

Science on Stage

Science plays a considerable part in a number of plays. Several have been critical and popular successes. George Bernard Shaw's *The Doctor's Dilemma*, Friedrich Dürrenmatt's *The Physicists* and *The New Men* by C.P. Snow and Roger Millar are good examples. More recently, Tom Stoppard's *Arcadia* and Michael Frayn's *Copenhagen* have added to the genre.

The two plays suggested here are *Square Rounds* (1992) by poet and playwright Tony Harrison and *Oxygen* (2001) by two chemists, Carl Djerassi – the organic chemist and 'father' of the contraceptive pill – and Roald Hoffmann, winner of the 1981 Nobel Prize for Chemistry. As well as non-fiction, Djerassi has written six novels, a volume of verse and another play. He also founded a centre in California that supports working artists in many disciplines. Hoffmann has written three volumes of poetry, and books linking the creative and humanistic aspects of chemistry with culture and society, including *Chemistry Imagined* with the artist Vivian Tonence.

Square Rounds

Square Rounds is a tale of misrepresented ideas, war, corruption and suicide.

The cast for its original run at the National Theatre was almost entirely female. The performance included song, dance, magic, quick changing of costumes and an impressive score by composer Dominic Muldowney. Harrison, incidentally, did all his own research while writing this play.

The play studies the chemist Fritz Haber. Haber believed that if Germany used poison gas in World War One, thousands of young soldiers would be saved from death at the hands of the Maxim brothers' machine-guns and explosions. But his ideas were corrupted and led to the suicide of his wife Clara.

Oxygen

Oxygen exposes competition and the urge for recognition among scientists, suggesting that little has changed in more than 200 years. It's full of sharpness, satire and wit, and has received praise from several Nobel Prize winners in chemistry, physics and medicine, and by Dario Fo, Nobel Laureate in Literature.

The play is set in 1777 and 2001 with all but one of the cast of six doubling parts in both eras.

In 1777 King Gustav III of Sweden wants to know who was the first to discover this new gas, and has summoned to his court the three men who claim priority: Dr Joseph Priestley, a Unitarian minister from England; Antoine Lavoisier, French tax farmer; and Carl Wilhelm Scheele, Swedish apothecary. Also present, and playing vitally important parts in the action, are Mrs Priestley, Mme Lavoisier and Fru Pohl (Scheele's housekeeper, who later married him).

Meanwhile, in 2001, the Chemistry Committee of the Royal Swedish Academy of Sciences has been asked to mark the Centenary of the Nobel Prizes by recommending someone for the award of the first retro-Nobel Prize for Chemistry – in other words, for work done *before* 1901. They decide that the award



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must be linked to the discovery of oxygen, which was in effect the birth of modern chemistry. But who should get the prize?

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What you need to do:

Read the excerpts from one or both of the plays. Your teacher will tell you which.

Depending on your coursework requirements, you may be asked to discuss the problems of casting, directing and staging the plays; perform excerpts (dramatised reading, perhaps semi-staged); discuss the interaction between scientific and dramatic aspects; discuss the moral dilemmas, etc., featured in the excerpts.

Your teacher will advise you here.

Resources that may help you:

Square Rounds, by Tony Harrison. Faber & Faber, 1992 (out of print, available from libraries).

Oxygen, by Carl Djerassi and Roald Hoffmann. Wiley/VCH, 2001 (£9.99)

Selected websites:

www.djerassi.com

www.nobel.se/chemistry/laureates/1981/hoffmann-autobio.html

For a contemporary view (1992) of The Gaze of the Gorgon and Square Rounds, go to: www.books.guardian.co.uk/Print/0,3858,3922860,00.html

If you want to go further:

Work on the complete plays.

SQUARE ROUNDS

SIR HIRAM MAXIM

(After a great deal of inhaling)

My worst nightmare's being short of air
and gasping for breath as you've seen
so you'll understand if I turn my hand
to perfecting this inhaling machine.

If, perish the thought, future wars won't be fought
with my weapon I'd find that depressing
but that's not my belief so I seek relief
for a problem that for me's far more pressing.

My killing machine in 1915
will stay as it is for ever
in a 100 years no engineer's
going to turn out a weapon so clever.

HUDSON MAXIM

And my powder, his gun will get this war won
I'd like you to know who to thank.
For his help in your fight he got made a Knight
but I'm staying an undubbable Yank.

Now you're aware I'll make the US prepare
and get ready to intervene
please give your applause to the winner of wars
Sir Hiram Maxim and life-saving machine.

Only by preparation can occupation
and such like ills be prevented.
For defensive use let me introduce
the greatest life-saving instrument ever invented!

(MUNITIONETTES *sing:*)

The greatest life-saving machine

HUDSON MAXIM

Though the USA has led the way
as machine gun pioneers
my brother knows his invention owes
a lot to a Limey dead 200 years ...

SIR HIRAM MAXIM

James Puckle first solved how a chamber revolved
and achieved a sustained rate of fire.
In 1718 he made a machine
that killed two ways lower and higher.

HUDSON MAXIM

In his own way and in his own day
he faced the problem we face at present

SIR HIRAM MAXIM

how to use the same gun on everyone

HUDSON MAXIM

but distinguish the Cross

SIR HIRAM MAXIM

from the Crescent

MUNITIONETTES (*Singing*)

With his protestant zeal he fashioned the steel
that got shot from his gun in two forms.
Paradox though it sounds he fashioned square rounds
to kill those who scorned Christian norms.

HUDSON MAXIM

If it's the Cross you revere you get killed by a sphere
but if you face Mecca at prayer
the pain that you'll feel pierced by James Puckle's steel
is redoubled when bullets

MUNITIONETTES

are square.

SIR HIRAM MAXIM

'For defending the Laws of the Protestant Cause'
he wrote of his gun with poetical flair
So a Catholic could fall by a spherical ball
but the ball for a Moslem was

(Audience)

square.

HUDSON MAXIM

In his day he'd decide how people died
according to religion or skin.
Those outside the bounds would get square rounds
and the round wounds would slay those within.

MUNITIONETTES

He couldn't forget the Islamic threat
and got his dual weapon to work
so that normal sphere killed Christian peers
but more painful rounds killed the Turk.

HUDSON MAXIM

In this day of ours with greater powers
the question of 'square rounds' is vaster
but whatever you say of death Maxim's way
there can't be many much faster.

SIR HIRAM MAXIM

(After using his inhaler)

A slower death gasping for breath
my bad lungs make that my nightmare.
When I have to go to pray it's not slow
and that I don't have a harsh struggle for air.

The very worst fate that I could contemplate
after years of desperate inhaling

is a scenario where I choke slow
with the atmosphere's oxygen failing.

It just seems as unfair as a round that's square
to interfere with the passage of breath.
I'd be gunned down rather than drown
or die any way than by choking to death.

HUDSON MAXIM

It's time for white knuckles when guns like James Puckle's
get into hands that are dark-skinned not fair
and then it's the white man's the one in the sight
and the round with the name on is square!

But perish the thought suppose that their sort
get a hold of my weapon and train

HUDSON AND HIRAM MAXIM

to kill cousins of similar colour.

MUNITIONETTES

The better the gun the sooner the war's won
and guns don't come much better than ours
but the present war's a balanced see-saw
when the gun's possessed by both powers.

(Re-enter FRITZ HABER)

FRITZ HABER

(Speaking)

I think that I may modestly say
this invention will be superseded.
In this very year I have an idea
that deliver exactly what's needed.

(Singing)

Here the Mensch is who'll get war out of the trenches
and back into open terrain.
We'll force our way right through Calais
with Haber's superior brain.

I think I'll devise a little surprise
something that's certain to stun
all those who thought that war's only fought
with things like their vulgar gun.

HUDSON MAXIM

Face up to the fact my brother's cracked
the matter of weapons for ever.
You can't outsmart the state of the art
even you who thinks he's so clever.

FRITZ HABER

(Speaking)

You think that you've got the best of the lot
I say to you modestly NEIN

because I prepare to release from the air
a little invention of mine.

(Singing)

The war I detest in which all the best
and bravest of men meet their fate
I do what I cannot for Deutschland, but MAN
and save him before it's too late ...

Something that shocks, unorthodox
a weapon not thought of before
a sudden surprise out of the skies
to bring a quick end to this war.

HUDSON MAXIM

I very much doubt that this curious Kraut
will be the one to surpass

SIR HARIM MAXIM

the great inspiration of my life-saving creation
what will you do it with?

FRITZ HABER

GAS!

*(Fritz Haber now produces from his top hat an endless ribbon
of chlorine gas silk which he pours over the Maxim gun downstage
centre and envelops it. Gas Alarm Music.
The SHELL-SHOCKED MAN picks up the top hat of Nitrous
Oxide. He laughs. He turns into a WW1 soldier. He laughs. He
tries to stop laughing. He turns from a WW1 soldier into a
mourning woman in black dress and black veil.)*

END OF PART ONE**PART TWO**

*The sound of laughter from the auditorium increases.
The sound of laughter draws from the centre back Olivier
Shutter the entire company as WOMEN IN MOURNING VEILS
Carrying lighted candles. MOURNING WOMEN sing:*

Who will bring the colour back to life
For mourning mother and the widowed wife?

When the flag-saluting nations fight
The world is drained to black and white

Black and white, black and white
Can you go on seeing the world in black and white?

*On the hiss that concludes the song the candles change into silks
the colour of chlorine gas. One of the WOMEN lifts her veil and
reveals herself as FRITZ HABER who collects the silks from the
WOMEN.*

FRITZ HABER

I see it now as my inventor's brief
to spare all Europe's mothers more appalling grief,
I've found a way to staunch the loss of Europe's sons
to yes, alas, my nitrates and the Maxim guns.
I've found, as some sort of penance to my wife,
a way to end the war and stop the loss of life.
I'll prove Chemistry is humanity's best friend
and by using its potential bring war to an end,
that both contestants were equally supplied
with Maxims and explosives let me decide
to use our advantage the chemistry supplies
the world, from Germany, with all its brilliant dyes.
The flags and banners of Europe's warring sides
were coloured by synthetic dyes that Germany provides.

Germany coloured the clothing worn by all the wives
who've waved their husbands off to throw away their lives,
all the cheerful colours put away
in mothballs till what they hope is Victory Day.
Out of the industry which gives the world its dyes
I can chemically concoct a new shock from the skies.

And when I speak of dyestuffs I should know.
My father, Siegfried, dealt in indigo
and though I advised him my father couldn't see
that plants would be supplanted by my chemistry.
He couldn't foresee that colours of all sorts
could be fabricated easily in test-tubes and retorts.
He believed in Nature. His son, the doctor, knew
that indigo was finished as the world's one source of blue.
It was then I learned the processes that now can be employed
to prevent a devastated Europe being totally destroyed
Clara has her scruples, moral reservation

on the use of science in the conflict between nations.
My official life is pressured my family life is nil
since Clara knew my nitrates could be used to kill.
The Prussian monarch's pressure, Clara's pique
at what she thought perversions of laboratory technique.
I apply to my mind to problems and I find
that most problems can be solved by a scientific mind.

Some ingenious method had to be found
to get the entrenched troops out of the ground.
Once we're victorious and war's brought to halt
Clara might forgive what she thinks is my fault
when she sees my nitrates that scorched Nature for the Kaiser
returned to crop-filled fields as fertilizer.

(Enter CLARA HABER.)

CLARA HABER

I gave up chemistry to share you as a wife
now you betray our science to poison life.
The beneficial chemistry that was our bond before
broken when I saw science made to serve the war.
You, a scientist, a chemist and yet you comply
with the Kaiser's orders so that millions will die.
You, who saved Mankind from Crookes' predicted doom
may send as many as you saved into an early tomb.
Now the Kaiser commands a chemist to devise
a form of killing from those brilliant dyes
that gave my dress its sheen and elegance
that caught your eye when you asked me to dance.

FRITZ HABER

But explosives are chemical weapons too.
Mine seems terrible only because it's new!
My gas will break the deadlock, make the war much shorter
and therefore save millions from the slaughter.

The explosives with which the war is being fought
are simply gas weapons of a different sort.
How many times in school did you hear your class recite
when carbon, sulphur and saltpetre mixed ignite
The volume of gas, Clara, GAS increases
800 times its bulk and blows to pieces
the canister confining it, and those bits fly
and pierce man's hearts and brains and make them die.
So what has brought the war to its present pass
is simply another way than mine of using gas.
Sentimentalists assume it's all very well
if Maxim uses gases as the power to propel
a bullet through the air, hit its mark, and shatter
a man's ribcage, but quite a different matter
if I use a gaseous resource but I dispense
with the metal missile. What's the difference?
Don't they both result in death? That's the intention
of both Sir Hiram Maxim's and my own invention.
If Maxim hadn't used gas from each round fired to feed
the next round chamber, now there'd be no need

to use any chemical genius in order to surpass
 his use of gaseous energy with my simpler use of gas.
 Without the gas the Maxim gun could not exist
 and no need for me to counter his mechanics with my mist.
 The force of explosive gas that travels very very fast
 blows head and limbs off in its fearsome blast.
 It's a chemical weapon, chemicals and gas
 and yet the scruples of the moralist let that pass.
 Make delicate distinctions, but alas,
 the essential element of both is gas, gas, gas.
 One gas blows to pieces, one manages to choke
 its unsuspecting victims with a greenish yellow smoke.
 If I were a victim's mother. Imagine being her
 I know which of the two fates for my son I'd prefer.
 If one were forced to make that gruesome choice
 and my son were the victim then gas would get my voice.
 An appalling decision but gas would get my vote
 because apart from internal damage to lungs and throat
 my boy would be intact, whole and I
 would have a corpse for burial I could identify.
 It would still be my boy, mein lieblich, him
 not half a helmet and one mangled limb.
 It's bad enough to die but once you've died
 isn't it better if your corpse can be identified?
 Rather than be bits and pieces jumbled up with others
 sent home to the wrong grief-stricken mothers?
 The burial parties won't take time to pick and choose,
 what each piece of raw meat once was or even whose.
 Better in your box intact whatever your belief
 if only that your mother has the right bits for her grief.
 RETURNED IN PIECES is the RIP
 of those who met their fates through TNT.

The metal weapons solidier than chlorine's
 the one that blows a man up into smithereens.
 The solid weapons shatter men to little shreds
 they separate their bodies and their heads.
 All those solid metals propelled by force
 are infinitely more merciful, of course! Of course!
 Unlike explosives nitrates my invention won't delay
 the end of hostilities day after bloody day.
 The war that's now in stalemate will at once be curtailed
 as soon as my invention is released and first inhaled.
 In the future, if you don't, the world will come to see
 that I saved millions and will one day honour me.

CLARA HABER

Honours aren't readily bestowed on Jews.
 You're well aware of the Kaiser's ant-Jewish views.

FRITZ HABER

That's precisely why, Clara, that I can't refuse!

CLARA HABER

He would never have used you if he could find
 a Gentile genius with your inventive mind.
 He's known to call Jews vermin and parasites

and thinks of them as Africans and not as fellow whites!
 Don't you realise the Kaiser will restrain
 his anti-Semitic prejudice while he can use your brain.
 If he could find an Aryan as brilliant as you
 do you think he'd even bother with a 'bloody Jew'?
 You are supping with the devil and very soon
 you'd wish you'd gone to supper with a longer spoon.
 He or some saner campaigner adviser sees
 that they can't win the war without your expertise.
 Once they've extracted from you all that they can use
 he'll dismiss you and detest you like all the other Jews.
 Once the war is won he won't bother to conceal
 he feels about the Jews as almost all the Prussians feel,
 and if his Imperial Majesty permits
 himself such prejudice, what hope have we, Fritz?

FRITZ HABER

I'll convert that Prussian sneering
 into surprised gratitude with a little engineering.
 Even the junkers will finally acknowledge
 the superior power of scientific knowledge.
 And they sneer at civilians and despise is too
 especially if like me the civilian's a Jew.
 He needs my expertise, and so he reins
 in his prejudice so he can pick my brains.
 And the Kaiser sends the Junkers to form an anxious
 queue
 to give chemical commissions to the genius Jew
 who made the invisible air serve the cause of world
 nutrition
 and so seems less a chemist and more of a magician.
 And who will stop the war unless I go
 to serve the Prussians as the Prosper?

(Music)

CLARA HABER

Colours in which young people's hearts rejoice
 when promenading or on the ballroom floor
 are the same hues that rival nations hoist
 for youth to follow blindly into war.

Colours chemistry invented cheered the soul
 and filled the youthful heart with rare delight
 but cut up into squares up on a pole
 lead the same youth to perish in the fight.

VEILED CHORUS

Can you go on seeing the world in black and white?

CLARA HABER

(Speaking over VEILED CHORUS)

I prefer that every brilliant colour will come back
 merged to one immeasurable length of widows' black.
 Those piffing pennants that made us feel so proud
 will be leached by bitter tears to one long shroud.

(Singing)

The bright flags waved by cheering crowds
when they paraded as recruits
are bleached now for the veterans' shrouds
or black veils and funeral suits.

VEILED CHORUS

(Singing)

The flags are now waving in the streets
are the widows' veils and winding sheets.

CLARA HABER

(Singing)

Bright brilliant banners flew
when the young men all left home
when they return the only hue
is a mournful monochrome.

VEILED CHORUS

(Singing)

Can you go on seeing the world in black and white?

CLARA HABER

(Singing over VEILED CHORUS)

It's black and white not brilliant shades
produced now by the fashion trades.
Black for all the waiting crowds
who've come to claim their men wrapped in white shrouds

Bits of cloth dipped in bright dyes
lead Europe's youth to war.
Cloths of black veil widows' eyes
and shroud-length figures scar.

VEILED CHORUS

(Singing)

Black and white, black and white
white and black, white and black,
Bright flags send them out to fight
white shrouds wrap them when sent back

CLARA HABER

(Singing over VEILED CHORUS)

I predict that every brilliant colour will come back
merged to one immeasurable length of widows' black.
Those piffling pennants that made us feel so proud
will be bleached by bitter tears to one long shroud.

(VEILED CHORUS *continue humming*)

CLARA HABER

(Speaking over VEILED CHORUS)

The shade you adore to see us women wear
are converted into cankers that corrupt the living air,
the green of undergarments, the green of a chemise
born as a deadly poison on the April breeze.
Into the top hat vats the coloured silks went in

and out came something most unfeminine.

Black tar from the gasworks gave the garment trade
glorious colours with the chemist's subtle aid.
Now the courtesan's costume, the gentlemen's cravat
come out caustic from the Kaiser's chemist's vat.
Those materials that lovers' hands would stroke
wafted as miasma and making young men choke.
A scary scarf, a shawl that's death to wear
an enveloping miasma choking off the air.
The sheen of those Chinese silk shantungs
choking boys and shattering men's lungs.
A rustling undergarment, a silken Chinese shawl
hovering above the earth as a poisonous pall.

FRITZ HABER

If not you then the world will one day see
how my invention stopped the war and will come to honour
me.

CLARA HABER

If you use our chemistry as a means of killing men

(Singing)

you'll never see your Clara alive again.

Exerpts from Square Rounds, by Tony Harrison (Faber, 1992), by kind permission of Faber and Faber Ltd.

OXYGEN

SCENE 4

(Stockholm, 2001, Royal Swedish Academy of Science, one week later. Committee members grouped around conference table, while Ulla Zorn sits with her computer on a separate small table).

ASTRID ROSENQVIST

First to the discovery: No one will question that oxygen confers great benefit to mankind, right?

BENGT HJALMARSSON

Oxygen was good for people before it was "discovered!".

ULF SVANHOLM

But there are plenty of benefits that require for oxygen to be isolated. What about the emphysema victim in an oxygen tent ... the Everest climber with his oxygen bottles ... the astronaut in his space suit?

SUNE KALLSTENIUS

We didn't pick oxygen for its value to mountain climbers or astronauts or sick people.

ULF SVANHOLM

There you go with your usual spiel ... the academic's ivory tower disdain for the useful ...

ASTRID ROSENQVIST

Let's compromise. Who'd like to come up with some simple phrases to explain to Ulf's public that without the discovery of oxygen there would've been no Chemical Revolution ... no chemistry as we now know it?

BENGT HJALMARSSON

I'll give it a try. Prior to Lavoisier –

SUNE KALLSTENIUS

You mean prior to the discovery of oxygen –

BENGT HJALMARSSON

To me they are the same.

SUNE KALLSTENIUS

To me they are not.

BENGT HJALMARSSON

Never mind ... Before the Chemical Revolution, people were convinced that when things burned, something was released ... called phlogiston ...

(*Turns to ZORN*)

Do you want me to spell that?

ULLA ZORN

(Quick and dismissive, without looking up while typing quickly)

P...H...L...O...G...I...S...T...O...N.

ASTRID ROSENQVIST

Hold it, Bengt! The public at large ... and these days, even many chemists ... won't have the slightest idea what phlogiston means. They can't even pronounce it. Please ... make it clear ... and make it short.

BENGT HJALMARSSON

"Phlogiston: The essence of fire." How's that for a pithy definition?

ASTRID ROSENQVIST

That's too pithy.

BENGT HJALMARSSON
You certainly are difficult to satisfy. But why even bother with a discarded theory?

ASTRID ROSENQVIST
Because Priestly and Scheele and most other 18th century chemists weren't fools. They believed in phlogiston till they died.

SUNE KALLSTENIUS
And it made sense ... in its own way. They thought when anything burns, something ... specifically that wondrous phlogiston ... leaves that burning object and goes out into the air.

ASTRID ROSENQVIST
For all of them, phlogiston represented the "Grand Unified Theory" of the chemistry of their time.

BENGT HJALMARSSON
(*Sarcastic*)
Oh, sure ... it could account for anything. That supposedly commonsense theory was rudely punctured ... by Lavoisier's revolutionary insight ... that during the process of burning ... something is taken from the air. And that "something" is oxygen!!

ULF SVANHOLM
Why not just say, the language of chemistry was a holy mess and the grammar all wrong? Let's get to the business of picking the winner. Prizes are given to people, not to discoveries.

ASTRID ROSENQVIST
Prizes go to people, sure. But they need to have discovered something, understood it.
(*Pauses*)
I now propose that each of you take the primary responsibility for digging up the evidence for the claims of one of the candidates. Who is fluent in French?

BENGT HJALMARSSON
Il n'y a pas de doute que c'est moi! I didn't spend two years as a postdoc at the Pasteur Institute speaking Swedish.

ASTRID ROSENQVIST
(*Ignores comment*)
Who else is fluent in French?

SUNE KALLSTENIUS
Try me in Greek or Latin. Or German ...

ASTRID ROSENQVIST
(*Addresses Svanholm*)
And you?

ULF SVANHOLM
(*Dismissive*)
Comme ci, comme ça ... usual high school French.

SUNE KALLSTENIUS
That's obvious

ASTRID ROSENQVIST
The Lavoisier archives are mostly in France and, of course, written in French. Lavoisier is your man, Bergt.
(*Turns to Kallstenius*)

You know Scheele wrote most in German ... and
some peculiar Latin? I propose to take Scheele ...

(Turns to Svanholm)

which leaves you with Priestley. OK?

ULF SVANHOLM

Are you offering me a choice?

ASTRID ROSENQVIST

I'm offering you a candidate. But if you're unhappy, you
and Sune could collaborate on both men.

ULF SVANHOLM

Thanks! I'll take Priestly.

ASTRID ROSENQVIST

Of course, you could always have a duel.

SUNE KALLSTENIUS

Only if I can choose the weapon.

BENGT HJALMARSSON

Enough of that.

(Looks at watch and starts to get up)

Is that it for today?

ASTRID ROSENQVIST

There's one issue that absolutely requires digging into
the original literature.

SUNE KALLSTENIUS

And what's that?

ASTRID ROSENQVIST

I'm referring to Scheele's letter to Lavoisier ... in which
he outlined his own experiments with oxygen, which he
called *Feuerluft* ... Did Lavoisier get that letter and if
so, when?

ULF SVANHOLM

In other words, we're right back at our usual
preoccupation with priority ... the Nobel Syndrome:
who did what first?

ASTRID ROSENQVIST

And did the one who did it first really know what he'd
done?

ULF SVANHOLM

Why should that matter?

ASTRID ROSENQVIST

I'm a theoretician. For me it's necessary to understand
what one finds. Maybe for you it matters less. *(Pause)*.

You're an experimentalist ... you actually get your
hands dirty-

ULF SVANHOLM

Now it's my students' hands.

BENGT HJALMARSSON

So it's dirt we're looking for?

ULF SVANHOLM

I just wonder which kind we'll find ... dirt from honest
labor or the other sort?

BENGT HJALMARSSON

And where do we look?

ULLA ZORN

(Looks up from PC)

The wives. *(Pause)* That's where I would look.

ULF SVANHOLM

(Confused)

The wives?
ULLA ZORN
Aren't they usually expected to clean up the dirt?

END OF SCENE 4

SCENE 8

LIGHTS UP

(A suggestion of a palace setting, a royal theatre. At centre or right upstage is a bare presentation table. Actual or simulated experiments will be done at this table, there may also be projections shown on rear screen. Left downstage is the sauna where the women will appear.)

COURT HERALD'S VOICE

Your Majesties, esteemed guests! Throughout Europe, pneumatic chemistry is in the air. A dispute has arisen: Who, among those great savants, discovered the vital air supporting life? (Pause). A golden medal ... with a likeness of our King Gustavus III ... will be struck in honor of the true discoverer. And our King is famed for his munificence in other ways ...

PRIESTLEY

(Aside)
As he squanders the people's money
(Trumpets)

COURT HERALD'S VOICE

Let the judgement of the Stockholm begin! And let the three savants be their own judges! Vital air! (Pause)
Who made it first?

SCHEELE

(Quietly, but quickly)
I did. And called it *eldsluft* ... a good Swedish word for fire air.

PRIESTLEY

But is that not air deprived of all phlogiston? The air that inflames all things? That is why I named it "dephlogisticated air." (Pause) But dear Scheele ... where should we have learned of your discovery?

SCHEELE

In my book, about to appear ...

PRIESTLEY

I made that by air by heating *mercurius calcinatus* in 1774 and ...
(Pause, then raised voice for emphasis)
communicated that discovery in the same year!
(Addresses Scheele)
I know of no paper of yours ...

LAVOISIER

(Smiling)
Mes amis! He who starts the hare, does not always catch it.

SCHEELE

There is no hare to catch if someone does not start the hunt!

LAVOISIER

It is he who must decide who first captured the essence of that vital air ...

PRIESTLEY

(Sarcastic)

And what does that mean?

SCHEELE

It is essential to know who made the air first ...

PRIESTLEY

... for it is the invention that will be remembered by posterity, not its ephemeral interpretation ...

LAVOISIER

(Shifting the subject)

Let us do the experiments we judge vital in this matter. Whose experiment will come first?

SCHEELE

Monsieur Lavoisier, do me the honor of performing the experiment I brought to your attention some three years ago in my letter-

LAVOISIER

I know of no letter-

SCHEELE

(Takes paper from his coat)

Let me read it to you.

(LIGHTS DIM; spots on two men. This is the first of three experimental scenes. The stage is darkened, except for the spots on the bench and on the man who performs the experiment, as well as the one who directs him.)

SCHEELE

(Reads from letter in his hand).

Dissolve silver in acid of nitre and precipitate it with alkali of tartar. Wash the precipitate, dry it, and reduce it by means of a burning lens ... A mixture of two airs will be emitted. And pure silver left behind.

LAVOISIER

And then?

(LIGHT DOWN on men, who continue their experiment in mime. LIGHT UP on women in sauna).

MRS. PRIESTLEY

How hot the air is in your sauna, Fru Pohl!

FRU POHL

Still ... it's the air we all breathe.

MME. LAVOISIER

Yet only part of it is vital air, the rest ...

FRU POHL

Indeed, this part is the air Apothecary Scheele made. Once he invited me into his shed to show me the experiment making fire air he had done earlier in Uppsala. He was bubbling the newly formed gas through a kind of water.

MME. LAVOISIER

It must have been the limewater.
MRS. PRIESTLEY
it turned cloudy, didn't it?
FRU POHL
How do you know?
MRS. PRIESTLEY
I've listened to Joseph's lectures on fixed air.
MME. LAVOISIER
The same air we expire ... the one we remove by
passage through limewater.
FRU POHL
In the remaining air, he bid me thrust a splint that
had blown out. Just a glow of a coal at its end. It was
toward evening.
(The flaring up of the splint in the men's experiments coincides with
its mention by Mrs. Priestley.)
MRS. PRIESTLEY
And it flared in brightest flame ... and kept burning!
FRU POHL
How could you know that?
MRS. PRIESTLEY
Because my Joseph did that too.
MME. LAVOISIER
We all did it.

(LIGHTS OUT on women, UP on men)

SCHEELE
I did that experiment in 1771 in a pharmacy in
Uppsala ... with equipment much more modest than
now put at our disposal by your Majesty.
PRIESTLEY
Yet you did not report it?
SCHEELE
I told Professor Bergman ... I thought he would tell
others.
PRIESTLEY
Your experiment was with silver salt.
SCHEELE
I obtained the air over the next three years in many
different ways, including red *mercurius calcinatus*, as
you did.
LAVOISIER
The red mercury compound – it is also how we ...
Dr. Priestly and I ... made that air.
PRIESTLEY
We? (Pause). We were not in the same laboratory,
Monsieur Lavoisier! Pray speak clearly of who did
what and when. I made that air first ... and did so
alone. And I will now show you how I accomplished
that Mrs. Scheele, will you perform the experiment?
SCHEELE
It will be an honor to do so.
(Both men step to demonstration table; LIGHTS DIM)
PRIESTLEY
In August of 1774, I exposed *mercurius calcinatus* ...
the red crust that forms as mercury is heated in air ...

in my laboratory to the light of my burning lens.
As the red solid is heated, an air will be emitted, while
dark mercury globules will condense on the walls of
the vessel. You will collect the air by bubbling it
through water.

LAVOISIER

But where is your balance, Dr. Priestly? Shall the gas
not be weighed?

PRIESTLEY

A timepiece is sufficient. We have here two
chambers ... one with ordinary air ... the other with
my new dephlogisticated one. Mr. Scheele, now take a
mouse ...

(LIGHTS DOWN on the men, who continue to mime experiment.
LIGHTS UP on women)

MRS. PRIESTLEY

I asked him-why mice?

FRU POHL

And?

MRS. PRIESTLEY

The good doctor said: Would you use English
children? Mice live as we do.

MME. LAVOISIER

On a part of ordinary air.

MRS. PRIESTLEY

Then he placed one mouse in a jar of plain air.

FRU POHL

Apothecary Scheele showed me.

MME. LAVOISIER

It is a well-known fact, described also by other savants.

MRS. PRIESTLEY

And then he placed the other one in-

FRU POHL

Fire air ...

MRS. PRIESTLEY

My Joseph's dephlogisticated air ...

MME. LAVOISIER

And it lived much longer, did it not? This is why we
called the new air eminently respirable. Or vital.

MRS. PRIESTLEY

I detest mice.

FRU POHL

(Laughs)

With living things, Carl Wilhelm can be clumsy.
He often dropped them! But we know mice in the
country. If I didn't catch them, the cats did.

(LIGHTS OUT on the women, UP on the men)

LAVOISIER

There is no doubt that Dr. Priestley's method
produces vital air. But-

PRIESTLEY

But, Monsieur?

LAVOISIER

Now is my turn. May I proceed?

SCHEELE, PRIESTLEY

Of course.

LAVOISIER

We just observed a mouse live longer in the vital air we have all made. Yet in the end that mouse also dies, as the air is depleted. However, in my own work ... I have moved far, far beyond watching mice die. Your Majesty, gentlemen! This air ... which I propose we henceforth call oxygen-

PRIESTLEY

(Interrupts)

I object, sir! It's easy to call something new by a new name ... when you don't know what you have! Be descriptive, sir! Why not dephlogisticated-

LAVOISIER

(Interrupts)

I know the air as well as you do, Monsieur. "Oxy" is Greek ... for sharp or acid. And since I believe our air to be found in all acids, I am being descriptive ...

PRIESTLEY

Descriptive? Bah! You, sir, are being sharp ... or perhaps acid ... but our dephlogisticated air is neither.

LAVOISIER

Allow me the courtesy to continue. This air is at the heart of all chemistry. I have shown that when we breathe, the wondrous machinery of the body transforms a given weight of oxygen ... into other gases and water.

PRIESTLEY

But that is obvious!

LAVOISIER

Not until you weigh it! For that ... (confronts Priestly) ... a timepiece is not sufficient ... Since nothing is gained ... nor lost in this world ... be it in the economy of a country or a chemical reaction ... the balance sheet of life's chemistry must be determined.

PRIESTLEY

Ah, it's the banker in you ...

LAVOISIER

(Ignores Priestley's comment)

I have brought from Paris a suit of rubber I have devised. It catches all the effluents of the body ... to show us that the equation balances. (Pause). Dr. Priestley, are you prepared to perform the experiment?

(LIGHTS OUT, except for spots on Priestley and Lavoisier)

PRIESTLEY

Indeed I am ... even weighing things on your balances. But ... it appears we require a volunteer for the experiment ... to wear your modern suit of armor. Mr Scheele?

SCHEELE

With pleasure.

(Scheele marches up with determination. He picks up "rubber suit",

not unlike old-fashioned diving or scuba suit).

LAVOISIER

Not only must you weigh Apothecary Scheele ... you must also weigh his suit. The measurements will take several hours.

LIGHTS DIM *on men*

MME. LAVOISIER

Ladies ... I would show you the sketch of the experiments M. Lavoisier performed.

Projection of one of Mme. Lavoisier's drawings of the experiment appears on screen for the remainder of the conversation.

FRU POHL

A sketch?

MRS. PRIESTLEY

For your own pleasure, Madame?

MME. LAVOISIER

As a record.

FRU POHL

But why should a "record" be needed.

MME. LAVOISIER

To give others evidence of what was done, of course.

MRS. PRIESTLEY

As well as when, I should think.

MME. LAVOISIER

(Startled for a moment)

Our experiments are quite complex. An assistant is encased in a suit of rubber and silk taffeta. And all that goes in and out of him is analysed. And recorded. Over many hours.

FRU POHL

The poor man!

MME. LAVOISIER

Quantitative analysis is a hard mistress.

(LIGHTS DIM *on women*, RISE ON *men*)

LAVOISIER

(Addresses Priestley)

I trust you took care ... for the margin of error must not be more than 18 grains in 125 pounds. What do you find?

PRIESTLEY

Mr. Scheele has lost some weight.

(Scheele seems weak, but smiles)

When we take into account the water breathed out, there's indeed a rough balance.

LAVOISIER

Nothing is created –

PRIESTLEY

Except by God.

LAVOISIER

Nor lost.

SCHEELE

Except by Man. Especially when he is the subject of an experiment.

LAVOISIER

(Driving his point home, and refusing to enter the banter)

Gentlemen! That crucial mass balance (with emphasis)
... punctures phlogiston's balloon.

SCHEELE

Surely the facts may be explained otherwise.

PRIESTLEY

Indeed, sir ...

(He looks at Lavoisier)

... the experiment you so laboriously had us do ... did demonstrate ... I readily confess ... one function of your ...

(Assumes sarcastic tone)

"eminently breathable air". *(Pause)*. But, Monsieur, you did not show us how you made that air.

LAVOISIER

I knew my air was there in ordinary air ... Did I not see metals combine with it ... with sulfur ... or with phosphorous?

PRIESTLEY

That does not tell us how you produced the dephlogisticated air ...

LAVOISIER

Pray stop calling it "dephlogisticated," Dr. Priestley. The name derives from a theory that is *passé*.

PRIESTLEY

Not for me.

SCHEELE

Not for me.

LAVOISIER

Why not a new name for the air, to avoid this argument?

PRIESTLEY

Call it oxygen? And yield to the tyranny of a nomenclature invented by you?

LAVOISIER

(Angry)

When a new structure is needed for a science ... when, indeed, there must be revolution, new names are also required.

PRIESTLEY

But you did not know what that gas was!

LAVOISIER

I saw the need for one air explaining rusting, burning, and respiration!

PRIESTLEY

(Heatedly)

But until that October dinner in Paris when I informed you of my observations ... you did not know the nature of that air ...

SCHEELE

(Untypically forceful)

And until that October day when you got my letter which told you how to make fire air ...

(They argue simultaneously to the end of the scene)

LAVOISIER

I had begun my experiments with *mercurius calcinatus* ...

PRIESTLEY

Only after you have heard of what I have discovered ...

SCHEELE

You did not know how to make that air ...

COURT HERALD' VOICE

(Sound of tapping staff)

Gentlemen! Gentlemen! His Majesty is vexed. *(Pause)*

Royal displeasure is the only judgement you will receive today!

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