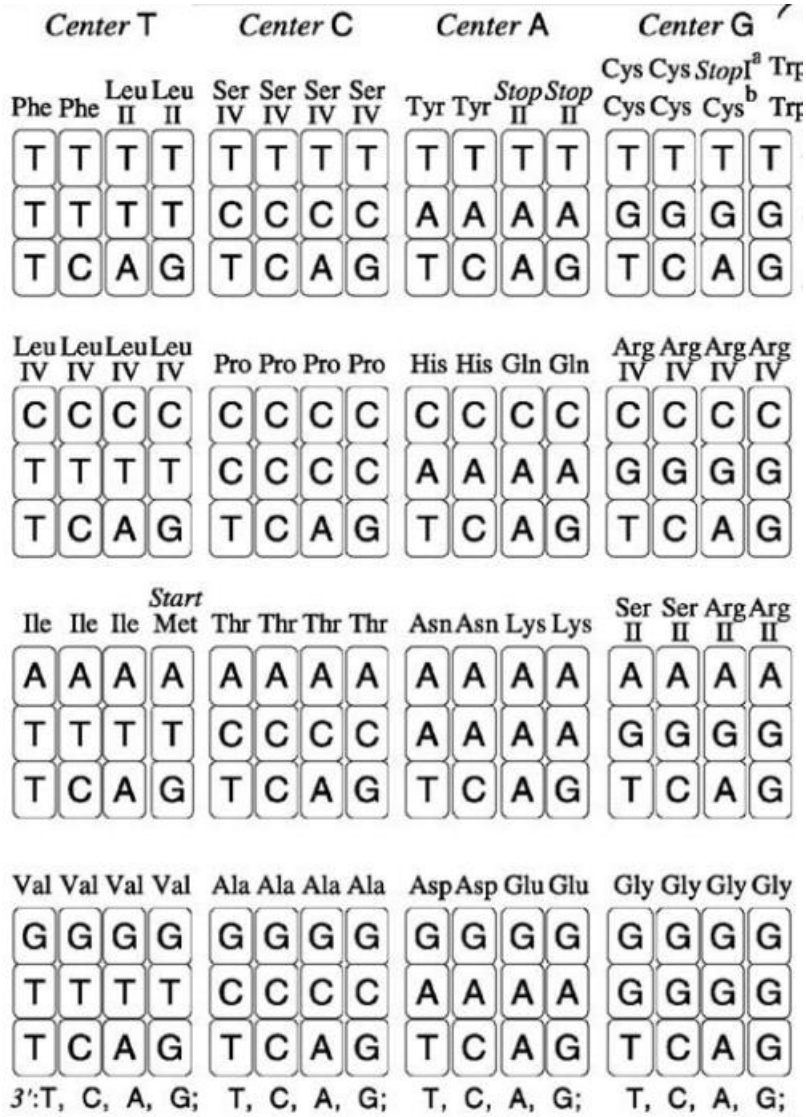
God's Rubik Cube

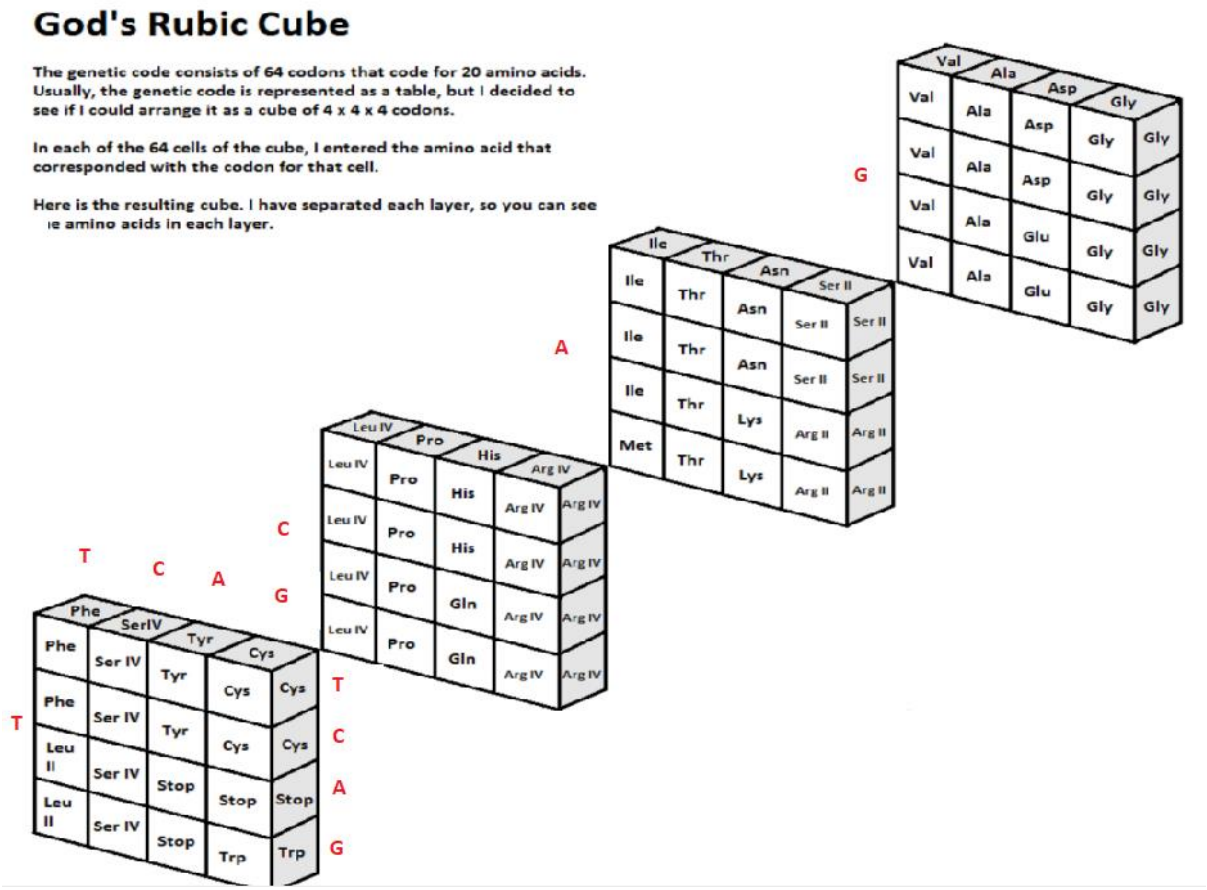
By Craig Paardekooper May 21st 2022

Here is the genetic code table



There are 4 different bases T, C, A, G. They form triplets, and each triplet (called a codon) codes for an amino-acid or a STOP signal. The table shows which codons code for which amino acid or STOP signals.

There are 64 codons altogether – 4 x 4 x 4 – which suggests that the codons can be arranged to form a cube.



What I did next was took an entire human chromosome – chromosome 8 – which has 145614000 bases, and I counted the frequency with which each codon occurs. Here are the results –

---	T	C	A	G	
T	1894126	1079922	1030676	986742	T
	974464	725152	552204	685895	C
	1028045	954834	1029764	956549	A
	934543	102959	633003	866825	G
C	980080	825447	905779	120506	T
	786665	590278	712845	103436	C
	630647	856307	920274	99975	A
	946678	118529	958333	120927	G
A	1241161	781377	1235136	781794	T
	652764	544416	723543	662572	C
	1030732	992157	1888070	1082083	A
	900229	120269	976472	826984	G
G	713015	656626	653591	541819	T
	449575	529503	451488	531115	C
	555625	692978	986558	739664	A
	714665	103992	787684	591361	G

I used software to do the counting. The software was written in Visual Basic computer language, and used to create a windows form project.

I then arranged the frequencies so that they matched the layers of the cube –

1894126	1079922	1030676	986742
974464	725152	552204	685895
1028045	954834	1029764	956549
934543	102959	633003	866825
980080	825447	905779	120506
786665	590278	712845	103436
630647	856307	920274	99975
946678	118529	958333	120927
1241161	781377	1235136	781794
652764	544416	723543	662572
1030732	992157	1888070	1082083
900229	120269	976472	826984
713015	656626	653591	541819
449575	529503	451488	531115
555625	692978	986558	739664
714665	103992	787684	591361

Now all that remained was to sum the faces of the cube. A cube has 6 faces –

Left

Right

Top

Bottom

Front

Back

Here are the results of the summations. I simply summed the frequencies of each codon on each face.

Left face

1894126	1079922	1030676	986742
974464	725152	552204	685895
1028045	954834	1029764	956549
934543	102959	633003	866825
980080	825447	905779	120506
786665	590278	712845	103436
630647	856307	920274	99975
946678	118529	958333	120927
1241161	781377	1235136	781794
652764	544416	723543	662572
1030732	992157	1888070	1082083
900229	120269	976472	826984
713015	656626	653591	541819
449575	529503	451488	531115
555625	692978	986558	739664
714665	103992	787684	591361

The Left Face summed to 14433014

Right Face

1894126	1079922	1030676	986742
974464	725152	552204	685895
1028045	954834	1029764	956549
934543	102959	633003	866825
980080	825447	905779	120506
786665	590278	712845	103436
630647	856307	920274	99975
946678	118529	958333	120927
1241161	781377	1235136	781794
652764	544416	723543	662572
1030732	992157	1888070	1082083
900229	120269	976472	826984
713015	656626	653591	541819
449575	529503	451488	531115
555625	692978	986558	739664
714665	103992	787684	591361

The Right Face summed to 9698247

Top Face

1894126	1079922	1030676	986742
974464	725152	552204	685895
1028045	954834	1029764	956549
934543	102959	633003	866825
980080	825447	905779	120506
786665	590278	712845	103436
630647	856307	920274	99975
946678	118529	958333	120927
1241161	781377	1235136	781794
652764	544416	723543	662572
1030732	992157	1888070	1082083
900229	120269	976472	826984
713015	656626	653591	541819
449575	529503	451488	531115
555625	692978	986558	739664
714665	103992	787684	591361

The Top Face summed to 14427797

Bottom Face

1894126	1079922	1030676	986742
974464	725152	552204	685895
1028045	954834	1029764	956549
934543	102959	633003	866825
980080	825447	905779	120506
786665	590278	712845	103436
630647	856307	920274	99975
946678	118529	958333	120927
1241161	781377	1235136	781794
652764	544416	723543	662572
1030732	992157	1888070	1082083
900229	120269	976472	826984
713015	656626	653591	541819
449575	529503	451488	531115
555625	692978	986558	739664
714665	103992	787684	591361

The Bottom Face summed to 9703453

Front Face

1894126	1079922	1030676	986742
974464	725152	552204	685895
1028045	954834	1029764	956549
934543	102959	633003	866825
980080	825447	905779	120506
786665	590278	712845	103436
630647	856307	920274	99975
946678	118529	958333	120927
1241161	781377	1235136	781794
652764	544416	723543	662572
1030732	992157	1888070	1082083
900229	120269	976472	826984
713015	656626	653591	541819
449575	529503	451488	531115
555625	692978	986558	739664
714665	103992	787684	591361

The Front Face summed to 14435703

Back Face

1894126	1079922	1030676	986742
974464	725152	552204	685895
1028045	954834	1029764	956549
934543	102959	633003	866825
980080	825447	905779	120506
786665	590278	712845	103436
630647	856307	920274	99975
946678	118529	958333	120927
1241161	781377	1235136	781794
652764	544416	723543	662572
1030732	992157	1888070	1082083
900229	120269	976472	826984
713015	656626	653591	541819
449575	529503	451488	531115
555625	692978	986558	739664
714665	103992	787684	591361

The Back Face summed to 9699259

So we have

Left + Right	**=**	**14433014 + 9698247**	**=**	**24131261**
Top + Bottom	**=**	**14427797 + 9703453**	**=**	**24131250**
Front + Back	**=**	**14435703 + 9699259**	**=**	**24134962**

So you can see that we have a Rubik Cube where the sum of the frequencies of the codons on opposite faces is always the same.

God's Rubik Cube !

This is the result for human chromosome 8.

I will repeat this procedure for each human chromosome

The Code

```
Imports System.IO
Public Class Form1


    Dim Count As Integer
    Dim TotalCodons As Long
    Dim OldTotalCodons As Long

    Dim TTT As Long = 0
    Dim TTC As Long = 0
    Dim TTA As Long = 0
    Dim TTG As Long = 0
    Dim TCT As Long = 0
    Dim TCC As Long = 0
    Dim TCA As Long = 0
    Dim TCG As Long = 0
    Dim TAT As Long = 0
    Dim TAC As Long = 0
    Dim TAA As Long = 0
    Dim TAG1 As Long = 0
    Dim TGT As Long = 0

    Dim TGC As Long = 0
    Dim TGA As Long = 0
    Dim TGG As Long = 0
    Dim CTT As Long = 0
    Dim CTC As Long = 0
    Dim CTA As Long = 0
    Dim CTG As Long = 0
    Dim CCT As Long = 0
```

```
Dim CCC As Long = 0
Dim CCA As Long = 0
Dim CCG As Long = 0
Dim CAT As Long = 0
Dim CAC As Long = 0
Dim CAA As Long = 0
Dim CAG As Long = 0
Dim CGT As Long = 0
Dim CGC As Long = 0
Dim CGA As Long = 0
Dim CGG As Long = 0
Dim ATT As Long = 0
Dim ATC As Long = 0
Dim ATA As Long = 0
Dim ATG As Long = 0
Dim ACT As Long = 0
Dim ACC As Long = 0
Dim ACA As Long = 0
Dim ACG As Long = 0
Dim AAT As Long = 0
Dim AAC As Long = 0
Dim AAA As Long = 0
Dim AAG As Long = 0
Dim AGT As Long = 0
Dim AGC As Long = 0
Dim AGA As Long = 0
Dim AGG As Long = 0
Dim GTT As Long = 0
Dim GTC As Long = 0
Dim GTA As Long = 0
Dim GTG As Long = 0
```

```
Dim GCT As Long = 0
Dim GCC As Long = 0
Dim GCA As Long = 0
Dim GCG As Long = 0
Dim GAT As Long = 0
Dim GAC As Long = 0
Dim GAA As Long = 0
Dim GAG As Long = 0
Dim GGT As Long = 0
Dim GGC As Long = 0

Dim GGA As Long = 0
Dim GGG As Long = 0
Dim NNN As Long = 0

Dim N As Integer = 0
Dim x As Integer
Dim Multiline As String = ""

Dim mTTT As Single = 0
Dim mTTC As Single = 0
Dim mTTA As Single = 0
Dim mTTG As Single = 0
Dim mTCT As Single = 0
Dim mTCC As Single = 0
Dim mTCA As Single = 0
Dim mTCG As Single = 0
Dim mTAT As Single = 0
Dim mTAC As Single = 0
Dim mTAA As Single = 0
Dim mTAG1 As Single = 0
```

```
Dim mTGT As Single = 0


Dim mTGC As Single = 0
Dim mTGA As Single = 0
Dim mTGG As Single = 0
Dim mCTT As Single = 0
Dim mCTC As Single = 0
Dim mCTA As Single = 0
Dim mCTG As Single = 0
Dim mCCT As Single = 0
Dim mCCC As Single = 0
Dim mCCA As Single = 0
Dim mCCG As Single = 0
Dim mCAT As Single = 0
Dim mCAC As Single = 0
Dim mCAA As Single = 0
Dim mCAG As Single = 0
Dim mCGT As Single = 0
Dim mCGC As Single = 0
Dim mCGA As Single = 0
Dim mCGG As Single = 0
Dim mATT As Single = 0
Dim mATC As Single = 0
Dim mATA As Single = 0
Dim mATG As Single = 0
Dim mACT As Single = 0
Dim mACC As Single = 0
Dim mACA As Single = 0
Dim mACG As Single = 0
Dim mAAT As Single = 0
Dim mAAC As Single = 0
```

```
Dim mAAA As Single = 0
Dim mAAG As Single = 0
Dim mAGT As Single = 0
Dim mAGC As Single = 0
Dim mAGA As Single = 0
Dim mAGG As Single = 0
Dim mGTT As Single = 0
Dim mGTC As Single = 0
Dim mGTA As Single = 0
Dim mGTG As Single = 0
Dim mGCT As Single = 0
Dim mGCC As Single = 0
Dim mGCA As Single = 0
Dim mGCG As Single = 0
Dim mGAT As Single = 0
Dim mGAC As Single = 0
Dim mGAA As Single = 0
Dim mGAG As Single = 0
Dim mGGT As Single = 0
Dim mGGC As Single = 0

Dim mGGA As Single = 0
Dim mGGG As Single = 0



Private Sub Button2_Click(sender As Object, e As EventArgs) Handles Button2.Click

  N = 300
  For x = 22 To 22 Step 1
    Count = 0
    Dim path As String = "C:\Users\User\Downloads\chromosome8.fasta"
```

```
        Dim Chromosome As String = "Chromosome21"



        '' Each line has 70 bases
        Dim sr As StreamReader = New StreamReader(path)

        Do While (sr.Peek() >= 0)
            Count += 1
            If Count Mod N <> 0 Then
                Application.DoEvents()
                Multiline &= sr.ReadLine

            Else

                Multiline = Multiline.Replace(vbCrLf, "")
                Multiline = Multiline.Replace(vbLf, "")
                Multiline = Multiline.Replace(" ", "")
                ProcessLines(Multiline, x)
                Multiline = ""
            End If
        Loop
    Next
End Sub

Sub ProcessLines(MultiLine, Chromosome)
    Dim Bin As String = ""
    Dim FirstLetter As String = ""
    Dim SecondLetter As String = ""
    Dim ThirdLetter As String = ""
```

```
If MultiLine.Length > 6 Then
   For y As Integer = 0 To MultiLine.length - 3 Step 3
      Bin = MultiLine.Substring(y, 3)

      Select Case Bin

         Case "TTT"
            TTT += 1
            TotalCodons += 1
            mTTT += 165.1891
         Case "TTC"
            TTC += 1
            TotalCodons += 1
            mTTC += 165.1891
         Case "TTA"
            TTA += 1
            TotalCodons += 1
            mTTA += 131.17292
         Case "TTG"
            TTG += 1
            TotalCodons += 1
            mTTG += 131.17292
         Case "TCT"
            TCT += 1
            TotalCodons += 1
            mTCT += 105.042593085
         Case "TCC"
            TCC += 1
            TotalCodons += 1
```

```
    mTCC += 105.042593085
Case "TCA"
    TCA += 1
    TotalCodons += 1
    mTCA += 105.042593085
Case "TCG"
    TCG += 1
    TotalCodons += 1
    mTCG += 105.042593085
Case "TAT"
    TAT += 1
    TotalCodons += 1
    mTAT += 181.18854
Case "TAC"
    TAC += 1
    TotalCodons += 1
    mTAC += 181.18854
Case "TAA"
    TAA += 1
    TotalCodons += 1
Case "TAG"
    TAG1 += 1
    TotalCodons += 1
Case "TGT"
    TGT += 1
    TotalCodons += 1
    mTGT += 121.1582
Case "TGC"
    TGC += 1
    TotalCodons += 1
    mTGC += 121.1582
```

Case "TGA"

TGA += 1

TotalCodons += 1

mTGA += 121.1582

Case "TGG"

TGG += 1

TotalCodons += 1

mTGG += 204.22518

Case "CTT"

CTT += 1

TotalCodons += 1

mCTT += 131.17292

Case "CTC"

CTC += 1

TotalCodons += 1

mCTC += 131.17292

Case "CTA"

CTA += 1

TotalCodons += 1

mCTA += 131.17292

Case "CTG"

CTG += 1

TotalCodons += 1

mCTG += 131.17292

Case "CCT"

CCT += 1

TotalCodons += 1

mCCT += 115.06332853

```
Case "CCC"
   CCC += 1
   TotalCodons += 1
   mCCC += 115.06332853
Case "CCA"
   CCA += 1
   TotalCodons += 1
   mCCA += 115.06332853
Case "CCG"
   CCG += 1
   TotalCodons += 1
   mCCG += 115.06332853
Case "CAT"
   CAT += 1
   TotalCodons += 1
   mCAT += 155.069476538
Case "CAC"
   CAC += 1
   TotalCodons += 1
   mCAC += 155.069476538
Case "CAA"
   CAA += 1
   TotalCodons += 1
Case "CAG"
   CAG += 1
   TotalCodons += 1
Case "CGT"
   CGT += 1
   TotalCodons += 1
Case "CGC"
   CGC += 1
```

```
    TotalCodons += 1
Case "CGA"
    CGA += 1
    TotalCodons += 1
Case "CGG"
    CGG += 1
    TotalCodons += 1
Case "ATT"
    ATT += 1
    TotalCodons += 1
Case "ATC"
    ATC += 1
    TotalCodons += 1
Case "ATA"
    ATA += 1
    TotalCodons += 1
Case "ATG"
    ATG += 1
    TotalCodons += 1
Case "ACT"
    ACT += 1
    TotalCodons += 1
Case "ACC"
    ACC += 1
    TotalCodons += 1
Case "ACA"
    ACA += 1
    TotalCodons += 1
Case "ACG"

    ACG += 1
```

```
    TotalCodons += 1
Case "AAT"
    AAT += 1
    TotalCodons += 1
Case "AAC"
    AAC += 1
    TotalCodons += 1
Case "AAA"
    AAA += 1
    TotalCodons += 1
Case "AAG"
    AAG += 1
    TotalCodons += 1
Case "AGT"
    AGT += 1
    TotalCodons += 1
Case "AGC"
    AGC += 1
    TotalCodons += 1
Case "AGA"
    AGA += 1
    TotalCodons += 1
Case "AGG"
    AGG += 1
    TotalCodons += 1
Case "GTT"
    GTT += 1
    TotalCodons += 1
Case "GTC"
    GTC += 1
    TotalCodons += 1
```

```
Case "GTA"
   GTA += 1
   TotalCodons += 1
Case "GTG"
   GTG += 1
   TotalCodons += 1

Case "GCT"
   GCT += 1
   TotalCodons += 1
Case "GCC"
   GCC += 1
   TotalCodons += 1

Case "GCA"
   GCA += 1
   TotalCodons += 1
Case "GCG"
   GCG += 1
   TotalCodons += 1
Case "GAT"
   GAT += 1
   TotalCodons += 1
Case "GAC"
   GAC += 1
   TotalCodons += 1
Case "GAA"
   GAA += 1
   TotalCodons += 1

Case "GAG"
```

```
                GAG += 1
                TotalCodons += 1
            Case "GGT"
                GGT += 1
                TotalCodons += 1
            Case "GGC"
                GGC += 1
                TotalCodons += 1
            Case "GGA"
                GGA += 1
                TotalCodons += 1
            Case "GGG"
                GGG += 1
                TotalCodons += 1
            Case "NNN"
                NNN += 1
                TotalCodons += 1


        End Select
    Next
End If

    RichTextBox1.Text =
"TTT =" & TTT & vbTab & vbTab & vbTab & vbTab & "AAA = " & AAA & vbTab & vbTab & vbTab &
"Ratio = " & AAA / TTT & vbCrLf &
"TTC = " & TTC & vbTab & vbTab & vbTab & vbTab & "GAA = " & GAA & vbTab & vbTab & vbTab &
"Ratio = " & TTC / GAA & vbCrLf &
"TTA = " & TTA & vbTab & vbTab & vbTab & vbTab & "TAA = " & TAA & vbTab & vbTab & vbTab &
"Ratio = " & TTA / TAA & vbCrLf &
"TTG = " & TTG & vbTab & vbTab & vbTab & vbTab & "CAA = " & CAA & vbTab & vbTab & vbTab &
"Ratio = " & TTG / CAA & vbCrLf &
```

"TCT = " & TCT & vbTab & vbTab & vbTab & vbTab & "AGA = " & AGA & vbTab & vbTab & vbTab &
"Ratio = " & TCT / AGA & vbCrLf &

"TCC = " & TCC & vbTab & vbTab & vbTab & vbTab & "GGA = " & GGA & vbTab & vbTab & vbTab &
"Ratio = " & TCC / GGA & vbCrLf &

"TCA = " & TCA & vbTab & vbTab & vbTab & vbTab & "TGA = " & TGA & vbTab & vbTab & vbTab &
"Ratio = " & TCA / TGA & vbCrLf &

"TCG = " & TCG & vbTab & vbTab & vbTab & vbTab & "CGA = " & CGA & vbTab & vbTab & vbTab &
"Ratio = " & TCG / CGA & vbCrLf & vbCrLf &

"CTT = " & CTT & vbTab & vbTab & vbTab & vbTab & "AAG = " & AAG & vbTab & vbTab & vbTab &
"Ratio = " & CTT / AAG & vbCrLf &

"CTC = " & CTC & vbTab & vbTab & vbTab & vbTab & "GAG = " & GAG & vbTab & vbTab & vbTab &
"Ratio = " & CTC / GAG & vbCrLf &

"CTA = " & CTA & vbTab & vbTab & vbTab & vbTab & "TAG = " & TAG1 & vbTab & vbTab & vbTab
& "Ratio = " & CTA / TAG1 & vbCrLf &

"CTG = " & CTG & vbTab & vbTab & vbTab & vbTab & "CAG = " & CAG & vbTab & vbTab & vbTab &
"Ratio = " & CTG / CAG & vbCrLf &

"CCT = " & CCT & vbTab & vbTab & vbTab & vbTab & "AGG = " & AGG & vbTab & vbTab & vbTab &
"Ratio = " & CCT / AGG & vbCrLf &

"CCC = " & CCC & vbTab & vbTab & vbTab & vbTab & "GGG = " & GGG & vbTab & vbTab & vbTab &
"Ratio = " & CCC / GGG & vbCrLf &

"CCA = " & CCA & vbTab & vbTab & vbTab & vbTab & "TGG = " & TGG & vbTab & vbTab & vbTab &
"Ratio = " & CCA / TGG & vbCrLf &

"CCG = " & CCG & vbTab & vbTab & vbTab & vbTab & "CGG = " & CGG & vbTab & vbTab & vbTab &
"Ratio = " & CCG / CGG & vbCrLf & vbCrLf &

"ATT = " & ATT & vbTab & vbTab & vbTab & vbTab & "AAT = " & AAT & vbTab & vbTab & vbTab &
"Ratio = " & ATT / AAT & vbCrLf &

"ATC = " & ATC & vbTab & vbTab & vbTab & vbTab & "GAT = " & GAT & vbTab & vbTab & vbTab &
"Ratio = " & ATC / GAT & vbCrLf &

"ATA = " & ATA & vbTab & vbTab & vbTab & vbTab & "TAT = " & TAT & vbTab & vbTab & vbTab &
"Ratio = " & ATA / TAT & vbCrLf &

"ATG = " & ATG & vbTab & vbTab & vbTab & vbTab & "CAT = " & CAT & vbTab & vbTab & vbTab &
"Ratio = " & ATG / CAT & vbCrLf &

"ACT = " & ACT & vbTab & vbTab & vbTab & vbTab & "AGT = " & AGT & vbTab & vbTab & vbTab &
"Ratio = " & ACT / AGT & vbCrLf &

"ACC = " & ACC & vbTab & vbTab & vbTab & vbTab & "GGT = " & GGT & vbTab & vbTab & vbTab &
"Ratio = " & ACC / GGT & vbCrLf &

"ACA = " & ACA & vbTab & vbTab & vbTab & vbTab & "TGT = " & TGT & vbTab & vbTab & vbTab &
"Ratio = " & ACA / TGT & vbCrLf &

```
"ACG = " & ACG & vbTab & vbTab & vbTab & vbTab & "CGT = " & CGT & vbTab & vbTab & vbTab &
"Ratio = " & ACG / CGT & vbCrLf & vbCrLf &

"GTT = " & GTT & vbTab & vbTab & vbTab & vbTab & "AAC = " & AAC & vbTab & vbTab & vbTab &
"Ratio = " & GTT / AAC & vbCrLf &

"GTC = " & GTC & vbTab & vbTab & vbTab & vbTab & "GAC = " & GAC & vbTab & vbTab & vbTab &
"Ratio = " & GTC / GAC & vbCrLf &

"GTA = " & GTA & vbTab & vbTab & vbTab & vbTab & "TAC = " & TAC & vbTab & vbTab & vbTab &
"Ratio = " & GTA / TAC & vbCrLf &

"GTG = " & GTG & vbTab & vbTab & vbTab & vbTab & "CAC = " & CAC & vbTab & vbTab & vbTab &
"Ratio = " & GTG / CAC & vbCrLf &

"GCT = " & GCT & vbTab & vbTab & vbTab & vbTab & "AGC = " & AGC & vbTab & vbTab & vbTab &
"Ratio = " & GCT / AGC & vbCrLf &

"GCC = " & GCC & vbTab & vbTab & vbTab & vbTab & "GGC = " & GGC & vbTab & vbTab & vbTab &
"Ratio = " & GCC / GGC & vbCrLf &

"GCA = " & GCA & vbTab & vbTab & vbTab & vbTab & "TGC = " & TGC & vbTab & vbTab & vbTab &
"Ratio = " & GCA / TGC & vbCrLf &

"GCG = " & GCG & vbTab & vbTab & vbTab & vbTab & "CGC = " & CGC & vbTab & vbTab & vbTab &
"Ratio = " & GCG / CGC & vbCrLf & vbCrLf &

"NNN (unknown) = " & NNN & vbCrLf & vbCrLf &

"TOTAL = " & TotalCodons



    Label2.Text = "Counting at rate of " & Rate * 3 & " bases per second"



    RichTextBox3.Text =

TTT & vbTab & AAA & vbCrLf &

TTC & vbTab & GAA & vbCrLf &

TTA & vbTab & TAA & vbCrLf &

TTG & vbTab & CAA & vbCrLf &

TCT & vbTab & AGA & vbCrLf &

TCC & vbTab & GGA & vbCrLf &

TCA & vbTab & TGA & vbCrLf &
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TCG & vbTab & CGA & vbCrLf &
CTT & vbTab & AAG & vbCrLf &
CTC & vbTab & GAG & vbCrLf &
CTA & vbTab & TAG1 & vbCrLf &
CTG & vbTab & CAG & vbCrLf &
CCT & vbTab & AGG & vbCrLf &
CCC & vbTab & GGG & vbCrLf &
CCA & vbTab & TGG & vbCrLf &
CCG & vbTab & CGG & vbCrLf &
ATT & vbTab & AAT & vbCrLf &
ATC & vbTab & GAT & vbCrLf &
ATA & vbTab & TAT & vbCrLf &
ATG & vbTab & CAT & vbCrLf &
ACT & vbTab & AGT & vbCrLf &
ACC & vbTab & GGT & vbCrLf &
ACA & vbTab & TGT & vbCrLf &
ACG & vbTab & CGT & vbCrLf &
GTT & vbTab & AAC & vbCrLf &
GTC & vbTab & GAC & vbCrLf &
GTA & vbTab & TAC & vbCrLf &
GTG & vbTab & CAC & vbCrLf &
GCT & vbTab & AGC & vbCrLf &
GCC & vbTab & GGC & vbCrLf &
GCA & vbTab & TGC & vbCrLf &
GCG & vbTab & CGC & vbCrLf & vbCrLf &
"NNN = " & NNN


    RichTextBox2.Text =
"---" & vbTab & "T" & vbTab & "C" & vbTab & "A" & vbTab & "G" & vbCrLf &
" T " & vbTab & TTT & vbTab & TCT & vbTab & TAT & vbTab & TGT & vbTab & " T " & vbCrLf &
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"   " & vbTab & TTC & vbTab & TCC & vbTab & TAC & vbTab & TGC & vbTab & " C " & vbCrLf &
"   " & vbTab & TTA & vbTab & TCA & vbTab & TAA & vbTab & TGA & vbTab & " A " & vbCrLf &
"   " & vbTab & TTG & vbTab & TCG & vbTab & TAG1 & vbTab & TGG & vbTab & " G " & vbCrLf &
" C " & vbTab & CTT & vbTab & CCT & vbTab & CAT & vbTab & CGT & vbTab & " T " & vbCrLf &
"   " & vbTab & CTC & vbTab & CCC & vbTab & CAC & vbTab & CGC & vbTab & " C " & vbCrLf &
"   " & vbTab & CTA & vbTab & CCA & vbTab & CAA & vbTab & CGA & vbTab & " A " & vbCrLf &
"   " & vbTab & CTG & vbTab & CCG & vbTab & CAG & vbTab & CGG & vbTab & " G " & vbCrLf &
" A " & vbTab & ATT & vbTab & ACT & vbTab & AAT & vbTab & AGT & vbTab & " T " & vbCrLf &
"   " & vbTab & ATC & vbTab & ACC & vbTab & AAC & vbTab & AGC & vbTab & " C " & vbCrLf &
"   " & vbTab & ATA & vbTab & ACA & vbTab & AAA & vbTab & AGA & vbTab & " A " & vbCrLf &
"   " & vbTab & ATG & vbTab & ACG & vbTab & AAG & vbTab & AGG & vbTab & " G " & vbCrLf &
" G " & vbTab & GTT & vbTab & GCT & vbTab & GAT & vbTab & GGT & vbTab & " T " & vbCrLf &
"   " & vbTab & GTC & vbTab & GCC & vbTab & GAC & vbTab & GGC & vbTab & " C " & vbCrLf &
"   " & vbTab & GTA & vbTab & GCA & vbTab & GAA & vbTab & GGA & vbTab & " A " & vbCrLf &
"   " & vbTab & GTG & vbTab & GCG & vbTab & GAG & vbTab & GGG & vbTab & " G "
        Label1.Text = Count * 70 & " bases"


    End Sub
    Dim Rate As Single
    Private Sub Timer1_Tick(sender As System.Object, e As System.EventArgs) Handles Timer1.Tick
        Rate = TotalCodons - OldTotalCodons
        OldTotalCodons = TotalCodons


    End Sub


    Private Sub Form1_Load(sender As Object, e As EventArgs) Handles MyBase.Load
        Button1.Text = "Remove newlines"
    End Sub


    Function RemoveLines(Multiline)
```

```
        Return Multiline
    End Function
End Class
```