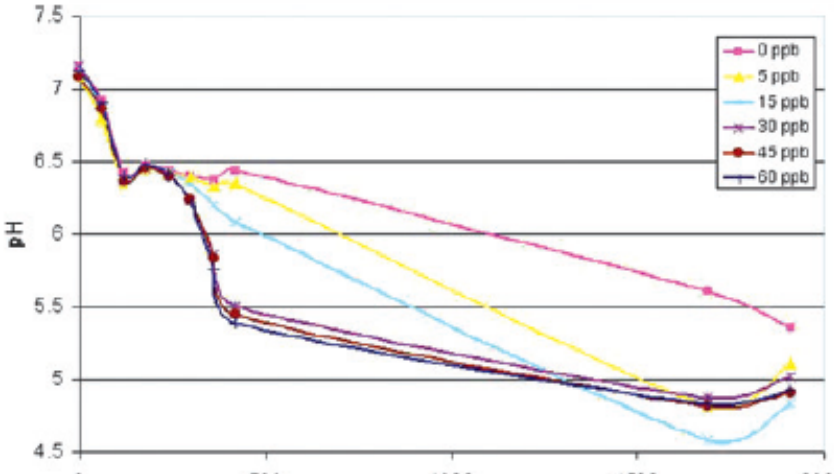

FINAL
(announced @ 8:30 pm)
In Alphabetical order....
HERE
UC
· Berkeley
· Paris
· Peking
· Slovenia
Mass. Ave.
~10 Blocks

Development of a novel biosensor for the detection of arsenic in drinking water

J. Aleksic, F. Bizzari, Y. Cai, B. Davidson, K. de Mora, S. Ivakhno, S.L. Seshasayee, J. Nicholson, J. Wilson, A. Elfick, C. French, L. Kozma-Bognar, H. Ma and A. Millar







Grand Prize, Winner of the BioBrick Trophy: Cambridge
1st Runner Up: Heidelberg
2nd Runner Up: Valencia

Finalists:

Cambridge
Freiburg bioware
Groningen
Heidelberg
Imperial College London
Valencia

Track Award Winners:

Best Food or Energy Project: UNIPV-Pavia
Best Environment Project: Cambridge
Best Health or Medicine Project: Stanford
Best Manufacturing Project: Imperial College London
Best New Application Area: Valencia
Best Foundation Advance: Alberta
Best Information Processing Project: TUDelft
Best Software Tool: Berkeley Software & Illinois-Tools (Tie)

Special Prizes Winners:

Best BioBrick Part, Natural: ULB-Brussels
Best New BioBrick Part or Device, Engineered: EPF-Lausanne & Freiburg Bioware (Tie)
Best Human Practices Advance: Imperial College London & Paris (Tie)
Best Experimental Measurement: Valencia
Best Model: BCCS-Bristol
Best Wiki: Heidelberg
Best Poster: Freiburg bioware
Best Presentation: ArtScienceBangalore
Best New Standard: Heidelberg

- Students
  - Training future synthetic biologists
  - Teaching entrepreneurial competition
- Instructors
  - Opportunities for junior faculty
  - New programs - new ideas
- Schools
  - Synthetic biology entering curriculum
  - Energize research programs
- Synthetic Biology
  - Examples, parts, successes, testimonials
  - Academic research projects – SynBERC
- A task worth the effort

M 2009

scussion edit history move watch teams

009 teams are asked to detail how they approached any issues of biological safety associated with their projects.

teams should consider the following four questions:

d any of your project ideas raise safety issues in terms of:

esearcher safety,

ublic safety, or

nvironmental safety?

ere a local biosafety group, committee, or review board at your institution?

t does your local biosafety group think about your project?

ny of the new BioBrick parts that you made this year raise any safety issues?

yes, did you document these issues in the Registry?

se document any answers to these (or other) safety questions in your presentation, wiki presentation, or poster.

be asked to evaluate your project, in part, on the basis of if and how you considered and addressed issues of biolo

ons arise regarding iGEM and biological safety please send an email to safety AT igem.org.

nakers: They first have to know about synthetic biology, have to understand this new research area herefore have to understand the basics of molecular and cell biology. And this step is where our proje nvolved.

Only a well-informed public is able to develop a non-prejudiced and profound opinion ab ynthetic biology."

rom the past we learned, that modern bioscience is not always accepted and fully integrated in the pu nterest. A good examle is the public view on green biotechnolgy in Germany and Europe. Many peop

combination in many cases leads to fear and by that to non-acceptance in the society. And this is v green biotechnology has to battle every single day.

"Science can only work successful and develop useful inventions if it is based on a high leve acceptance in the society."

Synthetic biology is up to now very young and far away from experiencing the same problematic lac acceptance that genetic engineering and green biotechnology underwent in many European countries

Security



"Biology should be more fun. It should be about exploring the world around us. We should want to get out there and do things. We should be able to do things more easily. Securing biology should be something that helps us do that. It cannot be something that gets in the way."

Scientific research continues to bring us new and unexpected knowledge, technologies and approaches. Synthetic biology, being on the very cutting edge of what is possible, promises unprecedented opportunities for health, wealth and better living. But science and technology can be used for destructive purposes as well as for constructive ones. Refining our control of biology opens up chances to intentionally cause harm to humans, animals, plants and the environment that just did not exist before. That's why it is important now, more than ever, for us to think about how others might use what we are doing in ways we would not be happy with.

Preventing Malign Use

Securing biology is not a simple task. It is not something those outside biology could, or should, do alone. Equally, this is not something that biologists can do by themselves (our focus, as the name implies is on the biology). This is a truly interdisciplinary problem - one that means we will need to work together, in new ways, with new partners, to find an approach that provides benefits for all. Given the interdisciplinary nature of synthetic

As a participant in iGEM, there are three things you can do right now to help us secure our science:

1. Include something in your project description and presentations that demonstrates that you have thought about how others could misuse your work
2. Contribute to community discussions on

Resources

People

Piers Millet
BWC ISU
bwc@unog.ch
www.unog.ch/bwc

The BWC ISU is the closest thing to an international organisation to ensure biology is used solely for beneficial purposes. It is housed in the UN Office for Disarmament Affairs in Geneva and, as Deputy Head, Piers helps States Parties to the Biological Weapons Convention ban the hostile use of biology. As a microbiologist and chartered biologist, Piers supports the technical aspects of the ISU's work.

Reports

Synthetic Genomics: Options for Governance by the J Craig Venter Institute, CSIS and MIT, October 2007

Students:

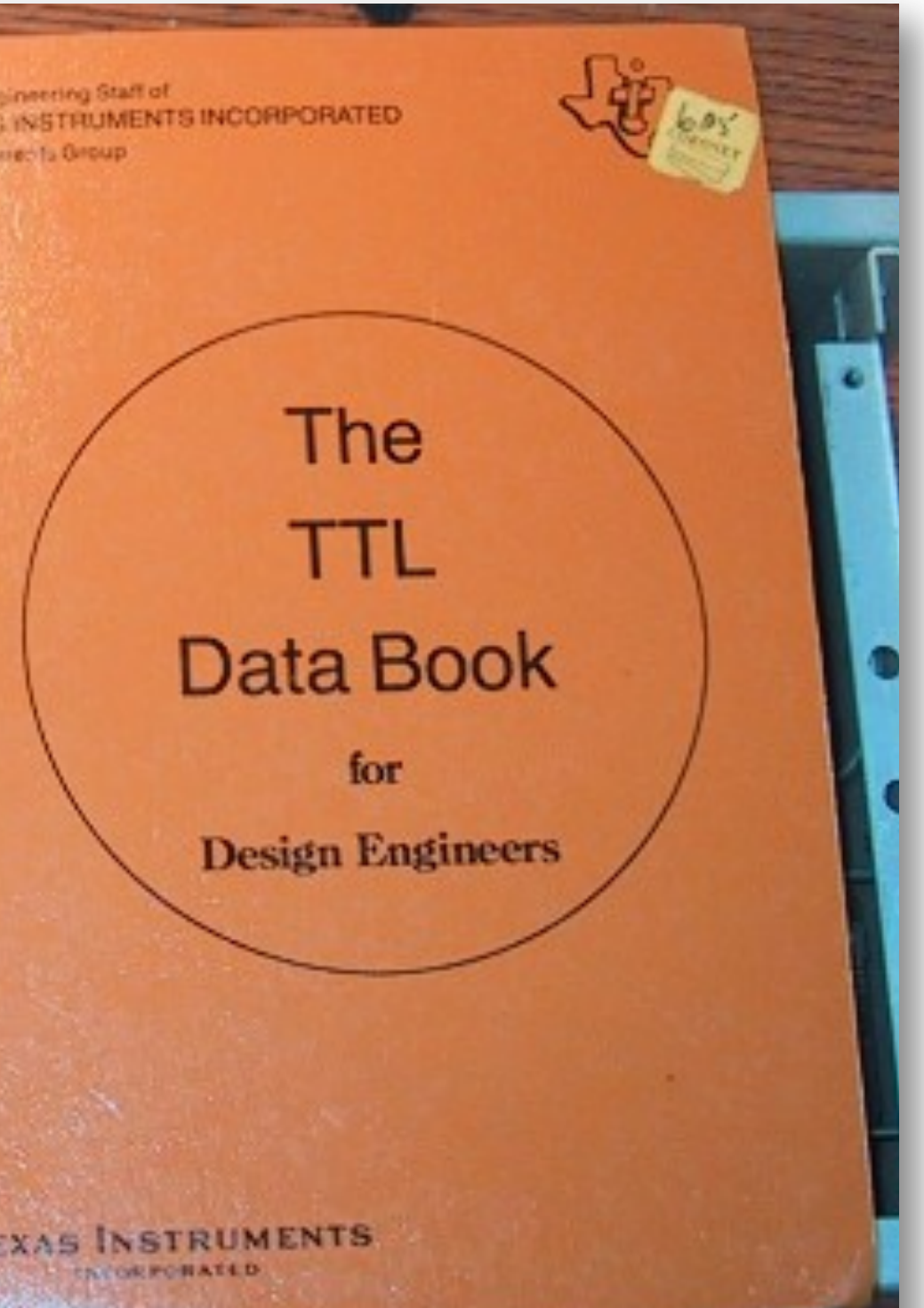
- **High School Student**: Allen Cai
- **High School Student**: Alex Smith
- **High School Student**: Edna Miao
- **High School Student**: Ethan Chan
- **High School Student**: Eric Wong
- **High School Student**: Jackie Tam
- **High School Student**: Ryan Liang

- **Undergrad Student**: Cathy Liu
- **Undergrad Student**: Ryan Quan

- **International Undergrad Student**: Hansi Liu
- **International Undergrad Student**: Katja Kolar

- **Advisor:** Wendell Lim
- **Advisor:** Orion Weiner
- **Advisor:** James Onuffer

- **Teacher at Lincoln High School: George Cachianes**
- **Teacher at Lincoln High School: Julie Reis**
- **Plus 10 “Buddies”**



SN74LS14

Schmitt Triggers
Dual Gate/Hex Inverter

The SN74LS14 contains logic gates/inverters which accept standard TTL input signals and provide standard TTL output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. Additionally, they have greater noise margin than conventional inverters.

Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input thresholds (typically 800 mV) is determined internally by resistor ratios and is essentially insensitive to temperature and supply voltage variations.

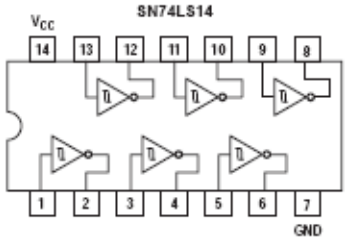
ON Semiconductor
Formerly a Division of Motorola
http://onsemi.com

LOW
POWER
SCHOTTKY

PLASTIC
N SUFFIX
CASE 646

SOIC
D SUFFIX
CASE 751A

LOGIC AND CONNECTION DIAGRAMS



GUARANTEED OPERATING RANGES

Symbol	Parameter	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	4.75	5.0	5.25	V
T_A	Operating Ambient Temperature Range	0	25	70	°C
I_{OH}	Output Current – High			−0.4	mA
I_{OL}	Output Current – Low			8.0	mA

ORDERING INFORMATION

Device	Package	Ship
SN74LS14N	14 Pin DIP	2000 U
SN74LS14D	14 Pin	2500/Tap

to the Registry of Standard Biological Parts.

y is a continuously growing collection of genetic parts that can be mixed and matched to build synthetic biology devices and sy 2003 at MIT, the Registry is part of the Synthetic Biology community's efforts to make biology easier to engineer. It provides a re netic parts to iGEM teams and academic labs. You can register a new lab here.

is based on the principle of "get some, give some". Registry users benefit from using the parts and information available from the Registr ir engineered biological systems. In exchange, the expectation is that Registry users will, in turn, contribute back information and data on v parts that they make to grow and improve this community resource.

f parts & ces

Help

Users & groups

DNA repositories

Registry tools

- Search parts (?)
- Add a part
- Request a part
- Send parts to the Registry
- Sequence analysis

You'll notice some significant changes to the Registry recently. In particular, the Registry catalog of parts has been entirely redesign for easier browsing of the available parts and devices. You can now browse parts and devices by type, by function, by chassis and You'll also notice that the documentation and help pages for each class of parts have been greatly enhanced.

The Registry of Standard Biological Parts is *always* a work in progress. Please browse the new catalog and let us know what you free to edit and improve the pages further.

news

010: Detailed information about parts is now available in XML format.

2009: You can now link to part pages directly from the iGEM wiki by typing the following `<partinfo>BBa_B0015</partinfo>`.

2009: We are considering changing the license terms of the Registry so that we can share our information with other databases. Go here

Registry of Standard Biological Parts

Part:BBa_I13600

DNA Available
Experience: Works

Designed by Christopher Batten, Victoria Chou, Kenneth Nesmith

Entered: 2004-07-16

From partsregistry.org

Tet with CFP reporter (without LVA tag)

The part glows (rather weakly) with a cyan colored flourescent protein. In the absence of the tetR protein, CFP expression is constitutive. tetR represses CFP production; this repression can be relieved by the addition of tetracycline or one of its analogs (ie. aTc) (http://openwetware.org/wiki/ATc) .

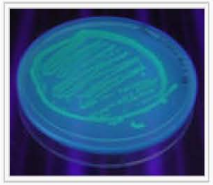
Sequence and Features

Format: Subparts | Ruler | SS | DS Search: Length: 940 bp Context: Part only Get selected sequence

p(tetR) . ECFP . .
R0040 B0034 E0020 B0010 B0012

Pictures

BBa_I13600 visualized under non-UV lightbox



BBa_I13600 visualized under 254nm wavelength UV

Plasmid backbones/Assembly

< Back to Plasmid backbones

Part assembly | System operation | Help! | Protein expression | Assembly of protein fusions | Part measurement | Screening of part libraries | Building BioBrick vectors | BioBrick friendly | Non-BioBrick | Archive

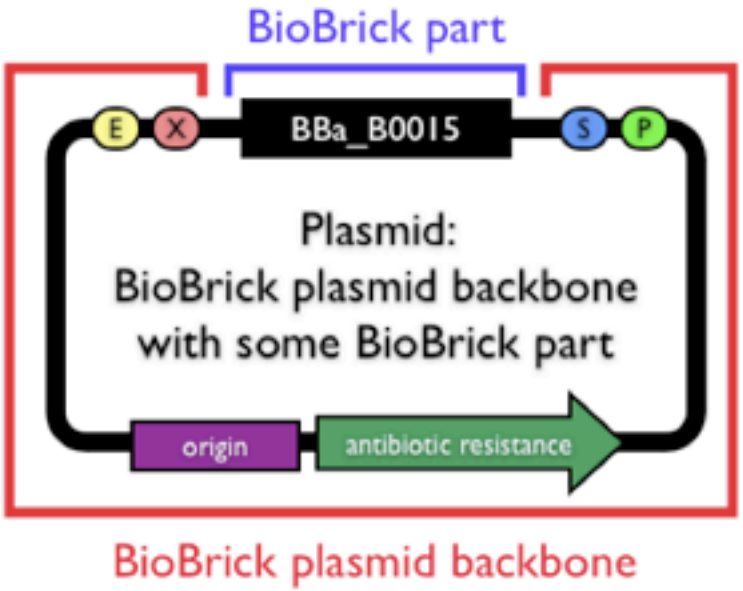
High copy plasmid backbones • Low or medium copy plasmid backbones • Inducible copy number plasmid backbones

Plasmids are circular, double-stranded DNA molecules typically containing a few thousand base pairs that replicate within the cell independently of the chromosomal DNA. Plasmid DNA is easily purified from cells, manipulated using common lab techniques and incorporated into cells. Most BioBrick parts in the Registry are maintained and propagated on plasmids. Thus, construction of BioBrick parts, devices and systems usually requires working with plasmids.

Note: In the Registry, plasmids are made up of two distinct components:

1. the BioBrick part, device or system that is located in the BioBrick cloning site, between *(and excluding)* the BioBrick prefix and suffix.
2. the plasmid backbone which propagates the BioBrick part. The plasmid backbone is defined as the sequence beginning with the BioBrick suffix, including the replication origin and antibiotic resistance marker, and ending with the BioBrick prefix. [Note that the plasmid backbone itself can be composed of BioBrick parts.]

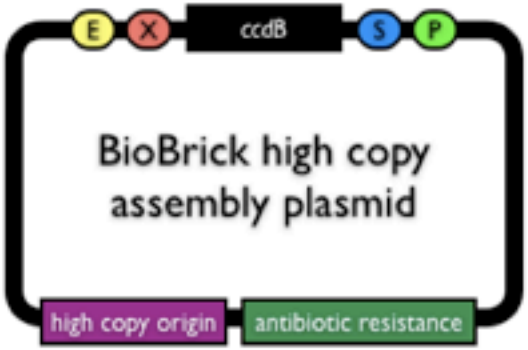
Many BioBrick parts in the Registry are maintained on more than one plasmid backbone!



One of the most common tasks that biological engineers do is to assemble two parts together using BioBrick® standard assembly. To make the process of assembling two BioBrick® parts together easier, there are several kinds of assembly plasmid backbones available via the Registry.

High copy number assembly plasmid backbones

The most common set of plasmid backbones that people use to assemble BioBrick® standard biological parts together are high copy BioBrick plasmid backbones. High copy plasmid DNA is easily purified in high yield from cultures, so it makes obtaining enough DNA for assembly easy.



The high copy plasmid backbones listed below have a common set of features.

1. A complete BioBrick® cloning site for easy cloning and assembly of BioBrick parts.
2. Terminators flanking the BioBrick® cloning site to insulate the vector from read-through transcription originating in the cloned BioBrick® part, device or system.
3. Primer binding sites for the standard BioBrick® verification primers VF2 (BBa_G00100) and VR (BBa_G00101). These primers are located for convenient sequencing and screening by colony PCR of cloned BioBrick® parts, devices, and systems.

Plasmid backbones are distributed by the Registry with a default insert. There are just a handful of default plasmid inserts used in the Registry. Many the available plasmid backbones have the *ccdB* positive selection marker (BBa_P1010) as the default plasmid insert within the BioBrick® cloning site. The *ccdB* gene ensures that when assembling two BioBrick® parts together, the uncut plasmid is not transformed. However, inclusion of the *ccdB* gene means that these vectors must be propagated in a *ccdB* tolerant strain, such as *E. coli* strain DB3.1 (BBa_V1005).

Finally, to make assembly of BioBrick® parts easier, these BioBrick® assembly plasmid backbones are available with three different antibiotic resistance markers, so that you can use 3 antibiotic assembly methods to assemble BioBrick® parts.

-?-		Name	Description	Resistance	Replicon	Copy number	Chassis	Length
A	W	pSB1A3	High copy BioBrick assembly plasmid	A	pMB1	100-300		2157
A	W	pSB1A7	Transcriptionally insulated high copy BioBrick plasmid	A	pMB1	100-300		2431
A	W	pSB1AC3	High copy BioBrick assembly plasmid	AC	pMB1	100-300		3055
A	W	pSB1AK3	High copy BioBrick assembly plasmid	AK	pMB1	100-300		3189
A	W	pSB1AT3	High copy BioBrick assembly plasmid	AT	pMB1	100-300		3446
	W	pSB1C3	High copy BioBrick assembly plasmid					2072
	W	pSB1K3	High copy BioBrick assembly plasmid					2206
	W	pSB1T3	High copy BioBrick assembly plasmid					2463

Karmella Haynes, an instructor of the 2006 Davidson College iGEM team, designed and constructed the plasmid backbone pSB1A7). You can read more about the 2006 Davidson project in their open-access paper Engineering bacteria to solve the Burnt Pancake Problem published in the *Journal of Biological Engineering.*

BBa_E0840

Reporter
GFP genera

DNA Available
1 Registry S
Get This Part

by Jennifer Braff Group: Endy Lab, Registry (2004-10-18)

generator

40 takes as input a transcriptional signal (PoPS) and produce as output the fluorescent protein GFP.

and Biology

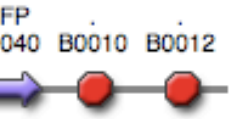
Ba_E0040 for additional details.

E0840 is often used to quantify the behavior of transcriptional control devices such as promoters.

E0840 has a strong ribosome binding site.

e and Features

mat: Subparts | Ruler | SS | DS Search: Length: 878 bp Context: Part only Get selected sequence



Compatibility: 10 21 23 25

[e

ers
Green
n
None

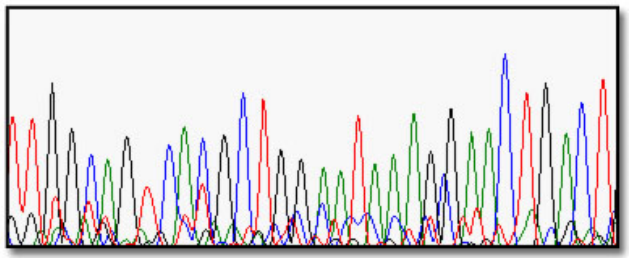
Twins
BBa_I741026 Deleted
BBa_I751310 Building
BBa_S04013 Planning

Reviews
1 Registry Star
Group Favorite
Experience: Works
5 (77)
4 (21)
3 (44)

Categories
//classic/reporter/ret
//iGEM2006/MIT/favorites


PUR
VWR
EVOLUTION ONE
EVOLU

Registry of Standard Biological Parts



ecount

Go Search

Analysis

.org

nize and analyze a set of DNA sequencing runs by comparing DNA sequences against parts in the Registry.
ompare sequences with a large number of genomes.
abase was last updated on Thu Sep 4 10:03:31 2008. (Update now)

ysis

Well 1A, Lib QC08	randy	2008-03-16
B0011 (length: 46bp)	Linked to part info page	

3_P620_W39493_VF)

1283bp Blast against: BBa_B0011 Basic Parts All Parts

chine files: *(Sequence)(Trace)* Get Phred files: *(Sequence)(Quality)(Trace)*

at 79 BB Suffix found at 147

uence (46bp)

3_P620_W39493_VR)

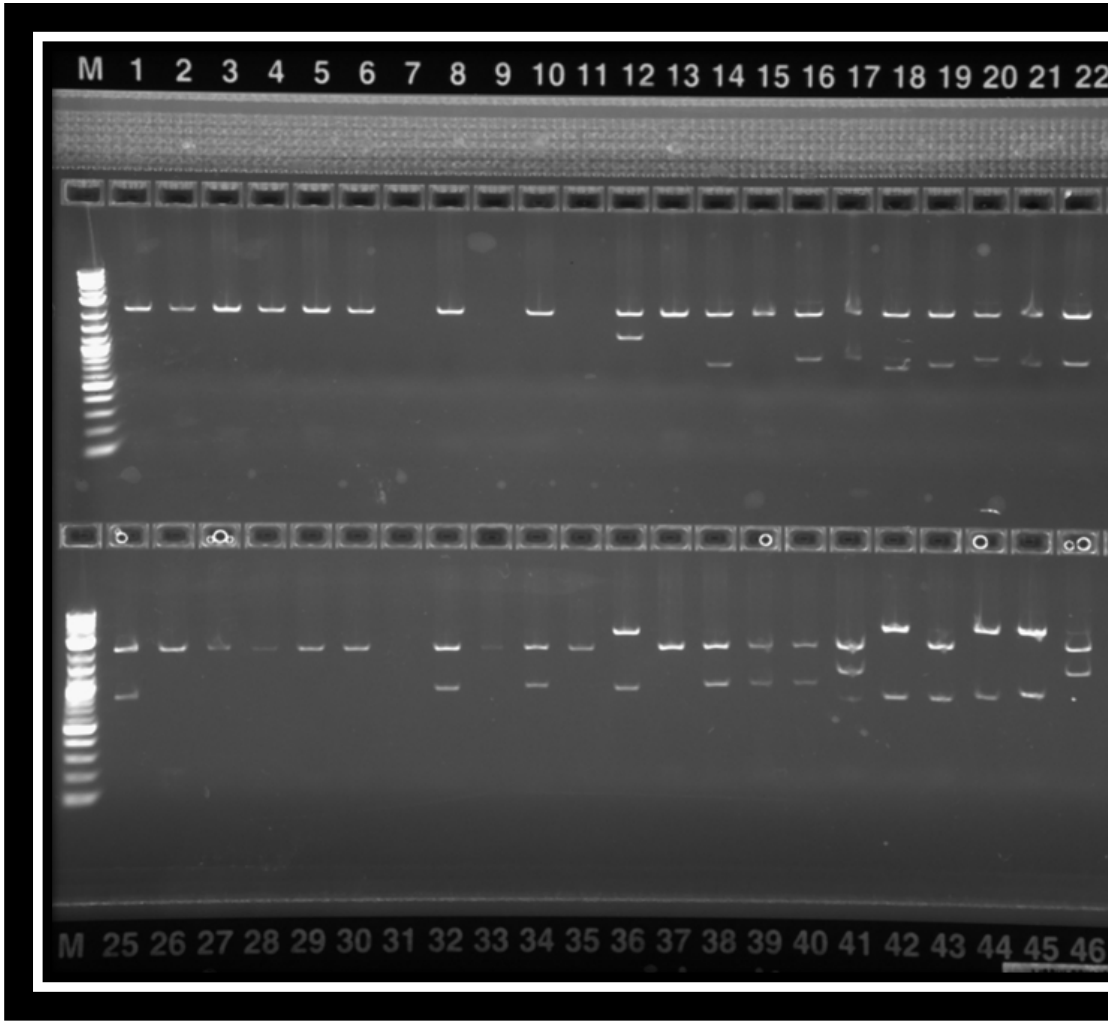
1387bp Blast against: BBa_B0011 Basic Parts All Parts

chine files: *(Sequence)(Trace)* Get Phred files: *(Sequence)(Quality)* *(Trace)*

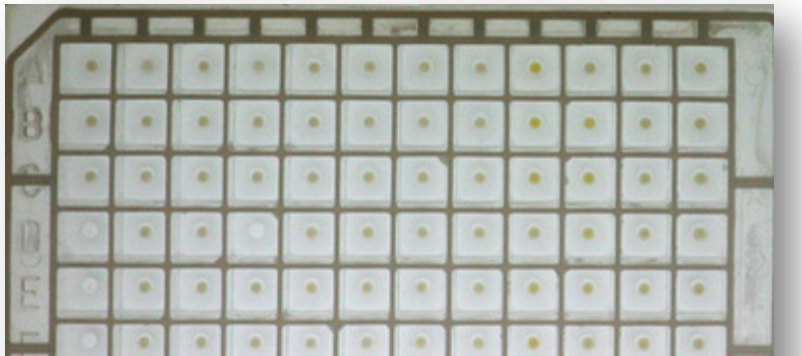
at 1258 BB Suffix found at 1326

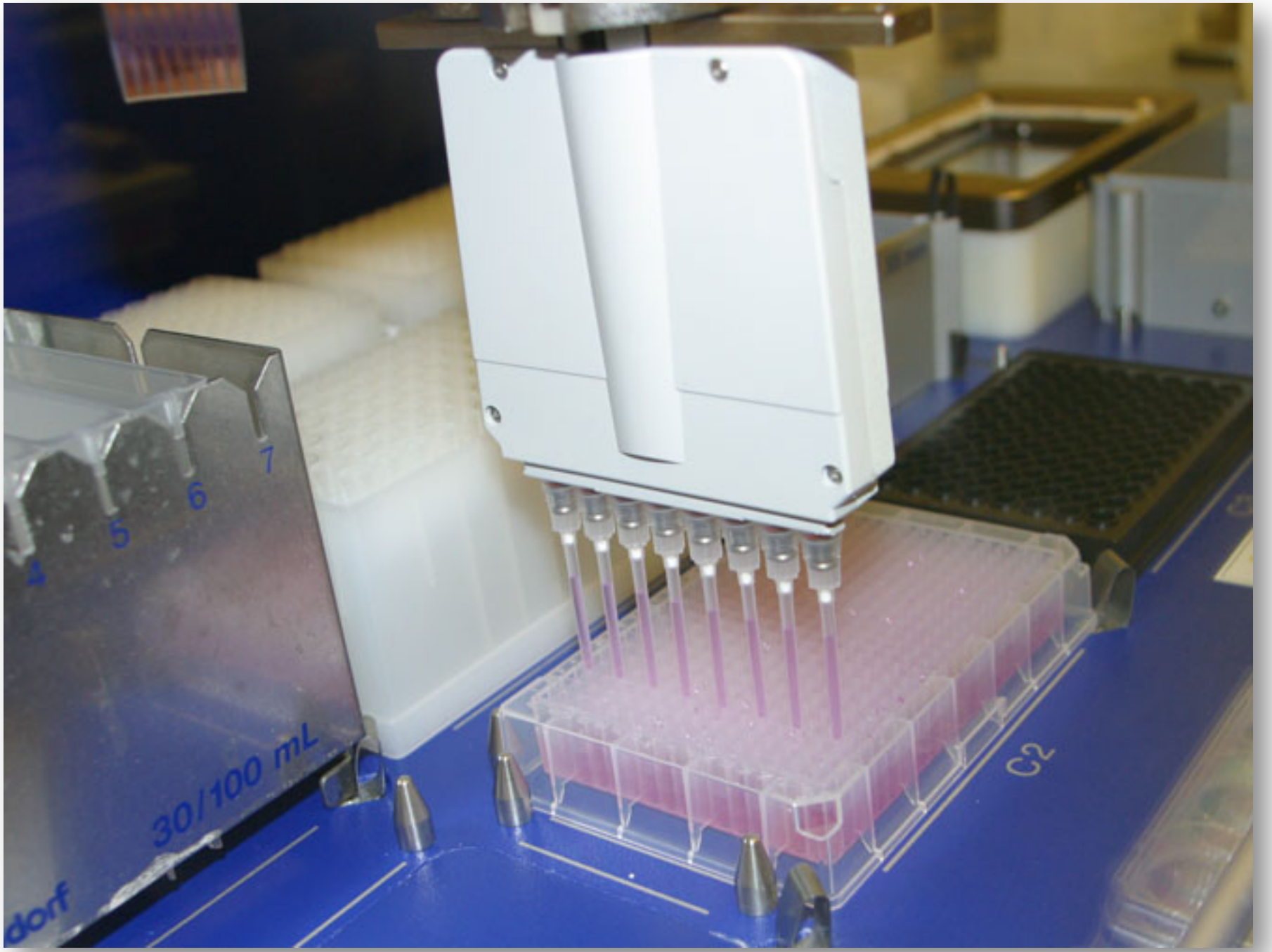
uence (46bp)

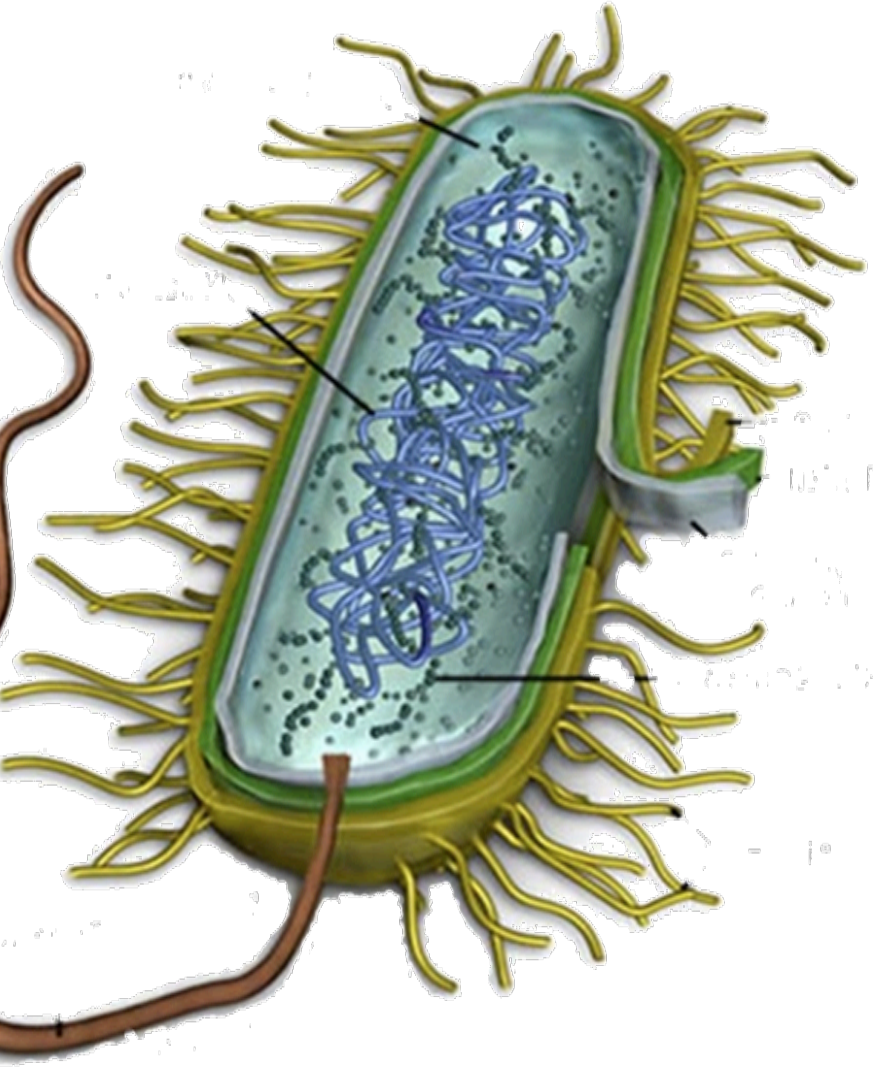
Confirmed Good: 46, Bad: 0, Not clear: 0, Not covered: 0

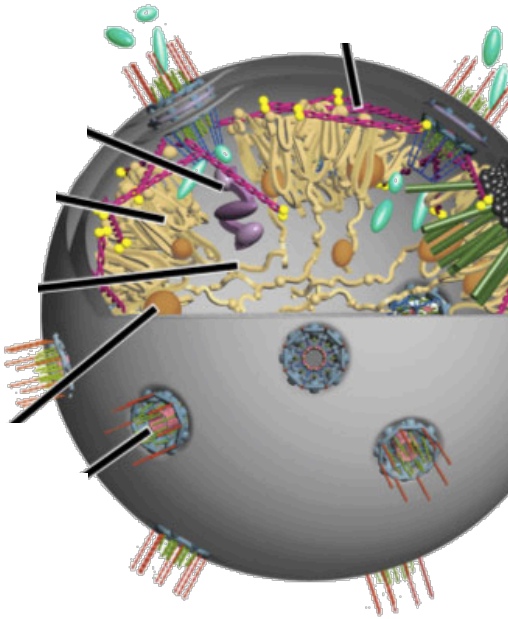


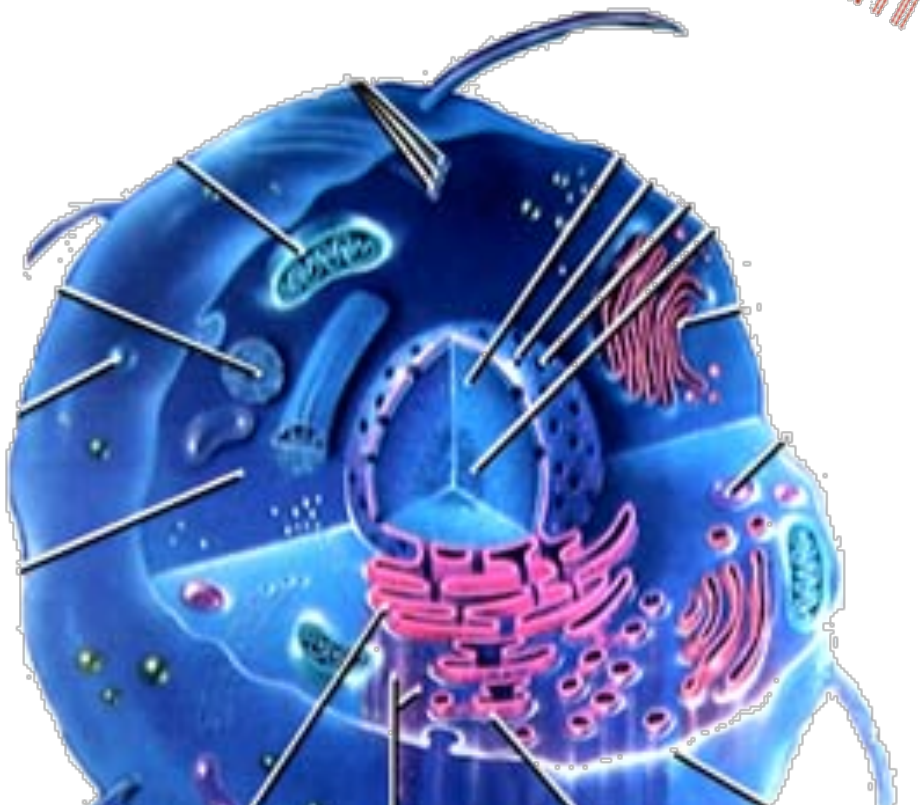
Source Plate 1000 Image Antibiotic A

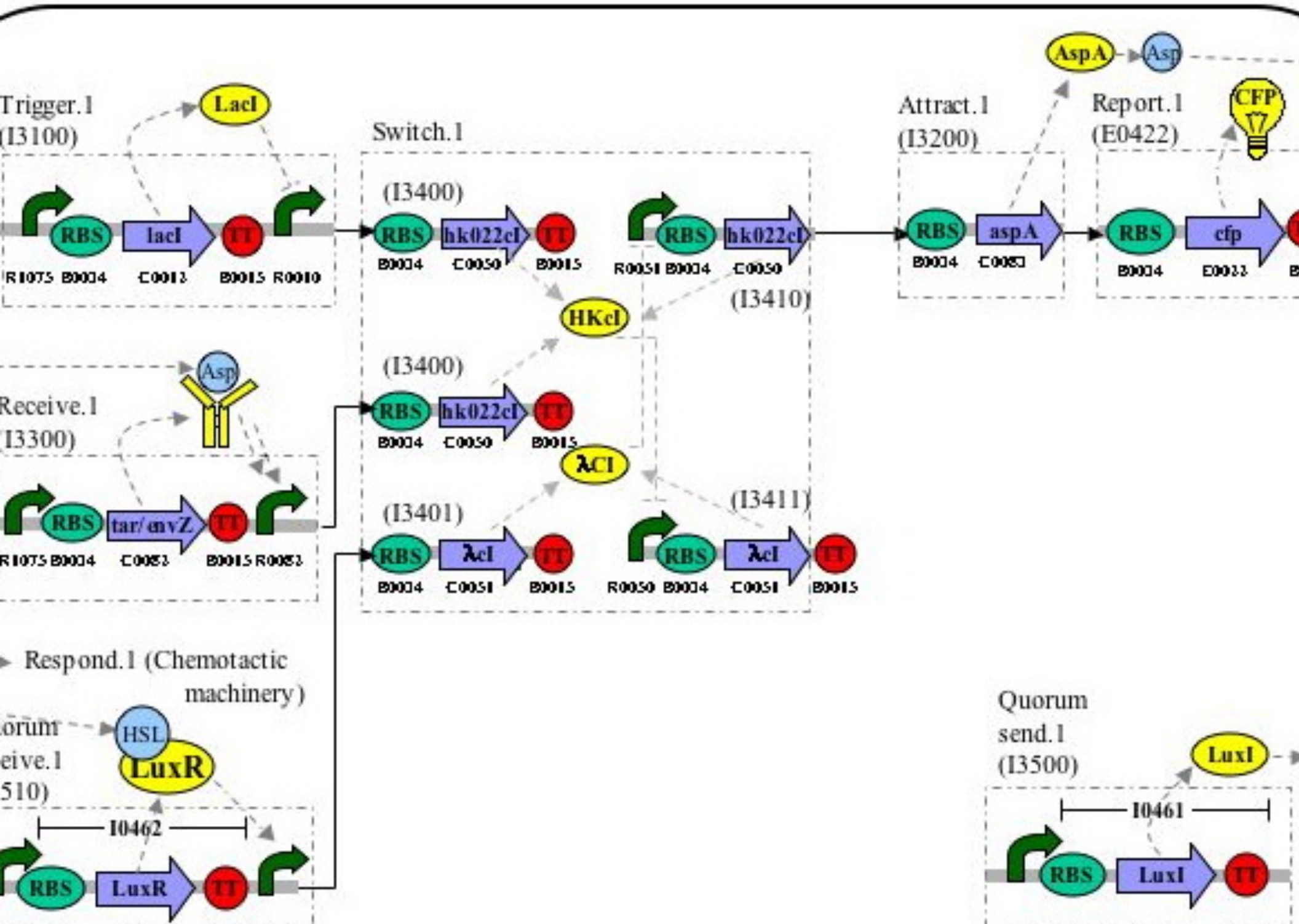



7
6
5
30/100 mL
C2








Trigger.1
(I3100)
LacI
RBS
lacI
TT
R1075 B0034 C0012 B0015 R0010
Switch.1
(I3400)
RBS
hk022cI
TT
B0034 C0050 B0015
R0051 B0034 C0050
HKcI
(I3410)
(I3400)
RBS
hk022cI
TT
B0034 C0050 B0015
λCI
(I3401)
RBS
λcI
TT
B0034 C0051 B0015
R0050 B0034 C0051 B0015
(I3411)
AspA
Asp
Attract.1
(I3200)
RBS
aspA
B0034 C0083
Report.1
(E0422)
CFP
RBS
cfp
B0034 E0022
Asp
Receive.1
(I3300)
RBS
tar/envZ
TT
R1075 B0034 C0083 B0015 R0083
Respond.1 (Chemotactic
machinery)
HSL
LuxR
I0462
RBS
LuxR
TT
Quorum
send.1
(I3500)
LuxI
I0461
RBS
LuxI
TT

```
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<part_author>
Vinay S Mahajan, Voichita D. Marinescu, Brian Chow, Alexander      D Wissner-Gross and Peter Carr IAP, 2003.
</part_author>
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<part_nickname/>
</subpart>
</deep_subparts>
```

- RBS Calculator
- Third-party sequence design interface
- Related Parts
- Part Rating System (Stars)
- Third-Party Tool Menu
- Cargo
- BioCyc
- ROSETTA

BACTOBLOOD

Researchers

Arthur Yu • Austin Day • David Tu
Hannah Cole • Kristin Doan • Kris
Fuller • Nhu Nguyen • Samantha
Vaibhavi Umesh • Vincent Parker

Teaching Assistants

Amin Hajimorad • Farnaz Nowroo
Rickey Bonds

Advisors

John Dueber • Christopher Anders

A test tube could contain all the necessary components: Freeze dried bacteria, growth med indicator powder, Ampicillin salt, etc…

- These tubes could then be given to local villagers to monitor their own water quality themselves
- A good alternative to the widely used Gutzeit method

Saturday

Duration	Event
0:45	**Breakfast / registration**
0:30	**Welcome**
0:45	**Synthetic Biology based on parts**
1:30	**Team introductions**
1:00	**Lunch**
	iGEM in a day (or two):
	Coming up w a project
0:30	ideas, navigating literature
	Navigating registry
0:20	search tool
0:45	catalog/curation/categories/tables
0:10	registry stars
0:30	**Break**
	Finding parts
0:20	dna distribution
0:20	browse / search / QC information / availability
	Making parts
0:20	adding basic parts
0:20	adding composite parts

Sunday

Time	Duration	Event
9:00 AM	0:30	**Breakfa**
		iGEM in a day (or two) continue
		Assembling of par
9:30 AM	0:20	standard asser
9:50 AM	0:20	plasmids
10:10 AM	0:20	proteins, linearized b
10:30 AM	0:30	**Devices / categori**
11:00 AM	0:20	**Measuring parts**
		Sending parts & a
11:20 AM	0:10	review adding a
11:30 AM	0:10	favorites
11:40 AM	0:10	shipping parts to R
11:50 AM	0:10	sequencing / pub
12:00 PM	1:00	**Lunch**
		iGEM 2010:
1:00 PM	0:30	software too
1:30 PM	0:30	requirements / safety
2:00 PM	1:00	iGEM 2011 and f
3:00 PM		**End**