Cost of genome sequencing.

Moore's law for computing costs.

Next generation sequencers enter the market.

The price of sequencing a whole human genome hovers around $5,000 and is expected to drop even lower.

Total number of publications

Calendar Quarter
promoter (verb) enhancer (adjective) gene (noun) terminator (punctuation)
Twinkle twinkle **BIG** star.
Twinkle twinkle little **BIG** star.

- **promoter** (verb)
- **enhancer** (adjective)
- **gene** (noun)
- **terminator** (punctuation)
promoter (verb) enhancer (adjective) gene (noun) terminator (punctuation)

Twinkle twinkle star.
Twinkle twinkle little star.
Need to be able to find a specific spot on the genome.
EX VIVO

1. Remove cells
2. Correct cells
3. Autologous transplantation of corrected cells
Timothy Brown
(Berlin Patient)
Mucopolysaccharidoses

Muscular dystrophy
Cystic Fibrosis Hemophilia
Phenylketonuria
Polycystic kidney disease
Rett's Syndrome Huntington's Disease
ALS Sickle Cell Disease
Tay-Sachs disease Lafora's Disease
Neurofibromatosis type 1

Lysosomal acid lipase deficiency
myotonic dystrophy
Retinitis Pigmentosa
Usher Syndrome
print >10,000 guide RNAs

package into viruses

generate library of mutant cells
start with a comprehensive library of cells with distinct perturbations

add virus of interest (e.g. HBV, ebola, etc)

analyze surviving cells to identify gene targets
start with a comprehensive library of seeds with distinct perturbations

plant under desired condition

analyze surviving species to identify gene targets
Computational Pipeline
Machine Learning

Novel Enzymes

NCBI
DDBJ
JGI
J. Craig Venter Institute
EMBL
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