



● *ASTRO Gold Medal Address*

**THE FUNCTION OF THE RADIATION BIOLOGIST IS TO MAKE THE
 CLINICIAN THINK: 1993 GOLD MEDAL ADDRESS**

ERIC J. HALL, D.Sc.

Center for Radiological Research, College of Physician and Surgeons of Columbia University, New York, New York

I am happy, grateful, and appreciative to receive the ASTRO Gold Medal. It is a special honor for a laboratory researcher to receive recognition from a predominantly clinical society, especially to be introduced by Rod Withers.

I'm told I have 15 minutes to reply. The only thing worse than having to summarize the accomplishments of your career in 15 minutes, is to find that you don't need that long!

So, with apologies to my fellow countryman Dylan Thomas—I decided to tell my story in humorous prose, because if you take life too seriously and can't laugh at yourself, you don't deserve a medal—and in any case, many a true word is spoken in jest. So here goes:

Years and years ago, when I was a boy
 when there were wolves in Wales, and
 birds the color of red flannel petticoats,
 I dreamed of being a scientist; of experiments and test-tubes
 and, who knows,
 a telephone call from Stockholm!

A wilderness is a parking lot without lines,
 so Rod Withers told us
 when he got the Gold Medal,
 with thoughts of Australia, no doubt.
 But believe me, you haven't seen a wilderness
 if you didn't see the Wales of my childhood.
 The smoke and grime of the industrial revolution
 blacked out the noon-day sun, and
 the miner coughed a souvenir
 of his days below ground.

Work hard at school the teacher said,
 or *you'll* end up digging coal!
 They didn't need to draw me a diagram!
 I often visited the mine where my father
 worked for 30 years in Abertillery
 So it was off to London for me, to study physics,
 to measure things, and learn to be argumentative.
 To be a high energy physicist,
 if I had been smart enough, which I wasn't.
 And if I had, I'd be out of work now!
 A victim of the cut-backs in basic research.

So, on to Oxford, City of Spires and Lost Causes,
 or, in my case,

of Wedge filters and Tissue Compensators,
 my first paper, of which I'm still proud,
 to work with Ellis, Oliver, and Lajtha,
 and a thousand treatment plans and radium implants.
 And friends made for life.
 Herman Suit, Martin Brown, Joel Bedford
 And then we had tea!

Physics is all well and good—
 it's nice to know what you are doing
 and be able to measure it,
 but the real challenge is biology.
 The trick, I learned at Oxford, is to talk
 biology to the physicists
 and physics to the biologists,
 and with luck no-one will ever find out
 how little you know about anything!

These were the productive years
 In Science, with Joel Bedford and the dose-rate effect
 Not to mention a wife and a son,
 Who has grown up to be a urologist
 (My son that is.)
 Winner of the golden catheter award
 to care for me in my old age.

So I left England for the New World,
 a refugee from the National Health Service,
 to escape cold winters, bureaucracy
 and hospital administrators,
 only to find that New York had more of all three
 than anyone had ever dreamed of in Oxford.

I learned a lot from Edith Quimby,
 who told me to write a book.
 "People believe anything they read in a book"
 she said,
 "and anyway it's casier than working for a living!"
 So I did that.

One year was so much like another
 in the productive chaos of Columbia Presbyterian,
 before the crack dealers, before Mayor Dinkins,
 before health reform,
 that I can never remember whether

Accepted for publication 20 April 1994.

Originally published in *Int. J. Radiat. Oncol. Biol. Phys.* (29(4):891–892; 1994. The address is reprinted in full due to errors in the original publication. We regret any inconvenience this might have caused.

we wrote six grants and six papers
when I had been there for twelve years,
or twelve grants and twelve papers
when I had been there for six years.
Either way, we prospered,
and NCI was kind and blessed our ways,
and (what's more to the point), crossed our palms
with silver.

There were neutrons and protons,
OER and LET and all the handwagons of the seventies;
Sensitizers and protectors and dose-rate infinitum.
Each new idea seized with as much enthusiasm,
as the last berth on the Titanic.
And discussed at length with colleagues
at tiring conferences in Colorado.

Then there were the hamsters,
fat and pregnant, nervous and wary,
knowing they were about to become short-term explants.
Assays for carcinogenicity,
victims in the quest for the causes of cancer,
for the eternal truths of science,
eternal that is until the next grant application!

Then there were the residents
who came to my Lab thirsting for knowledge
—or refugees from hard work in the basement
— I never figured out which.
They got their first taste of research
In my lab,
And promptly went into private practice,
Several may be in this room now,
Prosperous radiation oncologists,
with his and hers Mercedes,
Chuck Wilson, Ira Horowitz, Norm Schulman,
Mike Marchese, and Leon Harisiadis,
To name but a few.
They taught me patience and the clinical perspective.
And let me win at squash!

So what has radiobiology done for radiotherapy —
besides making it more expensive?
It gave us neutrons that didn't work
and protons that did.
High pressure oxygen tanks,
and Radiosensitizers that make your toes tingle
if they don't paralyze you altogether.
But the science was good
Led up the garden path by the mouse
So it's back to the drawing board,
or in this case the test-tube.
If you can't sensitize them, kill them,
Hypoxic cytotoxins are the wave of the future.
Take my word for it!

Bring out the tall tales that we told by the fireside.
How that protracting the dose is the way to go.
They learned that in France,
before any of us were born.
The rams didn't think it was much of a joke,
but fractionation in radiotherapy
was born in the shadow of the Eifel Tower.
After 70 years and a million mice,

Have we finally learned/to do it right,
With a little help from Rod Withers.
Treat them twice a day—B.I.D.
And the tumors will all go away—QED.
But you can't leave it to chance.
You must Predict it
with T pot, oxygen tension,
SF₂ and more.

So now we've all gone molecular.
You are dead if you haven't,
suffering from Mural Dyslexia,
The inability to read the writing on the wall.
With gels and cosmids and FISH,
The toys of recombinant technology
complete with instructions for little engineers,
Oh, how easy for Leonardo!

We've learned of
Oncogenes and checkpoint genes,
How an oncogene can be activated by a translocation to cause
leukemia

Or a suppressor gene knocked out by a deletion in a solid tumor
We've learned of Somatic homozygosity, which sounds as if it
should be illegal except perhaps in San Francisco.
Radioresistance caused by transfecting oncogenes, and if you
believe that, you'll believe anything!

The goal we must strive for now
is the ultimate in early diagnosis—
finding the susceptibility gene(s) for a given cancer.
The promise of the future in cancer prevention and treatment.

It can't be done say the skeptics
announcing ruin and disaster
like a town crier in Pompeii.
But it can be done. It's all in the genes.
We are captives of our inherited DNA,
modified by our lifestyle.

Anything good and pleasurable
is fattening or carcinogenic, or both.
*The function of the radiation biologist
is to make the clinician think.*

To lead the way,
To point to a new tomorrow.
And the lesson in 1993 is,
Go molecular young man, (or woman as the case may be).
There is PCR to amplify DNA
and SSCP to spot the mutation,
the tools of the trade.

In my day PCR meant
post coital remorse, but
we must learn the new definitions
and the future is to identify at birth
the spectrum of susceptibility genes
in a given individual and plan their life accordingly.

To lead the charge
To improve the patterns of care
To help the cancer patient
That's what it's all about.
It may be magic and can't be done today.
But don't bet
that we can't do it tomorrow!

Thank you ASTRO for honoring me
with the Gold Medal
I wear it with pride.