

## **SCU**

The smallest complete, controllable and significant unit which contributes to the functionality of the process at the nanoscale.

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*Listed from most important to least important*

### **Size Scale**

The average size of the SCU

*Scale: 0nm +*

### **State of the Art**

How close the technology is to being completely commercial.

*Commercial* is when it can be mass manufactured and profitable.

*Scale: 0-3*

0. Theory
1. Prototype
2. Manufacturable
3. Commercial

### **Use**

Tool: a macro scale device that manipulates at a nano level

*Example: AFM*

Device: a manufactured nanoscale object

*Example: CNT*

Nano tool: a nanoscale device that can function as a tool.

*Example: self replication nano machine (theoretical)*

### **Active**

Whether the SCU, by any means, causes a change in a separate atom that involves a change or movement of a particle not including an electron, photon or phonon.

*Scale: Active/Passive*

### **Dimensions Controlled**

The number of dimensions controlled in the manufacturing process.

*Scale: 0-3*

*Example: Ball milling (0 controlled)*

### **“Degrees of Freedom”**

The number of attributes the SCU can control.

*Scale: 0 +*

*Example: Insulation protein can envelop nanoparticles and leave it's “holder” open or closed on demand.*

## **Assembly Method**

*Scale:*

Bottom-up: Lowest level components made first and combined into higher level components

*Example:* SAMs

Top-down: Approach which takes a larger block of material and whittles away what isn't needed.

*Example:* Ball milling

Combination: A process which uses both forms of creation.

*Example:* Photolithograph

## **Assembly Precision**

The reliability of perfect duplication.

*Scale:* 0 – 1

*Example:* Ball milling (~0) and Photolithograph (~1)

## **Bio-Integration Index**

Whether or not the SCU has the ability to interact with naturally occurring or commercial biological materials.

*Scale:* Yes/No

*Example:* Bio bar codes

## **Forces**

Forces, ranked by importance, involved in enabling the functionality of the SCU.

## **Materials**

Type of materials used in the construction of the SCU.

## **Organic**

Relating or belonging to the class of chemical compounds having a carbon basis; "hydrocarbons are organic compounds" ([www.cogsci.princeton.edu/cgi-bin/webwn](http://www.cogsci.princeton.edu/cgi-bin/webwn))

*Scale:* Organic/Mixed/Inorganic

## **Homogeneity**

Homogeneous: Whether the SCU is a part of a homogeneous mixture.

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## **Dangerous**

Active  
Biological integration  
Size scale  
Use

*“Most dangerous”*

Active  
Easily bio-integrated  
Small scale  
Nanotool

## **NanoTechie**

Size scale  
Dimensions controlled  
Deterministic assembly (assembly precision)  
Active

*“Most nanotechie”*

Small scale  
More dimensions controlled  
Almost totally deterministic  
Active

*What is nanotechnology?*

The technology that pertains to the controlled manufacturing or application at the nanoscale.

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## **Applications**

1. Medical diagnosis
2. Optics
3. Increasing mechanical strengths (ex. Light bullet proof vest, stronger textiles, stronger bricks)
4. Sensors (gas detection, gas classification)