DNA 2.0

THE BUILDING BLOCKS OF LIFE. BUILT FOR YOU.

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GeneDesigner
The only software you need for custom gene design
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We would be delighted to hear your thoughts...
...ideas and questions about our products, what your needs are and how we can serve you better.
1-877-DNA-TOGO or info@dna20.com

Produced by:

Magda Bartilson, Ph.D.
Science Editor
BioWriterWiz

Gene Synthesis & Protein Engineering News

by DNA2.0, Inc. NOVEMBER/DECEMBER 2005

Dear Fellow Scientist,

You know that **DNA2.0** is in the business of designing custom genes for individual customers. But did you know that we also design and build off-the-shelf gene sets available in our **PlanetGene** online gene catalog?

The latest addition to PlanetGene includes viral genes. Our first set of more than 200 viral genes, including genes from HIV, SARS and Avian Flu Virus, has been optimized for *E. coli* expression by incorporating features that eliminate common problems specific to expressing viral sequences. The viral genes also include all of the design features used for the rest of the PlanetGene catalog, such as codon-optimization and convenient restriction sites to allow cloning into most commercial vectors.

Of the over 50,000 genes now in PlanetGene you can also find codon-optimized human genes, RNAi resistant genes and fluorescent protein genes, with more on the way. The PlanetGene catalog is searchable by keyword, Genbank accession number or protein sequence BLAST. If the gene you want is in PlanetGene, you can order it right away, which saves you time and design effort. Then again, we are always happy to help modify a sequence in our catalog to make it fit your needs even better. Best of all, the PlanetGene genes are often ready-to-go and a cheaper alternative to custom designed genes.

If you wonder exactly how we codon-optimize our synthetic genes, both custom made genes and those in the PlanetGene catalog, please refer to our paper "Codon

Ann Klefbohm
Graphic Designer
base media

Bias and Heterologous Expression" by Gustafsson C, Govindarajan S, Minshull J., published in *TIBTech* 2004 Jul; **22**(7) 346-353. We have received a lot of attention for this paper and it was the 10th most downloaded *TIBTech* paper in the last year. Let us know if you want a copy.

All of you who are planning to come to the ASCB meeting in San Francisco, 10-14 December, please stop by our booth #323 and we can tell you more about PlanetGene, codon optimization, GeneDesigner and much more.

All the best,

Jeremy Minshull, Ph.D.
President, DNA2.0
1-877-DNA-TOGO
info@DNA20.com

DNA 2.0
www.dna20.com

PlanetGene now includes expression-ready viral genes

Search viral gene designs

If you work with viral genes you know that they can be a pain to express. Having such small genomes, viruses pack open reading frames and regulatory sequences densely and often in an overlapping fashion. Cis-acting elements and other regulatory sequences that are encoded within open reading frames often interfere with gene expression, and the fat protein band you want to see on your gel remain absent. Don't panic, help is on the way.

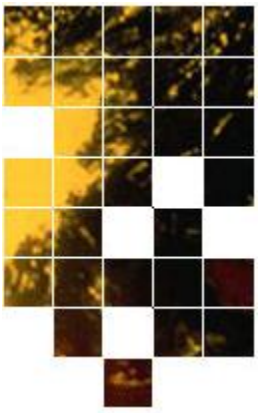
New PlanetGene viral sequences make protein production a breeze
The over 200 viral genes that are now in PlanetGene have been optimized to exclude interfering sequences and are codon-optimized for *E. coli* expression while retaining the wild-type amino acid sequence. We have used the same algorithm as for our RNAi resistant genes, which means that the gene variant sequences are as different as possible from the wild-type DNA sequence, while retaining optimal codon bias. Our software **GeneDesigner** includes this algorithm. This approach ensures that interfering regulatory sequences have the highest likelihood of being avoided, ensuring a better chance for successful gene expression.

One scientist we worked with gave us four viral genes to synthesize, none of which had ever produced enough protein to give more than a faint shadow of a band on a gel. We designed synthetic genes using the approach described above and received

a phone call just two weeks later from a very happy scientist who now had four fat bands on her PAGE.

Synthetic genes by the point-click-and-ship approach—that's PlanetGene
Selling synthetic genes through a catalog is a new concept—but how did we come up with such an idea? Well, we often saw that different customers ordered the same gene independently and thought that instead of designing and synthesizing the gene from scratch every time, we make it once and offer it to all our customers. Consequently, you will get the gene much faster through PlanetGene and at a lower price.

- Over **50,000 predesigned genes** in a searchable online catalog.
- **Faster and more affordable** than custom gene synthesis.
- Integrity of each gene is verified by double stranded DNA sequencing to ensure **100% accuracy**.



PlanetGene is an online resource for optimized genes. Each gene is a synthetic construct that has been optimized for a specific application, not for the function nature evolved it to fulfill.

Search the PlanetGene database

Email or call us for questions and suggestions.

support@dna20.com for tech support
sales@dna20.com for sales
info@dna20.com for general information.
Phone: 1-650-853-8347
Toll free: 1-877-DNA-TOGO

Come see us at the ASCB Meeting

45th Annual Meeting
The American Society for Cell Biology
December 10-14, 2005
Moscone Center San Francisco

We hope to see you by our both (323) or by our poster
Look for Louise Rafty or Claes Gustafsson

Abstract from DNA2.0:

Controlling Gene Expression Using a Synthetic Biology Approach

Gene expression is naturally regulated at multiple levels including transcription, translation and RNA processing. Cell biology experiments frequently require modifications of these regulatory systems, for example to express a heterologous protein, or to prevent expression of an endogenous gene. We have used the degeneracy of the genetic code to design genes that encode proteins with unchanged amino acid sequences but altered translational and RNA processing properties.

We have performed a thorough statistical analysis of the codon distribution in all 4288 *E. coli* ORFs and analyzed the patterns of codon bias. The codon distribution pattern is distinctly different in the first 20 amino acids of ORFs. This could be attributed to the ribosome switching from initiation to elongation mode. Contrary to several other studies, we do not find codon-pair bias to deviate from what would be expected. By using the codon bias elucidated from this analysis we have designed and synthesized genes for fungal and plant cytochrome P450s that express well in *E. coli*.

RNA interference is a transforming technology that can shut down gene expression using an endogenous RNA processing pathway. However, as with antisense technology two decades ago, non-specific effects are becoming apparent. To control for such effects it is possible to redesign genes so that their mRNAs encode the wild type protein but share only 60-70% sequence identity with the original. We have found that such genes are resistant to both single RNAi species as well as wild type mRNA digested with DICER. Addition of RNAi-resistant genes should restore the wild type phenotype if the RNA interference is specific. By knocking out the endogenous gene and making mutations in added-back RNAi-resistant genes, the effects of amino acid changes on gene function can be easily tested in genetically intractable systems.

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