TITLE:
PROPOSED CONCEPTUAL GUIDELINES
FOR THE DESIGN OF A BIOBRICK GRAPHICAL LANGUAGE
AND AN EXECUTIONAL EXAMPLE OF THOSE DESIGN PRINCIPLES.

AUTHOR LIST:
This document is authored by Eric Fernandez (efern211@gmail.com), but uses
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PURPOSE:
As we update the current BioBrick symbols we have an opportunity to look at the
end users of a BioBrick Graphical language and develop design guidelines so that
the new symbols best suit their needs. This document explores those needs,
looks at the design principles necessary to meet them, and puts those principles
into practice by showing an example of a new set of BioBrick symbols.

RELATED REQUESTS FOR COMMENTS:
EXTENDS BBF RFC 16: BioBrick Open Graphical Language (BOGL)

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What's the objective?
Design a standard BioBrick Visual Language that will (a) make it easier for professionals, educators, and students to share their ideas, (b) foster enthusiasm and interest, (c) lower learning curves and barriers by making BioBricks more intuitive and natural to use.

Who is the target? Who uses BioBrick Visuals?
BioBricks are used by two main groups: Professionals and Students.

What's the insight? What do they need from a BioBrick Visual Standard?
These two groups of BioBrick users have very unique needs:

PROFESSIONALS
Professionals need a visual communication standard that is incredibly versatile and efficient. It must have an ability to be shared both in color and in black and white on presentations, the internet, emails, academic papers, and printed pages. It also must have the ability to be easily and efficiently hand drawn so that professionals can quickly share their ideas with one another and with their students via notes, whiteboards, napkins, etc.

STUDENTS
Students are the future of Synth Bio, but they are overcoming a learning curve when they begin studying BioBricks. To become professionals they need to understand the functions of each BioBrick and its place within the BioBrick universe. They want to use a BioBrick visual language that will help make the learning process more intuitive and more fun.

How can a BioBrick Visual Language reach both groups?
BioBricks need to have standard universal symbols so that everyone is speaking the same language. However, as long as the symbols are standardized, the format they are presented in can change based on the abstraction needs of its users. Using this principle we can outline the steps to designing a BioBrick Visual Language:

Step 1:
Design a universal standard of BioBrick visuals that have a high level of usage versatility and abstraction.

Step 2:
Use this standard to design formats that meet (a) the versatility needs of professionals and (b) the educational needs of students.
Step 1:
Design a universal standard of BioBrick visuals that have a high level of usage versatility and abstraction.

Step 2:
Use this standard to design formats that meet:
(a) the versatility needs of professionals
(b) the educational needs of students.

1 STANDARD VISUAL LANGUAGE IS USED TO CREATE 4 USAGE FORMATS
**Universal Standard BioBrick Visual Language**

**Professional**
- **BioBrick Standard Tiles**
  - "Universal Standard BioBrick Visual Language"
- **BioBrick Drawing Format**
- **Study Format**

**Educational**
- **Introduction Format**

**How Is It Shared?**
- **BioBrick Tile File SVG**
  - SVG vector digital files with standard dimensions

**How Does It Help Students?**
- **Colors and symbols quickly show what type of action the BioBrick carries out, where this action takes place, the complexity of the part and its properties.**
- **Serves as a primer for students learning about each BioBrick type. It can be used as a flash card or to create trading card educational games.**

**Creatively Developing**

**Regulatory**

**What? Where? How? Type of Protocol?**
**BIOBRICK STANDARD TILES**

**INFORMAL**

**BIORICK DRAWING FORMAT**

**EXAMPLES**

**EXAMPLES OF USE**

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**BGa_I7100** TetR repressible GFP generator

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<th>R0040</th>
<th>B0030</th>
<th>E0040</th>
<th>B0010</th>
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<tr>
<td>TetR repressible promoter</td>
<td>RBS.1 (strong)</td>
<td>Green fluorescent protein</td>
<td>T1 from E. coli rrnB</td>
<td>TE from coliphageT7</td>
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**NOTE:** THE EDUCATIONAL FORMATS ARE CURRENTLY UNDER DEVELOPMENT AND ARE NOT SHOWN AT THIS TIME.
THE BIO BRICK
LIBRARY

BIORICK
STANDARD
TILES

INFORMAL
BIOBRICK
DRAWING
FORMAT

Terminator

Protein Coding

RNA

Transcription Regulator

Ribosome Binding Site

DNA
THE BIOBRICK LIBRARY

Measurement

Inverter

Protein Generator

Reporter

Composite Part

Signal Sender/Receiver
THE FINAL BIOBRICK VISUAL DESIGNS CAN BE SHARED WITH THE PUBLIC THROUGH THE RELEASE OF A BIOBRICK VISUALIZATION KIT WHICH SHOULD CONTAIN: VECTOR .SVG GRAPHIC FILES, A BIOBRICK FONT, DIAGRAMS FOR CORRECT HAND DRAWINGS, AND A “CORRECT USAGE AND GUIDELINES” DOCUMENT.

ALSO, TO HELP MARKET THE KIT AND PROMOTE ITS USE, A NAME SHOULD BE CHOSEN THAT CAN BE EASILY USED IN LANGUAGE. ONE EXAMPLE WOULD BE TO SHORTEN VISUALIZATION KIT TO “VISKIT”. THEN IT WOULD BE EASY TO PROMOTE COMPLIANCE BY SAYING, “DON’T FORGET TO USE THE VISKIT.”

VERSION NUMBERS WOULD ALLOW THE SYMBOLS TO CHANGE IN SUBTLE WAYS AS SYNTH BIO EVOLVES BY ENSURING COMPLIANCE WITH THE LATEST VERSION.

A MOCK UP EXAMPLE IS SHOWN BELOW.