

Energy Eigenstates. Words by Walter F. Smith, 4-22-08
 Tune: "A Comedy Tonight", from "A Funny Thing Happened on the Way to
 the Forum", by Stephen Sondheim

Abm7 = 1111 Am7 = 2213 Play on Crestline

Intro: G G C D G G C D
 G C D G C D

1. Take a wavefunction, any wavefunction –

G C F D7
You can synthesize it out of energy eigenstates!

G C D G C D
Why, might you ask, should I do this task?

G C F D7
Relax, and I will sing to you of energy eigenstates!

G B
No thinking hard! Let down your guard!

F F G Am C D7
Once I have sang of it, you'll get the hang of it!

G C D G C D
Stop feeling queasy – it's really easy.

G Abm7
I'll tell you all about their traits!

Am7 G
...My favorite functions, energy eigenstates!

G C D G C D
2. To be a bit formal, they're orthonormal.

G C F D7
That means the inner product of two energy eigenstates

G C D G C D
Is zero or one, and – here comes the fun- --

G C F D7
The secret to expand-ing in energy eigenstates!

G B
All we could wish! The coeffic-

F G Am C D7
ient in the sigma is no enigma:

G C D G C D
c-n is psi-n star times your psi, then

G Abm7
Integrate it over all of space!

Am7 G
It's the inner product with the energy eigenstate!

G C D G C D
3.They're not dramatic, in fact they're quite static.

G C F D7
Nothing ever changes in an energy eigenstate!

G C D G C D
Minus i E-n t, over h-bar we see

G C F D7
Is the exponential for an energy eigenstate!

G B
Stately and calm, they've no need for haste.

F G Am C D7
The lords and ladies of Hilbert space-!

G C D G C D
But add them up right now, you'll see a sight now,

G Abm7
With the time dependence it creates!

Ab7
Levels electronic! Spherical harmonics!
Radial equation! Harmonic oscillation!
Tunneling authentic! Atoms hydrogenic!

Paraboloid, trapezoid, sinusoid, overjoyed!

G B
Stately and calm, they've no need for haste.

F G Am C D7
The lords and ladies of Hilbert space-!

G C D G C D
But add them up right now, you'll see a sight now,

G Abm7
With the time dependence it creates!

Am7 G
Superpositions of energy eigenstates!