

PHYSICS CAROLS SINGALONG 2018

“IT CAME UPON A DEMO DAY”

(Sung to “It Came Upon a Midnight Clear”)

by Marian McKenzie, 12-15-03

It came upon a demo day
In Denmark long ago
With Oersted bending near the bench
To make the current flow.
The students watch the needle move
And, awed, they vent their cries –
“Gosh, wow, Professor!” they exclaim.
“Good Golly!” He replies.

Still at the modern demo bench
What Oersted found, we find -
Electric and magnetic fields
Delightfully entwined.
We see, wherever we may be
What Oersted’s students saw
And hail the glad discovery
That gave us Ampere’s law

And ye, beneath work’s crushing load
Whose forms are bending low
Who labor through each problem set
In painful steps and slow
Take heart, for Oersted’s golden hour
Can move us, even now
And makes us echo, in joyous tones
That long ago “Gosh Wow!”

Ohms, Volts, and Amps (Sung to “Oh Holy Night”)

Written 12/83 by anon, Ed. by WFS & MMcK
From the Oberlin College Physics Songbook, 1983

Ohms, volts, and amps
The ‘scope displays are shining,
It is the day of our transistor lab.
Long sit we down, And hook up all the wiring
Until at last, all looks right, we turn the knob.
A thrill of hope as we turn on the power,
The smell of smoke brings our professor’s glower.
Run for your life! And disconnect the current!
The voltage was too high, So now my transistor’s burnt.
The voltage too high We heave a sigh, and start again.

Led by our notes, we do some calculations
Involving phase shifts around our feedback loop.
Now we try to build a voltage amplifier
This time we’re sure that we check every wire!
Our load line gives a point of operation
We take line noise into consideration.

On goes the source! The result’s- even worse.
The needles all pinned, I think my exper^{ment}’s ruined

“Behold,” I asked the prof,
And she says, “Please just turn it off.”

Truly we’re taught to make our circuits function,
Impedance high where no current’s to flow.
Ohm’s law does not explain the PN junction,
But we grind it out, check once more, here we go.
Our patience thin, our souls within us pleading,
We flip the switch, Voila! We get a reading!
TRIUMPH at last, the gain in all its glory!
By now, though, I see,
there’s no one left to share the joy!
But now I can go home,
And get the sleep that I’ve been needing!

Use SI

(To “Let It Snow”)

Words by Marian McKenzie 12-14

Oh, when problem sets I am grading
And mistakes are just cascading,
Again and again I cry: "Use SI! Use SI! Use SI!"

When the units are wrong or missing
You will often hear me hissing,
"I cannot imagine WHY - Use SI! Use SI! Use SI!"

[*Bridge*] Any answer in ergs or dynes
Fills my heart with sensations of dread.
What’s the problem with jolly Joules?
Why not use Newtons instead?

Well, my eyes have been slowly crossing,
So in dreams I’ll soon be tossing
But with every snore I’ll sigh, "Use SI! Use SI! Use SI!"

“STATIC EQUILIBRIUM” (sung to “Winter
Wonderland”) by Alvin Lee, 1983, Ed. by WFS
[“*Moment*” and “*torque*” mean the same thing.
Engineers tend to use “moment”.]

Forces cancel completely,
Moments balance quite neatly.
I’m fully inert, and doing no work,
Here in static equilibrium.
Every push-- meets another,
Every twist has an inverse brother,
The state I’m in, dude, is true lassitude,
Here in static equilibrium.

[*Bridge*] All my forces balance out precisely,
And my torques all cancel out just so.
I’m not movin’ and it suits me nicely,
‘Cause I’ve no place I really need to go.

My body feels-- kinda like jello,
I’m warm and ha--ppy and mellow.
Don’t want to go home,
So leave me alone, here in static equilibrium.

The Nobel Laureate's Carol

Words by Marian McKenzie

Tune: Do you see what I see

[*Tass was the Soviet news agency during the cold war. Reuters was then, and still is, a British news agency.*]

Said Penzius, "Wilson, cock an ear –

Do you hear what I hear?

Rendering our signal unclear –

Do you hear what I hear?

This noise, this noise, coming from the Void,

It has really got me annoyed,

It has really got me annoyed!"

Said Becquerel to the two Curies,

"Do you see what I see?

On my photo plate, Dear Curies –

Do you see what I see?

It's been exposed, even in the dark,

Oh, what could make such a mark?

Oh, what could make such a mark?"

Said Einstein to the human race, "Listen to what I say!

Newton got it wrong, human race. Listen to what I say!

It all conserves, energy and mass,

Send it out by Reuters and Tass!

Send it out by Reuters and Tass!"

"COAXIAL WAVES" (sung to "Jingle Bell Rock")

by Walter F. Smith, 11-30-11

[*Impulses on coaxial cables travel as waves of voltage and current, in exact analogy to the waves of electric and magnetic fields in light. The "characteristic resistance" of the standard type of coax cable, RG58, is 50 ohms. The connectors at the end of such cables are called "BNC" for "Bayonet Neill Conselman".*]

1) If you want a cable that's great,

Then you should choose RG58!

It has capac'tance one hundred "puff"

Per meter– That's clearly enough!

2) Combine it with inductance two hundred five-oh

Nanohenries per meter, now watch the waves go!

Zippin' and zappin' at twice the speed c ,

Divided by three!

[Bridge] When it's wave time, you can save time

By using this simple rule:

That the V-wave is like the E-wave

Of light in a vacuum, ain't that cool?

3) Giddy-up, current times L-naught (I think)

Moves like the B behaves!

Swing and wiggle in cylindrical sync –

That's coaxial waves!

4) The ratio of voltage to current is just
Root L-naught by C-naught, as we have discussed.
So, an infinite cable, though it sounds bizarre,
Feels like a 50-ohm R!

[Bridge] Let us all kneel to- Paul Neill,

And Carl Conselman as well.

The correct plug's a bayonet plug—

The BNC connector's totally swell!

5) For left-moving waves, the I's and the V's

Are one eighty degrees out of phase

Swing with anti-symmetrical ease –

That's coaxial

That's coaxial

That's coaxial waves!