

THE PLANT-PARASITIC NEMATODE SONGBOOK ANTHOLOGY

LYRICS BY KATHY MERRIFIELD

I wrote the three volumes of The Plant-Parasitic Nematode Songbook in the late 1980s and early 1990s during work on an MS in Nematode Diseases of Plants and then as a research assistant with Professor Russ Ingham at Oregon State University. These included Volume I: Serious Music for Serious Pests, Volume II: More Serious Music for Serious Pests, and Volume III: Camp Songs. The melodies were hand-written on staff paper; the lyrics were also hand-written. Each of the three volumes existed as comb-bound hard copies.

When my supply of hard copies ran low, I replaced them with The Plant-Parasitic Nematode Songbook Anthology, which was also produced as comb-bound hard copies. The lyrics were computer-printed, and the melodies were omitted. As in this digital version, I figured that most people don't read music, so it really wouldn't help much. Besides, many of the melodies are familiar. Maybe melodies can be added in the future – maybe even computer generated so they're legible.

The Anthology contained three new songs in addition to those from the first three volumes. These were cowboy songs from the forthcoming Volume IV: Cowboy Songs. Volume IV has now been forthcoming for about twenty years.

PROCESSIONAL

Melody: **Kahinto Kamya**, Processional (Camp Fire Girls)
-- by *Helen Gerrish Hughes*, © *Camp Fire*, 1954

We dig the soil from our random design
With measured tread and slow
Because this stand is in deep decline
Because it's infested with nematodes
Nematodes, nematodes

We harvest nematodes out of the soil
With measured water and slow
It's worth the hours of grueling toil
To find parasitic nematodes
Nematodes, nematodes

We count a thousand samples a day
With measured fingers and slow
Our eyeballs twirl and our brains decay
Because we've seen so many nematodes
Nematodes, nematodes

Helen Gerrish Hughes was born Abbie Gerrish in 1863. For more information about this song and about the history of Camp Fire Girls, now Camp Fire USA, refer to

<http://alicemariebeard.com/campfire/songs.htm>
<http://www.alicemariebeard.com/campfire/history.htm>
<http://www.campfireusa.org/>

I could find no information at all
on the name of this melody, Kahinto Kamya or on the melody itself.

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THE NEMATODE MARCHING SONG

Melody: Onward Christian Soldiers

Arthur S. Sullivan wrote this melody in 1871.

Onward, little nematodes, marching as to war
With protruding stylets going on before.
Hungry little parasites debilitate the foe;
Through eight hundred power, see the metacarpus go

Refrain: Onward, little nematodes, marching as to war,
With protruding stylets going on before.

Like a mighty army move the nematodes
When infested soil is hauled along the roads.
Dirty farm equipment, gunk on muddy boots,
And nematodey water will bring doom to all those roots.

Refrain....

Roots and rhizomes perish; crops may rise and wane.
Nematode populations constantly remain.
Nematicide will never against our worms prevail:
Tenacious and prolific, nematodes will never fail!

Refrain....

This is the Sullivan of Gilbert and Sullivan operettas.
Sullivan named this melody "St. Gertrude," after the wife of his friend
Ernest Clay Ker Seymer, at whose country home he composed it.

To learn more about the melody and its writer, refer to the following sites:

http://www.cyberhymnal.org/bio/s/u/l/sullivan_as.htm
<http://www.cyberhymnal.org/hym/o/n/onwardcs.htm>
<http://conjoyant.blogspot.com/2008/05/sir-arthur-sullivan.html>
<http://www.faithepc.org/Sermons/1999/990919.htm>

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THE SOUTHERN CALIFORNIA ROOT-KNOT LAMENT

Melody: Oh, Shenandoah

Meloidogyne, I will extract you
From the roots of my tomatoes.
Meloidogyne, you'll always be there
Down in the soil ... behind my house,
Cross the swollen root knot.

Meloidogyne, I long to count you
To determine if your numbers
Are high enough to fumigate you.
Or maybe I ... should just plant peas
Cross the swollen root knot.

Meloidogyne, I long to kill you;
You have ruined my tomatoes.
No salsa, and no ceviche -
A dismal summer, thanks to you,
Cross the swollen root knot.

Of the countless web sites about Oh Shenandoah,
<http://www.statemaster.com/encyclopedia/Oh-Shenandoah>
looks like about the best one. Various accounts describe the song's origin
as a ballad of true love between a European settler and a beautiful Indian maiden,
the heroic life of Chief Shenandoah,
or a river chantey that went to sea.
In summary, its provenance is unclear.

This is one of the most profoundly beautiful melodies I know.
In hindsight, I'm not proud of myself for parodying its lyrics.

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ODE TO THE RING NEMATODE

Melody: Ode to Joy,
Ludwig von Beethoven's musical setting
of an ode (a poem suitable for singing) written in 1785
by the German poet, playwright, and historian Friedrich Schiller.
The theme of the poem is the unity and brotherhood of humanity.
Beethoven's setting appears as a secondary theme in the final movement of his Ninth Symphony.

Criconema or *-nemella* or *-nemoides*, I'm not sure -
Because of all your stylet wounds, we're researching to find a cure.
You are the most beautiful worm I think that I have ever knowed;
Though you move in earthworm ways, I know you are a nematode.

Criconema or *-nemella* or *-nemoides*, one of those
Seeing you give me a thrill clear from my head down to my toes.
Maybe you're a virus vector, or else just an ectoparasite;
You lead the way for more diseases through the lesions you incite.

Criconema or *-nemella* or *-nemoides*, all the same;
Now they want to call you *Macroposthonia*, what a name.
Baermann funnels are beneath you; you refuse to migrate out,
But flotation's worth the fuss to see your body, ringed and stout.

Criconema or *-nemella* or *-nemoides*, I'm not sure -
Because of all your stylet wounds, we're researching to find a cure.
You are the most beautiful worm I think that I have ever knowed;
Though you move in earthworm ways, I know you are a nematode.

*****8

Leonard Bernstein comments on Beethoven's Ode to Joy at
<http://www.youtube.com/watch?v=nZJ1Tgf4JL8>,
and you can hear this section of Beethoven's Ninth Symphony there as well.

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THE SPIRAL HYMN OF NECROSIS

Melody: John Brown's Body (The Battle Hymn of the Republic);

Brisk marching tempo

Mine eyes have seen destruction by the spiral nematode;
It has ruined every plant that I have ever tried to grow.
From the native ecosystem, it's invaded every row;
Necrosis marches on.

Refrain: All from *Helicotylenchus*; all from *Helicotylenchus*.
All from *Helicotylenchus*; necrosis marches on.

These migratory ectoparasites are moving through
All the beds of pink geraniums and hedges green with yew.
All the violets are shrinking, though you'd think they'd leave a few;
Necrosis marches on.

Refrain

My plantation of bananas is in really awful form:
I forgot to pare away the rotting tissue from each corm,
Or to dip them in nematicide or in water that was warm;
Necrosis marches on.

Refrain

Contemplative, but returning to briskness on last line:

In the beauty of the lilies, every root's begun to rot,
And the lettuce is all wilted, and the radishes are not
Forming marketable taproots; everything has gone to pot
Necrosis marches on.

Refrain

A concise history of *John Brown's Body*
and *Battle Hymn of the Republic* may be found at
<http://www.pbs.org/wgbh/amex/brown/sfeature/song.html>

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**THE YELLOW EAR ROT SONG
(FORMERLY THE YELLOW HEAD ROT SONG)**

Melody: On Top of Old Smokey

On top of a wheat spike all yellow with slime,
Corynebacterium with *Anguina* did climb.

The cuticle sticky with nematode pro-
Teins picks up bacteria, and together they grow.

The juvenile wormlet on foliage will feed
But some galling instinct makes it head for the seed.

The other life stages take place in the gall;
With exudate dripping, together they fall

So over and over, the cycle still turns.
There's always bacteria, and there'll always be worms.

On top of a wheat spike all covered with slime,
Corynebacterium with *Anguina* did climb.

Other names for this disease include Yellow Slime Rot and Spike Blight, and in India, Tundu.

Soon after I wrote these lyrics, I became aware that the bacterium involved in Yellow Ear Rot had been transferred from *Corynebacterium* to *Clavibacter*. *Clavibacter* does not fit into these lyrics, so the bacterium remains *Corynebacterium* in this work.

Wikipedia comes through
with the story:
http://en.wikipedia.org/wiki/On_Top_of_Old_Smokey

See also
http://www.scoutorama.com/song/song_display.cfm?song_id=391
for the classic parody of the original.

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HETERODERA

Melody: Que sara sara

When an *Avena* sample came,
I asked my professor, "What worm will it be?"
"Will it be root knot, will it be ring?"
Here's what he said to me:

Heterodera,
Whatever will be will be.
The cysts will be ours to see,
Heterodera.

Do not be fooled by young tylenchs
Posing as juvenile cyst nematodes.
Notice the somewhat sclerotized head;
See how the tail shape grows.

Heterodera,
Whatever will be will be.
The cysts will be ours to see,
Heterodera.

Lemon-shaped females on the the root
Will be the sign that will give them away.
When you incise a neat vulval cone,
You'll look through the scope and say ...

Heterodera,
Whatever will be will be.
The cysts will be ours to see,
Heterodera.

Doris Day sang *Que sara sara* in the Alfred Hitchcock movie *The Man Who Knew Too Much*.
The song was written by Ray Evans and Jay Livingston under contract with Paramount Pictures.

For more details, see <http://www.songfacts.com/detail.php?id=4667>

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A BIRTHDAY WISH FOR GORDON

Melody: Old Rosin the Bow (Acres of Clams); a traditional Irish melody.

May your apples be free from coddling moth,
Your begonias with strength be bestowed;
And may your tomatoes forever escape
The curse of root knot nematode.

The curse of root knot nematode,
The curse of root knot nematode,
And may your tomatoes forever escape
The curse of root knot nematode.

May your sunflower heads be heavy with seeds,
Your flower beds with ferns overflowed;
May your oranges never be called to endure
The citrus-root nematode.

The citrus-root nematode,
The citrus-root nematode.
May your oranges never be called to endure
The citrus-root nematode.

May your lipstick plant be laden with lips;
On your peach, may the branches be loaded.
May all your domain live eternally on
Without having to be nematoded.

Without having to be nematoded,
Without having to be nematoded.
May all your domain live eternally on
Without having to be nematoded.

I wrote this as a poem to mail down to my California friends Norma and Gordon Rowley. I couldn't go to Los Angeles County for Gordon's birthday party, because I had just begun graduate study of plant-parasitic nematodes. Soon after, I realized that the poem fit well with the tune "Rosin the Bow," which has been made famous, at least in western Washington, by the lyrics "Acres of Clams."

"Rosin the Bow" is a nickname for a fiddler. As string players know, a bow requires the application of rosin -- hardened tree sap -- to achieve optimal resistance between the bow and the string. This resistance is used to produce the characteristic vibrations that are the specific sounds of that bowed string instrument.

Lyrics for "Acres of Clams" are at <http://sniff.numachi.com/pages/tiOLDSETLR;ttROSINBOW.html> and <http://ingeb.org/songs/ivewanda.html>. Lyrics to "Old Rosin the Bow" along with the traditional Irish tune is played for you at: <http://www.ireland-information.com/irishmusic/roisinthebow.shtml>

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GHOST WORMS IN THE SKY

Melody: Ghost Riders, by Stan Jones

A scientist went sampling on a dark and windy day.
Upon a hill he rested as he went along his way,
When all at once a mighty herd of red hot worms he saw,
A-plowin' through the sandy soil,
And rising through the straw.

Yippee-i-ay.....Yippee-i-oh
The ghost worms in the sky.

Their stylets were on fire and their spicules made of steel;
Their phasmids were fluorescent, and pulsations he could feel.
A bolt of fear went through him as they thundered through the field,
Performating every root,
And decreasing the yield.

Yippee-i-ay.....Yippee-i-oh
The ghost worms in the sky.

As the nematodes went by him, he heard one call his name:
"If nematology's your route to fortune and to fame,
"You'll be sampling forever in that field up in the sky,
"Counting worms eternally,
"And never knowing why."

Yippee-i-ayb.....Yippee-i-oh
The ghost worms in the sky.

Don't forget the glissando on the "oh" of each Yippee-i-oh.

Stan Jones worked jobs of every kind, including field representative for the American Red Cross in Bend, Oregon before joining the National Park Service and settling in at Death Valley National Monument as the Park Service's representative for film crews making westerns there. "Ghost Riders" narrates a story told to him when he was a child by an old cowboy near his home in Douglas, Arizona.

Two of the many good sites from which you can learn more about Stan Jones and Ghost Riders are
<http://everything2.com/title/Stan+Jones> and
<http://www.answers.com/topic/stan-jones>

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VIVE LA NEMATODE

Melody: Vive la compagnie, 1844

Sing the refrain between each stanza, or at least as often as you can bear it.

Let's take up our shovels and sample the soil.
Vive la nematode!
Rejoicing and singing through hours of toil.
Vive la nematode!

Refrain: Vive la Vive la Vive la worm, Vive la Vive la Vive la worm
Vive la worm, Vive la worm, Vive la nematode!

In each stanza below, repeat "Vive la nematode!" after each line.

Let's weigh out the sample to force through the sieve
Combing the soil to see where they live

Let's open the centrifuge, put them inside
Since nematodes always enjoy a ride

Let's pour in the sucrose and spin them again
And hope they're suspended, since they cannot swim

Let's pour all the nematodes into a dish
Disqualifying all those who are squeamish

While clicking and searching, our total will mount
As we are getting an accurate count

A few microns forward our project will lurch
As nematodes donate their lives to research

Scholar Benjamin Robert Tubb says that Steven Foster may have composed this melody: it is included under "1844" in a chronological listing of Foster's songs at <http://www.pdmusic.org/foster.html>. At this site, the lyrics are attributed to "Anonymous," as they are in all other sites I've checked, too. Several of these sites assert that there's no way Steven Foster could have written this song.

This universal song of good will and cooperation is featured in a web site listing "more college drinking songs," as a subject for countless glee clubs and fraternities, as a Brothers Four hit, as a scout song at several Boy Scout, Girl Scout, and Camp Fire International sites, and as the finale for the initial planning meeting of the Nelson Mandela Foundation's Dialogue Programme in January 2009.

In the original Plant Parasitic Nematode Songbook, which became Volume I of III.5, I arranged this melody for soprano, alto, tenor, and bass just to see if I could still manage four-part voice-leading 25 years after studying music theory. I could. Although it followed all the four-part voice-leading rules, it was unsingable.

Whatever its words, Vive la compagnie is really fun to sing. Once singing begins, harmony is nearly inevitable, so it really doesn't need to be written down at all.

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THE PARASITIC NEMATODE RAG

Melody: Ring-Around-a-Rosie Rag, ©1967-1969
by Arlo Guthrie Appleseed Music, Inc. (ASCAP)

A nice healthy patch of tomatoes I had,
But then *Meloidogyne* swelled up the roots and made them taste bad,
And they were all doin' the parasitic nematode rag.
My old orange tree went and had a mishap,
Because *Tylenchulus* stuck in its head and sucked out the sap,
And they were all doin' the parasitic nematode rag.

Refrain:

Nematodes, parasitic nemas,
In the soil and the roots, they're real dilemmas,
And they're all doin' the parasitic nematode rag.
Nematodes, parasitic nemas,
Down the roots and up the stem as
They're all doin' the parasitic nematode rag.

Potatoes grow big in the Columbia Basin,
But *Meloidogyne chitwoodi* can really debase 'em
And they're all doin' the parasitic nematode rag.
Raspberry vines will produce a whole lot
Unless *Xiphinema* vectors in Tomato Ringspot,
While they're all doin' the parasitic nematode rag.

Refrain....

Keep filling up your tubular intesting
Will cell sap, and keep on digestin':
That's how you do the parasitic nematode rag.
Gratefully ingest what that plant has given
And give thanks that you're not free-livin':
Keep on doin' the parasitic nematode rag.

Refrain....

<http://www.arlo.net/resources/lyrics/ring-around.shtml>
is one of several sources for Arlo Guthrie's copyrighted original lyrics.

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THE NEMATODES' PICNIC

Melody: The Teddy Bears' Picnic, by John Walter Bratton, 1907
Definitive original teddy bear lyrics by Jimmy Kennedy, 1932

If you go down in the dirt today, you better not go alone.
If you go down in the dirt today, avoid all the sandy loam.
For every worm that ever there was, today is very special because
Today's the day the nematodes have their picnic.

If you go down in the dirt today, prepare for a big surprise.
If you go down in the dirt today, you may not believe your eyes.
For every worm for miles around around the rhizosphere will be found
Today's the day the nematodes have their picnic.

Picnic time for nematodes;
We know the nematodes are having a lovely time today.
See their stylets make inroads
Into the cortex cells without delay.
See their metacorpi pump
The juicy cytoplasm while leaving the walls behind.
And when the roots are brown and necrotic, they'll all go home to bed,
Because they're tired little nematodes.

If you go down in the dirt today, you better not go alone.
If you go down in the dirt please stay away from the root hair zone.
For every nematode in the ground the healthy roots will gather around
Today's the day the nematodes have their picnic.

At <http://www.songfacts.com/detail.php?id=14553>, you can learn about the history of "The Teddy Bears' Picnic," including the complex history of the lyrics.

Although it has a frivolous sounding title, the site says, this melody is actually a sophisticated piece of classical music. The story of the teddy bear phenomenon is outlined by Michèle Brown in *The Little History Of The Teddy Bear*, 2007, Tempus, ISBN 0752440659; ISBN-13 9780752440651.

Sorry, digitoids -- it's an actual book.
Your independent local bookstore can special-order it for you.
Or, check with your public library.

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I'M DREAMING OF A WHITE FEMALE

Melody: I'm dreaming of a white Christmas, by Irving Berlin

I'm dreaming of a white female
Just like the ones inside this dish.
While the cysts envelope, the eggs develop
To make them so much fun to squish.
I'm dreaming of a white female
And the disease she will incite.
May your roots be wormy tonight,
And may *Heterodera* be white.

I'm dreaming of a white female,
Just like the ones in soybean roots
That infest a field, and decrease yield,
And make the grower say, "Oh shoot."
I'm dreaming of a white female
Producing eggs with all her might.
May your soybeans stand up and fight,
And may *Heterodera* be white.

 **see glossary IMMEDIATELY**

This original lyrics about a New Yorker stranded in sunny California at Christmas was written by Irving Berlin. Bing Crosby recorded it for the 1942 movie *Holiday Inn*, in which he co-starred with Fred Astaire. *White Christmas* won the Academy Award for Best Song in 1942. Bing Crosby again sang *White Christmas* in the 1954 movie *White Christmas*, in which he co-starred with Danny Kaye.

As of 2010, *White Christmas* is the biggest selling Christmas song of all time.

For more information, refer to

http://modern-us-history.suite101.com/article.cfm/why_is_the_song_white_christmasso_popular
and

<http://www.songfacts.com/detail.php?id=4072>

And here's a good site to amaze yourself about Irving Berlin:

<http://parlorsongs.com/bios/berlin/iberlin.php>

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THE AUTUMN WORMS

Melody: The Autumn Leaves,
by Jacques Prévert, Johnny Mercer, and Joseph Kosma

The autumn worms drift through my soil sieve,
The autumn worms I've tried to hold.
I dream of data, and hope they're living,
Although right now they are wet and cold.
But then the screen goes dark -- it's filled with mud!
The worms are hidden in icky crud.
Oh, I'm missing data points from summer
When autumn worms start to crawl.

The autumn worms drift through my graphics
The autumn worms now data are.
I dream of green fields and summer sampling
But know my outliers are bizarre.
But then the screen goes dark -- the power surged
Wiped out my data; I am discouraged!
Oh, I'm missing data points from summer
When autumn worms start to crawl.

Autumn Leaves music by Joseph Kosma and French lyrics by Jacques Prévert were written in 1945 as "*Les feuilles mortes*" ("The Dead Leaves").

American songwriter Johnny Mercer,
who might have thought the idea of decomposing plant material
did not provide a catchy enough title,
wrote English lyrics ("*The Autumn Leaves*") in 1947.

Refer to
<http://www.squidoo.com/autumnleaves-song>
to read more information and to hear many versions.

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THE ENDOPARASITE ROUND

Melody: Three Blind Mice
(Traditional melody)

Nematodes
Nematodes
See how they squirm.
See how they squirm.
With parasitic lifestyle in view
They all crawl into the root tissue
While fungal and algal cells they eschew
Nematodes
Nematodes

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THE NEMATODE COUNTING ROUND

Melody: Row, row, row your boat
(Traditional melody)

Count those nematodes
Circling 'round the dish.
Be thankful that they came from plants,
Not from rotten fish.

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THE FOLIAR NEMATODE ROUND

Melody: White Coral Bells
(Traditional melody)

Plant parasites upon a slender stalk.
Small necrotic flowers deck my garden walk.
Oh! Don't you wish that you could hear them feed?
That will happen only when the flowers bleed.

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AN ATTEMPT TO PUT *PRATYLENCHUS* INTO PERSPECTIVE

Melody: It's a Small World.
Words and music by Richard B. Sherman and Roger B. Sherman

It's a worm of lesions, a worm of rot
And a trail of damage its life has wrought.
There's so much to repair that it's time we're aware
It's a small worm after all.

Refrain: It's a small worm after all
It's a small worm after all
It's a small worm after all
It's a small, small worm.

There is just one stylet in each small head
That will render cells of the cortex dead.
There's such rot of the root that control's almost futile,
a small worm after all.

Refrain

From cell to cell sucking little bites
Go these migrating endoparasites.
From Swiss chard to eggplant and tomato to cantaloupe,
small worms after all.

Refrain

According to <http://www.songfacts.com/detail.php?id=4691>, "It's a Small World" was written by the brothers Richard M and Robert B. Sherman for the Walt Disney display at the 1964 New York City World's Fair. Walt Disney was in charge of the "Children of the World" pavilion, which became "It's a Small World" at Disneyland after the fair. Walt Disney asked the Sherman brothers to write a song for the attraction.

According to Roger Sherman Jr., three reasons this song is so catchy and so hard to quit hearing are that first, the stanzas and the chorus harmonize with each other: they repeat the same harmonic series. Second, a given line rises in pitch while a corresponding line in the next verse or refrain falls. Third, the rhythm of the stanza – mostly quarter and eighth notes – is different from that of the chorus -- lots of half notes – so that played and sung together, the notes tend to alternate. This repetitive yet varied pattern tricks the mind into effortlessly absorbing and emitting it. The Sherman brothers wrote several well-known songs using this plan. For more about the intricacies of It's a Small World, refer to <http://www.songfacts.com/detail.php?id=4691>

WHAT NEMATODE

Melody: Greensleeves, maybe written by King Henry VIII, but maybe not.
It came into being in the mid-1500s.

What worm is this which laid to rest
In this counting dish I've been keeping?
It's lacking in both form and zest,
So I think that it's dead, not just sleeping.

Refrain: This, this is a nematode
Whose identity will ne'er be knowed.
Haste, the counting dish to unload
Down the sink in the laboratory.

So bring them acid and formalin
And dessicate their little forms.
Evaporate to just glycerine
And admire the bodies of lifeless worms.

Refrain

According to [songfacts.com](http://www.songfacts.com),
the English song "Greensleeves" was composed by Henry VIII of England.
According to [heavenlyharpist.com](http://www.heavenlyharpist.com),
Greensleeves is a traditional English ballad written by an unknown composer
in a style unknown in England until after Henry VIII died.

See

<http://www.songfacts.com/detail.php?id=8685>
<http://www.heavenlyharpist.com/mp3/greensleeves.htm>

Songfacts.com says,
“As with many folk songs, the melody is far superior to the words.”
The nematode lyrics are in good company.

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THE HOLLY AND THE IVY

Melody: The Holly and the Ivy, a traditional French or English carol

The holly and the ivy
When they are both full grown
Are susceptible well-suited to the plant-
Parasitic nematode.

The rhizosphere surrounded
By the running exudates
Will induce ionic gradients
Where the eager stylet waits.

The holly and the ivy
When they are both in flower
Send out juicy little feeder roots
That the nematodes devour.

The rising of the sap and
The running of the wound
Will decrease the turgor pressure un-
Til the victim has been ruined.

The holly and the ivy
When they are both full grown
Are susceptible well-suited to the plant-
Parasitic nematode.

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Both evergreen plants, holly and ivy were used by pre-Christian pagans during solstice celebrations as allusions to the hope of life even in the deep darkness of winter. Further thoughts on the origin of this Christmas carol may be found at

http://landscaping.about.com/od/holidayplants1/a/holly_and_ivy.htm

See next page for additional information on holly and ivy.

THE HOLLY AND THE IVY, CONTINUED

Both English holly (*Ilex aquifolium*) and English ivy (*Hedera helix*) are extremely serious weeds in Pacific Northwest forests. Both thrive in the mild, wet climate. Neither is native, so they are divorced from their natural controls such as climate, diseases, competitors, and herbivores.

Holly outcompetes native tree and shrub species for light, water, and nutrients and can become the dominant plant in the shrub story. Holly berries are dispersed by birds, some of which cache them in the soil as they do nuts and other fruits. Some birds carry berries into forests beyond human penetration.

Because its branches and leaves are closely spaced, a holly plant is dense. Because it grows well in the Pacific Northwest, holly can form impenetrable thickets that dominate the shrub layer and so thoroughly block light that it suppresses germination and growth of native species.

Ivy's broad leaves and penetrating vines cover the ground so effectively that native herb and shrub species can't get sufficient light and water, so they die. Anchored by its tightly clinging aerial roots, ivy climbs tree trunks. It branches copiously, thereby loading trees with far more weight than that of the trees' own branches and leaves. Such loaded trees may fall over and die if the ivy is not removed.

Ivy flowers, followed by seed-bearing berries, occur only on shoots that ascend above the ground. Vines on trees, fences, walls, and other ascending objects flower and fruit prolifically. Fruit-eating birds and other animals disperse the berries, and therefore the seeds, far beyond the influence of any individual plant. The tough little ivy seedlings are good survivors, and they grow ever onward, renewing the cycle and multiplying the problem.

WEB SITES:

ENGLISH HOLLY

<http://www.arkive.org/common-holly/ilex-aquifolium/info.html>

http://www.rainyside.com/features/pest_watch/Pest_Holly.html

<http://www.kingcounty.gov/environment/animalsandplants/noxious-weeds/weed-identification/english-holly.aspx>

http://www.hear.org/pier/species/ilex_aquifolium.htm

ENGLISH IVY

<http://www.portlandonline.com/parks/index.cfm?c=47820>

<http://horticulture.cfans.umn.edu/vd/h5015/00papers/okerman.htm>

<http://www.nps.gov/plants/alien/fact/hehe1.htm>

<http://www.issg.org/database/species/ecology.asp?si=469>

GOOD KING NEMATODE

Melody: 13th Century spring carol

Good King Nematode looked out
O'er the tuber field
Where the galls spread round about
Decreasing the yield.
Brightly shone the moon that night,
Though the frost was cruel.
When a farmer came in sight,
His tractor to refu-oo-el.

"Hither, worms, and tell me of
"The events ensuing.
"Yonder farmer, who is he?
"What the heck's he doing?"
"Sire, he's going to spray us all
"With nematicide.
"He will not be happy till
"All of us have die-ie-ied."

"Attack the tubers and the roots:
"Make them all grow thinner.
"Thou and I will make him eat
"Worms for Christmas dinner."
Therefore, nematodes, be sure,
When potatoes chewing:
Though you may infest a field,
Trouble may be brew-oo-ing.

The lyrics of Good Kind Wenceslas, by John Mason Neale (1818-1866), first appeared in *Carols for Christmas-Tide*, 1853, by Neale and Thomas Hellmore. Neale may have written the hymn some time earlier; he related the story on which it is based in *Deeds of Faith* (1849). The story is based in truth: Wenceslas was a real person, although a duke, not a king. The melody, *Tempus Adest Floridum* (Spring has unwrapped her flowers), a 13th century spring carol, was first published in the Swedish *Piae Cantiones* in 1582. See http://www.hymnsandcarolsofchristmas.com/Text/legend_of_s_wenceslaus.htm and http://www.hymnsandcarolsofchristmas.com/Hymns_and_Carols/good_king_wenceslas.htm

MY FAVORITE WORMS

Melody: My Favorite Things, from The Sound of Music:
Words by Oscar Hammerstein, music by Richard Rogers.

Spiral on radish and ring on tomato
Lesion on mint and root knot on potato
Stem-and-bulb climbing up maidenhair ferns:
These are a few of my favorite worms.

Dagger on woody plants, seed gall on grasses
Second stage juveniles forming wool masses
Stubby-root vectoring corky ring germs
These are a few of my favorite worms –

When the stem wilts, when the leaf burns,
When I'm feeling sad,
I simply remember my favorite worms
And then I don't feel so bad.

Citrus on citrus and pinewood on pine trees
Rice root on rice roots than then invade lime trees.
Burrowing that between species discerns –
These are a few of my favorite worms

Golden on tubers and cyst upon clover
Sting on red pepper and stunt rolling over
Pin that swells up but to normal returns –
These are a few of my favorite worms

When the stem wilts, when the leaf burns,
When I'm feeling sad,
I simply remember my favorite worms
And then I don't feel so bad.

<http://www.filmsite.org/soun.html>

provides critiques of the movie version of “The Sound of Music.”

<http://www.sound-of-music.com/>

provides everything you might want to know about the Broadway musical, the movie,
and the setting of “The Sound of Music”
as well as the fictional and the real stories of the von Trappe family.

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SHE WEARS AN “N”

Tune: She wears a G for Generosity (Girl Scouts)

I have a strong feeling that the lyrics to the song parodied by these lyrics are in turn a parody of an earlier song. In turn, “She wears a G for Generosity” is one of the most parodied of Girl Scout songs....

She wears an N cause she’s N-vertebrate,
She wears and E for endoderm,
She wears an M for metarhabdiate,
She wears an A for a cute worm (for a cute worm),
She wears a T for triploblasticness,
Although a pseudocoelomate (-locoelomate),
She wears and O – D – E for odious, odious,
Cause that’s the kind of worm we love to hate.

For the Girl Scout lyrics, visit

<http://www.scoutsongs.com/lyrics/shewearsag.htm>

I can find no information about the origin of this song.

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THE GOLDEN SUN

Melody: The Golden Sun (Girl Scouts)

The golden sun sinks in the west;
It's time for nematodes to rest.
We've had our work, we've had out play,
And we have lived in the Nematode Way.

Each day we puncture some new root,
The crops to pillage, rape, and loot,
Reducing farming revenue,
And now we pledge our wormship true.

Upon my honor I will try
To pierce these roots and suck them dry,
Obey the Parasitic Code,
And to live the life of a nematode.

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THE ORIGINAL GIRL SCOUT SONG GOES LIKE THIS:

The golden sun sinks in the west;
Great spirits call Girl Scouts to rest
We've had our work, we've had our play,
And we have lived in the Girl Scout way

Each day we've done some new good turn:
Someone to help, not praise to earn
We've lived our lives with this in view,
And now we pledge our scoutship true

Upon my honor I will try
To do my duty to God on high
To help all other people out
And to live the life of a true Girl Scout.

... and I can't find any information about the origin of this song, either.

SHE'LL BE SQUIRMIN' THROUGH THE BAERMANN

Tune: She'll be Comin' Round the Mountain

She'll be squirmin' through the Baermann when she comes
(Squirm, squirm)

She'll be squirmin' through the Baermann when she comes
(Squirm, squirm)

She'll be squirmin' through the Baermann

She'll be squirmin' through the Baermann

She'll be squirmin' through the Baermann when she comes
(Squirm, squirm)

She'll be squirtin' through the latex when she comes
(Pptt, pppt)

She'll be floatin' in the bottle when she comes
(Blub, blub)

She'll be freezin' in the cold room when she comes
(Brrr, brrr)

Oh, we'll all come out to count her when she comes
(One, two!)

She'll be funding publications when she comes
(Clink, clink)

She'll be driving brand new software when she comes
(Beep, beep)

She'll be dumped into the garbage when we're done
(Splat, splat)

According to

[http://www.gothic-catalog.com/Shenandoah American Spirit Pacific Chorale p/g-49263.htm](http://www.gothic-catalog.com/Shenandoah_American_Spirit_Pacific_Chorale_p/g-49263.htm), "She'll Be Comin' 'Round the Mountain" appears to have been adapted after the Civil War from a Negro spiritual entitled "When the Chariot Comes," then converted by Appalachian whites into a folksong, and finally transformed into a railroad work-gang song.

For more background, see

[http://en.wikipedia.org/wiki/She'll Be Coming 'Round the Mountain](http://en.wikipedia.org/wiki/She'll_Be_Coming_'Round_the_Mountain) and
<http://www.scribblestreet.co.uk/pictures/mountain/mountainsay.html>

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THE HAPPY NEMATOLOGIST

Tune: The Happy Wanderer

I love to look for nematodes
'Neath moss and tree and fern.
Transformed into collecting mode,
I hunt the wily worm.

Val di ree ... val di rah ...
Val di ree ... val de ra ha ha ha ha ha
Val di ree ... val di rah ...
I hunt the wily worm.

I wave my probe to all I meet,
And they wave back to me.
Tylenchids twitch and plectoids creep,
To fill their niche with glee.

Val di ree ... val di rah ...
Val di ree ... val de ra ha ha ha ha ha
Val di ree ... val di rah ...
To fill their niche with glee.

Oh, may I go a-nemato-
Ding 'til the day I die!
May every taxon that I know
My funding justify.

Val di ree ... val di rah ...
Val di ree ... val de ra ha ha ha ha ha
Val di ree ... val di rah ...
My funding justify.

The Obernkirchen Children's Choir, from Obernkirchen in North Germany, was founded in 1949 by Edith Moller. In 1953, BBC Radio aired the choir's winning performance of "The Happy Wanderer" from Llangollen International Eisteddfod, an annual arts festival in North Wales. The broadcast turned the cheerful hiking song into the great sing-along it has been for years after. It was the best-selling sheet music in 1954 in the UK. Although often assumed to be a folk song, "The Happy Wanderer" is actually an original work by Edith Moller's brother Friedrich-Wilhelm Moller written especially for the competition.

Can't you just hear the accordion and tuba boom-chucking while children in lederhosen march, wave soil probes in formation, and sing about nematodes?

Source: <http://www.songfacts.com/detail.php?id=7983>

OH, I WISH I WAS A LITTLE NEMATODE

Tune: Oh, I wish I was a little bar of soap
(If you're happy and you know it)

Oh, I wish I was a little nematode
Oh, I wish I was a little nematode
Oh, I'd piercey and I'd suckey til the entire crop was yucky
Oh, I wish I was a little nematode

Oh, I wish I was a little *Trichodorus*...
Oh, I'd squirmy and I'd grubby until every root was stubby

Oh, I wish I was a little *Heterodera*...
Though varieties resist me, I'd continue to encystie

Oh, I wish I was a little *Criconemella*...
I'd play ring around the rosie on the roots of every posie

Oh, I wish I was a little *Macroposthonia*...
When they don't know what to name me, how can anybody blame me?

Oh, I wish I was a little *Ditylenchus dipsaci*...
Oh, I'd fill an onion fully with my Dauerlarvae woolly

Oh, I wish I was a little *Ditylenchus desctuctor*...
I'd turn each and every tuber into piles of slimey goober

Oh, I wish I was a little *Anguina*...
Oh, I'd climb up to the toppy, where I'd make the plant look sloppy

Oh, I wish I was a little *Pratylenchus*...
Through the cells I'd leave my squeezins as I manufactured lesions

Oh, I wish I was a little nematode
Oh, I'd piercey and I'd suckey til the entire crop was yucky

The melody of "Oh I wish I was a little bar of soap" is formed of notes of equal value, whereas that of "If you're happy and you know it" formed of dotted notes. Original lyrics to "Oh I wish I was a little bar of soap" show up on many internet catalogs of music for youth camps. We'll never know who, in the inky shadows of age-old campfires, produced this classic.

CHEW, CHEW

Tune: Cuckoo

From out the battered mint field,
Flea beetles cry, "I'm here."
And from the nearby roots, *Pra-*
tylenchus answers clear:

Chew, chew ... chew, chew,
Chew chew chew chew chew chew.
Chew, chew ... chew, chew,
Chew chew chew chew chew chew.

(Of course, we know that this should really be "Suck, suck," but it just doesn't carry the punch derived from rhyming with the original. In addition, the abrupt end of the word "suck" prevents the diminished fadeout facilitated by a word ending in "oo.")

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N - E - M - ATODE

Tune: B - I - N - G - O (clapping song)

There was a farmer had a worm
nem UH tode was its name-o.
N - E - M - a tode, N - E - M - a tode,
N - E - M - a tode,
nem UH tode was its name-o.

It's too hard to explain. Just refer to <http://www.dltk-kids.com/animals/songs/bingo.htm>. This parody is dumb, but then, so is the original.

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THE NEMATODE LAW

Tune: Flow Gently, Sweet Afton -- the same as that used for the Camp Fire Law

Seek nematodes by sampling;
Extract every day.
Identify genera
Without delay.
Count samples regularly,
Or they'll decompose.
And analyze data
On your nematodes.

Most Camp Fire youth learn the Camp Fire Law by singing it. The Law seldom is spoken; it is most often sung. The melody is the old Scottish folk melody "Flow Gently Sweet Afton," written by Alexander Hume. The original lyrics of "Flow Gently" were written by Robert Burns in 1786. The Afton is a river in Scotland, and the lyrics depict a man asking the river to flow gently because the woman he loves is sleeping beside it.

The real Camp Fire Law includes an extra introductory line for the first law, "Worship God." This is hummed and then sung on the perfect fourth formed by the (5) and then the (1) on which the first two syllables of the main melody are sung. That would be "Seek nem-" above and "Seek beau-" in the real Camp Fire Law. Got it?

See http://www.absoluteastronomy.com/topics/Camp_Fire_USA

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I KNOW A PLACE

Melody: I know a place

I know a place where nothing ever grows
Due to plant parasitic nematodes.
It's hidden in a low spot right above a hardpan
And standing there among the dying plants I find that I can
Feel the pulsations nematodes will make
While plant productivity they take –
Now I know that nematodes are here for me.

One can imagine herself as in a dream
Sieving and pouring, extracting all the nem-
Atodes from every sample from this special place
And only since it's special, I find that I can face the
Bottles and tubes of samples I must count
Through the season continuing to mount –
Now I know that nematodes are here for me.

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Internet searches for the origin of the youth camp song "I know a place" yielded no information. Tony Hatch wrote the music and lyrics to "I know a place where the music is fine and the lights are always low," which was recorded in 1965 by Petula Clark. "I know a place where we can carry on" by Bob Marley was recorded by Bob Marley ... sometime. The internet is thick with references to these two "I know a places" but not to the "I know a place" sung at youth camps and referenced above, except to quote the original lyrics (<http://www.backyardgardener.com/loowit/song/song42.html>) or to present one song based on it.

Unlike most woodland entities, it has left no trail.

NEMATODE HYMN

Melody: Philmont Hymn (Boy Scouts)

Stylet on the cell, rhizosphere above
Mycorrhizal strands, cell sap that you love –
Nematodes, you are perfect parasites
Here among the roots tonight.

Films of water gleam on the soil crumbs main-
taining turgid roots, especially in the rain.
Nematodes you are perfect parasites
Here among the roots tonight.

Information accompanying downloadable sheet music including lyrics to the Philmont Hymn at <http://www.watchu.org/Docs/Hymn.pdf> relates that the Philmont Hymn was written by John Westfall, on August 17, 1945, while at Camp Cimarroncito, one of Philmont Scout Ranch's three rock climbing and rappelling camps.

Philmont Scout Ranch is the Boy Scouts of America's oldest national High-Adventure Base. In the Rocky Mountains near Cimarron, New Mexico, it includes 34 staffed camps and 55 trail camps.

Longtime Cub Scout leader and Boy Scout volunteer Michelle Bojanowski, who worked at the Corvallis Kinko's in 1992 when "Volume III – Camp Songs" was published, agreed with me that a book of camp songs must include at least one song specific to Boy Scouts. Volunteering to help, she selected Philmont Hymn as a good subject and supplied me with a copy, made at Kinko's, of course. I had never heard of Camp Philmont, so she explained it a little.

I observed singing Boy Scouts during two summer Girl Scout Ranger Aid projects at Spirit Lake Girl Scout Camp, five miles from Mt. St. Helens in Washington. We sometimes shared campfires with the staff of the adjacent Boy Scout camp. Boy Scouts and Girl Scouts knew a lot of the same songs, and in addition, we serenaded each other with songs that hadn't jumped the Boy Scout-Girl Scout boundary. Those Spirit Lake campfire circles are probably somewhere in eastern Montana now, under thirty years worth of large woody debris, smaller litter, and maybe even an A Horizon.

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PIERCING ALONG WITH THE ROOT-SUCKING NEMATODES

Melody: Drifting Along with the Tumbling Tumbleweed

See them squirming around
Pledging their lives to the ground
Lonely but free I'll be found
Piercing along with the root-sucking nematodes.

Disease of the past is behind
In the new roots I will find
Just where the lesions will wind
Piercing along with the root-sucking nematodes.

I know when tissue's gone
There are new roots before too long

So I'll keep sucking along
In my metacarpus a song
Here in the dirt I belong
Piercing along with the root-sucking nematodes.

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Words and music by Bob Nolan, 1934. Copyright: Lyrics Copyright Warner/Chappell Music, Inc./Songwriters Guild of America.

If you think the tale of Leonard Slye of Cincinnati, Ohio is exciting, you out to hear the story of Bob Nolan. Bob Nolan was a technically excellent musician as well as an innovator. Creativity as well as precise style and delivery helped credit him as the founder of western music.*

As a young adult in his native Nova Scotia, Bob Nolan wrote "Drifting along with the tumbling leaves." He moved west to live with his estranged father, whose family told him that his mother abandoned him rather than pass along her frequent letters and also rebuffed her attempts at contact. His mistaken conclusion led him to trust no one, but he fell in love with the southwestern deserts (*sensu lato*) and felt that they would never betray him. Changed to "Drifting along with the tumbling tumbleweeds," this song was one of the Pioneers' earliest and most enduring hits.

Leonard Slye came west in 1931 to earn a living as a musician. After a few years of every imaginable kind of labor as well as solo and group singing, a movie lead required a stage name. He chose Rogers after Will Rogers and Roy from a list.

Before he became Roy Rogers, Leonard Slye was a founding member of Sons of the Pioneers. Although he had to resign because of contract conflicts, he remained associated with them for as long as they were together. Bob Nolan was another founding member, and he remained a member throughout its long existence. His story is at <http://www.bobnolan-sop.net/Biographies/Bob%20Nolan/Bob%20Nolan%20bio/Bob%20bio.htm>

*Western music as in country and western music, not as in the progression from one-line plainchant and multi-line polyphony through Renaissance, Baroque, Classical, Romantic, and so forth. I kept getting confused on this point, wondering how Sons of the Pioneers related to Gregorian chant.

HOME ON THE RANGE

Melody: Home on the Range

Oh, give me a home where the nematodes roam,
Where free-livers and parasites play,
Where often is heard a descending cow turd,
And the worms are well fed every day.

Refrain:

Home, home on the range,
Where free-livers and parasites play,
Where often is heard a descending cow turd,
And the worms are well fed every day.

How often each morn, in the root tissue torn,
Do I meditate on my success?
I'm continually amazed as I level my gaze
By the plants that I've made such a mess.

Refrain

Written by Dr. Brewster M. Higley, a physician who homesteaded in Kansas, the words to what we now know as "Home on the Range" was originally published in the Smith County Pioneer in 1873. Daniel E. Kelley, a friend of Higley's, wrote the melody. Words of both the stanzas and refrain have varied over the years. John Lomax, collector of American folk songs for the Smithsonian Institution, collected this song in 1910. In 1947, it became the state song of Kansas.

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I'M GOING TO LEAVE OLD TEXAS NOW

Melody: I'm Going To Leave Old Texas Now

I'm going to leave old Texas now;
With poor host species it's been endowed.

They've narrowed down my broad host range;
Resistant cultivars are all so strange.

I'll take my stilet, I'll take my spic-
ules I'll be ready to make plants sick.

I'll take my spurs, I'll take my genes,
Live on tortillas and roots of beans.

The hard, hard ground will be my bed;
It would feel good if the plants were dead.

If necrotic plants will be in my dreams,
It won't be as bad as it now seems.

I'm going to leave Old Texas now;
With poor host species it's been endowed.

The original lyrics to this song recall the Texas Fence-Cutting War and the end of the free-range ranch life in Texas. Free-range ranching developed on the Great Plains in the mid-1800s. Ranchers grazed and watered their cattle on public lands. The land they used belonged to the state or federal government, not to the ranchers. Some would benefit from the free-range system, while others would be disadvantaged. The transition from free-range ranching to fenced-stock farming occurred rapidly in Texas with the introduction of barbed wire, a new product of industrialization.

Most of the fence-building ranchers fenced just the land they owned or leased, but others also enclosed public land, other peoples' property, and public roads. Access to schools and churches and mail delivery routes were blocked. Such unwarranted fencing led to fence-cutting, often malicious. The Cutting War proliferated, resulting in several kinds of crime including the burning of fenced pastures and murder of fencers. The clashes discouraged farming and scared away some prospective settlers. The Fort Worth Gazette asserted in 1883 that fence troubles had caused tax valuations to decline by 30 million dollars just in Brown County.

This information came from

http://www.museumonmainstreet.org/admin/fences_admin/fences_local/Fences_Don't_Fence_Me_In_Lesson.pdf, which is a good source for more information.

I can find no information on the composer or lyricist. Maybe it's another true folk song. But I would have guessed that about Home on the Range, too.

BEEN DIGGIN'

Melody: Been Ridin' (Joggin' Along)

Been diggin' since daylight
Through shadow and sunlight
And now in the twilight
We're shovelin' slow.
Our plots are all trampled
But still we will sample
In the field where the sun hangs low.

Refrain: Diggin' along to nowhere,
Diggin' along all day
Diggin' along to nowhere,
We sure know the way.

Here are lyrics to the original:

Been ridin' since daylight through shadow and sunlight
And now in the twilight, we're travelin' slow
We'll ride on together, whatever the weather
Down the trail where the sun hangs low.

Joggin' along to nowhere, joggin' along all day.
Joggin' along to nowhere; we sure know the way.

It's another mystery: I can find no information about the composer or lyricist of this song or about its story.

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RECESSIONAL

Melody: Recessional (Camp Fire Girls)

Go we forth with our nematodes
Into the night, into the night.
In our hearts, renewed desire
Burning bright, burning bright.
Vermiformity we've found
In the worms we love.
Soil's stillness closes 'round;
Roots and air above
Blend into the mystic call
Of "nematodes, nematodes."
May N. A. Cobb's blessing fall
Upon us as we go.

-- by Helen Gerrish Hughes, copyright by Camp Fire

Helen Gerrish Hughes is also the author of the Processional, the first song parodied in this sequence. I can't find any other information about the Recessional, either. The same web sites suggested for the Processional also provide background understanding of the original lyrics for this song.

PLANT-PARASITIC NEMATODE SONGBOOK GLOSSARY

Anguina: seed gall nematode, a migratory parasite of above-ground plant parts.

Araeolaimida: An order in Phylum Nematoda characterized by the following qualities. Amphids spiral or loop-like. Caudal glands present. Head with four cephalic bristles well back from the labial papillae. Body cuticle smooth or annulated, sometimes with bristles. Esophagus with procorpus, isthmus, and terminal bulb; or terminal bulb absent.

Avena: genus name of oats; subject to cereal cyst nematode (*Heterodera avenae*) colonization.

Baermann: affectionate term used for Baermann funnels, apparatus used for extraction of nematodes from soil, plant materials, and other substances. They were originally developed by Professor Baermann for, uh, "other substances."

Baermann funnels: see above.

cell sap: loose term for everything inside the cell except the nucleus.

citrus nematode: common name of *Tylenchulus semipenetrans*, a sedentary ectoparasite historically and frequently associated with citrus.

Cobb, Nathan A.: pioneer plant nematologist who described numerous species and originated many techniques still used in nematology.

Corynebacterium: genus of bacteria, some species of which have now been transferred to *Clavibacter*, which contains plant-pathogenic species. Yellow ear rot results from cooperative colonization by *Clavibacter tritici* and *Anguina tritici*.

corm: a short, flattened, modified stem which acts as a vegetative propagule as well as a storage organ. Corms resemble bulbs, but bulbs consist primarily of overlapping fleshy leaves. *Gladiolus*, *Crocus*, and banana, among other plants, form and are propagated from corms.

corky ringspot: disease symptoms in potato tubers produced by Tobacco Rattle Virus, which is vectored by various species of *Trichodorus sensu lato*.

cortex: the typically parenchymatous layer of tissue external to the vascular tissue and internal to the corky or epidermal tissues of a vascular plant.

Criconemella: one genus name for some ring nematode species.

cuticle: the non-cellular exterior covering of nematodes, produced by the hypodermis.

cryptobiosis: a state of extremely low metabolism induced by slow desiccation and terminated by hydration. Organisms in a cryptobiotic state can remain in this state indefinitely. Many nematodes, rotifers, and tardigrades are capable of cryptobiosis.

cyst: among plant-parasitic nematodes, the oxidized cuticle of dead adult females of the genus *Heterodera* and related genera which confers protection to the eggs contained therein.

cytoplasm: a more correct term for cell sap, but still loose.

dagger nematode: a common name for members of the genus *Xiphinema*.

dauerlarvae: nematode juveniles capable of resisting low moisture conditions.

Ditylenchus: stem-and-bulb nematode, a migratory parasite usually of above-ground plant parts.

Criconemella: a name for *Mesocriconema* which is no longer in vogue for species *xenoplax*.

ectoparasite: a parasite that accesses its host from outside the host body.

endoderm: in triploblastic animals, the inner of the three embryonic cell layers (germ layers). Most cells of this inner layer become the gut.

endoparasite: a parasite that accesses its host from inside the host body.

extract: in nematology, to remove nematodes from soil, plant material, or other substances.

feeder roots: a loose, non-technical, and completely and frustratingly inaccurate term for absorptive roots.

flame: a method of crop pest control. Propane flame from a burner pulled behind a tractor through a field is used to control fungi and insects on peppermint. Nematodes in plant tissues near and above the soil surface are also affected.

flea beetle: a group of small beetles, some of which are crop pests.

flotation: in nematology, a method of extracting nematodes from soil in which the soil sample is centrifuged in a solution denser than water. Soil particles form a pellet, whereas nematodes and other small invertebrates remain in the supernatant.

Formalin: originally a trademark for a clear aqueous solution of formaldehyde containing a small amount of methanol; in general, a small percentage (usually 4%) of formaldehyde in water.

free-living: in nematology, a term used to describe those nematodes which are not known to be parasitic on larger organisms.

fumigation: the application to soil of a toxic gas intended to kill organisms.

funding: what many scientists spend much of their time looking for.

funnels, Baermann: see Baermann funnels.

gall: a proliferation of usually undifferentiated plant tissue formed in response to an irritant, including parasites.

genera: plural of genus, which is a group of closely related species.

gland overlap: region of overlap of the intestine by the digestive glands: a diagnostic character for some nematode taxa.

glycerine: a sweet, syrupy hygroscopic trihydroxy alcohol (C₆H₈O₃) usually obtained by the saponification of fats. After a meticulous fixing and dehydration process, nematodes are permanently mounted in glycerine on microscope slides.

golden nematode: common name of *Globodera rostochiensis*, a cyst nematode parasite of potato tubers.

Goodey, Basil: author of second edition of *Soil and Freshwater Nematodes*, Methuen and Co., London, 1963, an old yet valuable encyclopedic reference.

gradient: change in the value of a quantity per unit distance in a specified direction.

hardpan: a hardened, sometimes lens-shaped layer in soil often impermeable to water.

Helicotylenchus: one of three genera included in the common designation “spiral nematode,” so named because of the spiral configuration of the worms at rest.

Heterodera: cyst nematode, a sedentary endoparasite, the female of which swells up while inside the root, resulting in the splitting of the root as the female matures.

hypodermis: a thick tissue layer beneath the cuticle which thickens to form the dorsal, lateral, and ventral chords, which extend the length of the body.

ion(ic): referring to an atom, group of atoms, or subatomic particle that carries a charge.

latex: reference to the latex tubing attached to the bottom of the funnel in the Baermann funnel apparatus.

lesion: a localized spot of diseased tissue.

lesion nematode: common name of *Pratylenchus* species, migratory root endoparasites which cause lesions.

Macroposthonia: a name for *Mesocriconema* which is no longer in vogue for species *xenoplax*.

Meloidogyne: genus of endoparasitic nematodes characterized by swollen females which induce galls or knots on roots.

Meloidogyne chitwoodi: Columbia root-knot nematode, which occurs in the northwestern United States and which colonizes various hosts including potato, in which it causes cosmetic damage on tubers.

metacarpus: the middle of three subdivisions of the esophagus of the two secernentean nematode orders containing soil-dwelling representative. In Order Tylenchida and some members of Order Rhabditida, the metacarpus is mostly round or oval and contains a valve. In the remainder of Order Rhabditida, the metacarpus consists of a subtle to marked swelling of the esophagus but lacks a valve.

metarhabdiate: possessing metarhabdions.

metarhabdions: one of several sets of sclerotized tubular sections in the stoma of Order Rhabditida.

migratory: moving around rather than staying in one place for an extended time, such as life or a major part of it. Compare “sedentary.”

mycorrhizal: referring to fungi symbiotic with roots.

necrosis: death.

necrotic: referring to dead cells or tissues.

nematicide: a compound that kills or incapacitates nematodes.

nematode: a plain round worm – not flat, not segmented, but just plain and round.

nematode wool: a mass of cryptobiotic fourth-stage *Ditylenchus dipsaci* individuals that occurs on or in some plant tissue. The best known location of nematode wool is on the basal plate of *Allium* species -- onions and garlic.

Neolatin: Latin terms coined for use in science.

niche (ecological): an organism or population’s response to and alteration of the distribution of resources and competitors in its ecosystem.

objective: in microscopy, the lens complex closest to the viewee, which the eye looks through.

‘oid: useful suffix which, when attached to any Latinized adjective or taxon name renders the user authoritative.

outlier: a data point situated or classed away from a main body of data points.

Paratylenchus: pin nematodes, which are migratory ectoparasites.

phasmid: one of a pair of lateral caudal papillae connected to glands and located in the lateral field and believed to be chemoreceptive.

pin nematode: common name for members of the genus *Paratylenchus*, migratory root ectoparasites usually causing little damage except when occurring in large numbers.

plectoid: loose term for a member of the Order Araeolaimida resembling *Plectus*.

Plectus: genus of soil- and moss-dwelling bacterivorous nematodes in the order Araeolaimida.

power surge: sudden hypernormal flow of electricity through a power grid.

Pratylenchus: lesion nematode, migratory endoparasites with wide host ranges, individuals of which create necrotic areas (lesions) in roots. Several species are among the most destructive of plant parasites.

pseudocoelomate: animal whose body cavity is lined only partially with mesoderm. A true coelom is completely lined with mesoderm. Please refer to your embryology notes from General Biology.

publications: the entire objective of science.

random design: term shortened by poetic license referring to randomized block design, an experimental design introducing chance yet allowing for differences across plot area.

refraction: the bending of light rays in a way that makes the agent of bending visible.

rhabdions: fused or separate tubular entities visible in the stoma of members of the Order Rhabditida.

Rhabditida: an order of Phylum Nematoda, many species of which dwell in soils. Members of the Rhabditida are characterized by a smooth or annulated cuticle; small, pocket-like amphids; the presence of phasmids and the absence of caudal glands; stoma containing five or more fused or separate tubular sections called rhabdions; and esophagus consisting of a procorpus, a valved or non-valved median bulb, and a valved or non-valved terminal bulb.

rhizome: a horizontal below-ground stem. Compare stolon.

rhizosphere: soil immediately surrounding roots.

rice-root nematode: *Hirschmanniella oryzae*, a migratory endoparasite of rice roots which enters the roots through air channels between radial lamellae of the cortical parenchyma.

ring nematode: common name for members of the genera *Criconema*, *Criconemella*, *Criconemoides*, *Macroposthonia*, *Hemicriconema*, *Hemicriconemella*, *Hemicriconemoides*, *Hemimacroposthinia*, and variously ephemerally-named relatives involved in an uncontrollable exponentially ramifying proliferation of taxonomic Neolatin. All bear cuticles ornamented with annules large enough to be visible at 40 power and often far lower than in some taxa are further adorned with recurvature or fringes. The species *xenoplax*, among others, travels between and among these genera at short, unpredictable intervals.

root knot: gall or knot on a plant root formed in response to parasitism by *Meloidogyne*.

sample: a part of what you want to know about that should be a good representation of the whole thing.

sclerotin: an insoluble tanned protein permeating and stiffening the chitin of the cuticle of arthropods.

sclerotized: hardened, perhaps by sclerotin or another mix of proteins, and refractive.

saponification: the hydrolysis of an ester into the corresponding alcohol and acid.

sedentary: indicates staying in one place for an extended time, such as life or a major part of it, rather than moving around. Compare "migratory."

seed gall nematode: a common name for those species of the genus *Anguina* which induce production of galls containing infective stages of nematodes in place of seeds.

sensu lato: Latin for “in the broad sense.” You can get away with a lot if you use this term, especially because it’s Latin and due to the prestige involved in using this language acts as a smoke screen to hide the fact that you don’t know what you’re talking about.

spicule: paired curved structures protruding from the male nematode’s cloaca. Use your imagination.

spiral nematode: a common name applied to *Helicotylenchus*, *Rotylenchus*, and related genera. Spiral nematodes are named for their spiral resting shape.

stem and bulb nematode: common name of *Ditylenchus dipsaci*, which colonizes above-ground plant parts such as stems and bulbs.

sting nematode: common name of *Belonolaimus*, a genus of migratory root endoparasites.

stolon: a horizontal above-ground stem. Compare rhizome.

stubby-root nematode: common name of species of *Trichodorus sensu lato*, including *Paratrichodorus*, *Monotrichodorus*, *Allotrichodorus*, and *Ecuadorus*, nematodes placed in or near Order Dorylaimida which possess two-part esophagi and curved, solid stylets and which make external feeding tubes out of spit. Feeding by stubby-root nematodes tends to make the affected roots stubby.

stylet: In nematodes, a sclerotized protrusible hollow spear (solid in one group, the trichodorids) characteristic of most plant-parasitic nematodes as well as those that feed on fungi and algae and of some that feed on insects. The stylet in the Tylenchida, one of two orders containing stylet-bearing nematodes, evolved from the walls of the stoma. In the other order containing stylet-bearing nematodes, the Dorylaimida, the stylet evolved from the esophageal wall.

suscept: victim of a pathogen.

symbiosis: relationship in which two dissimilar organisms live in close association. In the classical sense, both organisms benefit. In the modern sense, this is just any old relationship. The adjective derived from this noun is “symbiotic.”

taxon: a unit of classification. We like to talk about species, but often we know only the genus, family, or order of an organism. Use of the word “taxon” is the scholarly alternative to overt admission that you don’t know what species something is.

taxonomy: The study of the theory, procedure, and rules of classification of organisms, based on similarities and differences.

tomato ringspot: Tomato Ringspot Virus or TRV, which infects tomato and raspberry, among other hosts, and is vectored by *Xiphinema* species.

Trichodorus: the genus of stubby-root nematode species. These are migratory ectoparasites whose feeding on roots stunts their growth, which results in roots being stubby. The only plant

parasitic nematodes that have solid stylets, members of this genus (or group of genera; see “stubby-root nematode”) are virus vectors.

Trichodorids: see stubby-root nematode.

triploblasticness: the condition of possessing three cell layers as an embryo. I made this word up.

Tylenchida: an order of Phylum Nematoda, many species of which dwell in soils. Members of Order Tylenchida are characterized by an annulated cuticle; small, pocket-like amphids; the presence of phasmids and the absence of caudal glands; a stoma housing a protrusible, hollow spear, the stylet, formed by fusion of some of the rhabdions; and esophagus consisting of a procorpus, a valved median bulb, an isthmus, and a terminal glandular bulb.

tylenchoid: a loose term applied to the members of the Order Tylenchida, which contains the majority of kinds of plant-parasitic nematodes.

tuber: a short, fleshy, underground stem which bears minute scale leaves, each with a bud in its axil and thus potentially able to form a new plant. The part of a potato normally eaten is a tuber – NOT a root.

turgor pressure: pressure exerted towards the outside of a cell by its contents; the distention of the protoplasmic layer and wall of a plant cell by its fluid contents.

Tylenchulus: genus of the citrus nematode.

vector: any carrier, particularly an animal that transmits a disease organism from one host to another.

vermiformity: the quality of being vermiform – that is, worm-shaped.

vulval cone: cuticle around the vulva of an adult female *Heterodera* removed from the remainder of the cuticle and neatly mounted on a microscope slide, the features of which are examined in order to determine its specific identity. It sounds so easy, doesn't it?

white female: an individual adult female *Heterodera* species, or species in a related genus, during the middle portion of its life cycle after it has become sedentary and enlarged but before it dies and its cuticle turns brown due to oxidation.

wool (nematode): a mass of cryptobiotic fourth-stage *Ditylenchus dipsaci* that occurs on or in some plant tissue. The best known location of nematode wool is on the basal plate of *Allium* species -- onions and garlic.

Xiphinema: dagger nematodes, a genus of migratory ectoparasitic species identifiable by their long, slender profile (some species are over 5 mm long but 60 to 80 times as long as wide), their relatively long stylets borne on long stylet extensions enlarged at the base, guiding rings near where the stylet joins the stylet extensions, and their configuration in a “C” when relaxed.