

# The Franklin Effect CD

## Text for attendees at Happy Birthday Rosalind Franklin

<https://www.electricvoicetheatre.co.uk/>

This is not a comprehensive compilation of the texts of the CD. It is a guide, intended primarily for those who have hearing impairments, which is designed to improve your enjoyment of the music as you listen.

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Frances M. LYNCH (1959–)

### 1. Minerva Scientifica Soundscape (Franklin Mix 1)

*“Minerva Scientifica.....(atmospheric singing – and voice collage with names of many women in science)*

Rosalind Franklin

She worked using x-ray crystallography to gather the data

To understand the structure of DNA

Which allowed her and others to discover the structure of DNA

She hugely inspired me as a young potential scientist

Rosalind Franklin 1920 - 1958

### Minerva Scientifica – The Franklin Effect

A set of variations on the theme of Rosalind Franklin for vocal quartet and speaker

Cheryl FRANCES-HOAD (1980–) with Prof. Elizabeth Kuipers (Professor Emerita of Clinical Psychology)

#### Photo 51

#### 2. (i) Rosalind fixed her steady eyes like X-rays

Rosalind fixed her steady eyes like X-rays on the human specimen before her

#### 3. (ii) Rosy of course

Rosy of course, did not directly give us her data

For that matter no-one at King’s realised it was in our hands

It has not escaped our notice that the specific pairing we have postulated

Immediately suggests a possible copying mechanism for the genetic material

#### 4. (iii) Photo 51

While the biological properties of the deoxyribose nucleic acid

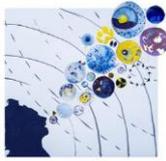
Suggest a molecular structure containing great complexity

x-ray diffraction studies described here

show the basic molecular configuration has great simplicity

#### 5. (iv) The instant I saw the picture...

The instant I saw the picture my mouth fell open, and pulse began to race



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Lynne PLOWMAN (1969–) with Dr Claire Sharpe (Clinical Senior Lecturer in Renal Sciences, Honorary Consultant Nephrologist)

### 6. *K-Ras*

*Based on a musical translation of the genetic code for the K-Ras gene  
(only sounds used are the letters of the code in combination – ATG ARCUGCAT – etc....)*

Shirley J. THOMPSON (1958–) with Prof. Ellen Solomon (Prince Philip Professor of Human Genetics)

### *Life Sequences*

#### 7. Machinery of Replication

*(no text – mostly using TaW or TA sounds)*

#### 8. Random Sequences

*(Sung section – AH only)*

*Spoken:*

Most often in cell division an exact copy is made of the DNA. Randomly, mutations occur and the cell with the mutation can become a tumour or cancer

*Sung:*

Random Changes Why?

For many years we have been looking at the changes in the cells

Genome exploration is helping us with answers

Random Changes Why? When? How? Where?

*Spoken: (with AH sung section)*

Through Genome sequencing of tumours we can discern the different kinds of mutations and divide them into types - such as leukaemia or breastcancer.

We can now provide personalised medicine and treat our patients with drugs targetted to their own mutations.

Genome sequencing is essential to understand cell mutations and how to treat them

Kate WHITLEY (1989–) with Prof. Mairi Sakellariadou (Theoretical Physicist and Cosmologist)

### *Theories of Quantum Mechanics*

#### 9. Intro: Geometrogenesis

Geometrogenesis

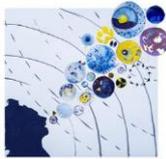
*Spoken:*

How did space and time come about?

*Sung:*

Geometrogenesis

No notion of time before there was



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### 10. String/M-Theory

Spoken:

In String Theory, matter consists of 1-dimensional objects, called strings.

Sung:

Matter consists of 1 dimensional objects called strings

### 11. Loop Quantum Gravity

Spoken:

In loop quantum gravity, space-time is composed of elementary discrete bits visualised as tiny 1-dimensional loops.

Sung:

Hm, da, dr, drm.....

### 12. Causal Dynamical Triangulations

Spoken:

In Causal Dynamical Triangulations, space-time is considered as a collection of triangles, glued together in a variety of ways.

Sung:

C D T

### 13. Causal Sets

Spoken:

In causal sets, space-time events are related by a partial order representing causality relations between them.

Sung:

Sets are related by a partial order

### 14. Noncommutative Geometry

Spoken:

Within noncommutative geometry, the universe can be seen as a vibrating membrane, a tambourine.

Sung:

Ta Ta Ta.....

Can you hear the shape of a drum?

If you heard a drum played in the next door room

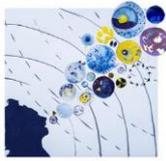
Just from hearing it

Just from hearing the frequencies

Can you work out its shape?

Spoken:

(So we ask), can we hear the shape of our universe?



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Frances M. LYNCH

### 15. **Minerva Scientifica Soundscape (Franklin Mix 2)**

*“Minerva Scientifica.....(atmospheric singing – with voice collage with names of many women in science)*

Franklin was an x-ray crystallographer  
She was studying the structure of the DNA molecule.....  
It's really important to understand the structure.....  
She was working on taking photographs at microscopic levels  
Looking at patterns of the way x-rays were reflected off of the molecules....  
...and it was known before then that there was a backbone with these 4 bases coming off  
And everyone was assuming that the backbone was on the inside  
With the bases stuck on the outside  
But what Rosalind Franklin's work confirmed was that the backbone was on the outside  
And the bases were on the inside which allowed them to pair with each other

Rosalind Franklin x-ray crystallographer 1920 – 1958  
Her data confirmed the model that Watson & Crick built up  
And it was the data that convinced the rest of the world that this model was correct

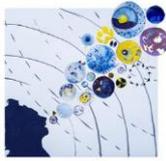
Rosalind Franklin  
Rosalind Franklin x-ray crystallographer 1920 – 1958

## Minerva Scientifica – The Franklin Effect: Project Extras

Frances M. LYNCH

### 16. **Golden Hand**

Doo wap (*continuous backing*)  
Golden Hand  
Fact, experience and experiment  
Important biological objects come in pairs  
Adenine guanine thymine cytosine  
In nature's infinite book of secrecy A little I can read  
AH, Ha, da, Twist, Turn, Up, Down  
Very pretty - but how are you going to prove it?  
The sheer beauty of it made me weep  
Golden Hand  
She was always good at sewing  
We are such stuff as dreams are made on  
Our little life is rounded with a sleep  
Science and everyday life cannot and should not be separated  
In nature's infinite book of secrecy A little I can read



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Kate WHITLEY

**17. The brain is wider than the sky** - Text by Emily Dickinson

The brain is wider than the sky  
The brain is deeper than the sea  
The brain is just the weight of God

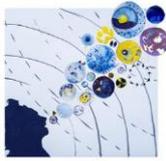
Frances M. LYNCH

**18. Swallowtail - Papilio machaon ssp britannicus**

Papilion  
Swallowtail  
You won't see them everywhere  
their species is so rare  
Milk parsley is the fare  
of hungry caterpillars  
and false eyes  
and false tails  
will not save them  
Still the swallowtail flies the fenlands  
All around the Norfolk Broads

**19. DNA: Rosalind Franklin**

Rosalind  
Dr Rosalind Franklin  
x-ray crystallographer  
She took photograph 51 that proved the structure of DNA  
Dr Rosalind Franklin x-ray crystallographer  
ACAT.... Deoxyribonucleic acid  
Break the code  
And find out who you are  
DAN in every cell of every plant and animal  
AGACTA...  
Genes are sections of DNA  
Copy, divide,  
HUH!  
Oops a mistake  
Evolution



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#### 20. Minerva Scientifica Soundscape III (The Franklin Effect at King's)

Minerva Scientifica....(atmospheric singing behind all following text)

Spoken:

**Narrator (Frances M Lynch):**

Rosalind Franklin - molecular biologist and crystallographer, whose photo 51 was the key to unlocking the mystery of the structure of DNA.

**Rosalind Franklin (Penny Osmond):**

"...in nature's infinite book of secrecy a little I can read"

**N:**

Shakespeare streamed through her life and therefore her science

**RF:**

"...science and everyday life cannot and should not be separated. Science, for me, gives a partial explanation of life. In so far as it goes, it is based on fact, experience and experiment...."

**N:**

Everyday life for Franklin included indulging her family passion for climbing mountains.

**RF:**

"the sheer beauty of it made me weep" ..... "mer de nuages"

**N:**

She was not quite so struck with the beauty of the model of DNA built by Professors Crick and Watson

**RF:**

"Very pretty – but how are you going to prove it."

**James Watson (David Sheppard):**

...photograph 51

**N:**

...the contribution of women in science can be overlooked

**Francis Crick (Julian Stocker):**

This is beginning to change

**N:**

Not before time

**FC:**

This is beginning to change

**N:**

...there is still a long way to go

**JW:**

1952 – King's College London, Rosalind Franklin takes photograph 51

**FC:**

...the key to unlocking the mystery of the structure of DNA

**FC & JW:**

1953 "We discover the secret of life!"

**N:**

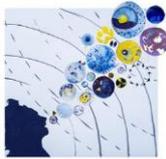
1958 On seeing her laboratory soon after Rosalind's early death from cancer, her mother remarked - "she was always good at sewing"

**FC & JW:**

1962, We receive the Nobel Prize

**N:**

....the contribution of women in science can be overlooked.....



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**JW:**

1968 The Double Helix - My Personal Account of the Discovery of the Structure of DNA .....

**N:**

... based on crystal radiograph 51 taken in 1952 by Rosalind Franklin

The Franklin Effect begins to seep through the cracks..

1964 Jennifer Harvey discovers the first RAS gene

1983 Claire Sharpe reads the double helix by James Watson and becomes inspired by Rosalind Franklin's story

1985 Sharpe is accepted at medical school

1989 the Crystal structure of the K-Ras gene is discovered

2004 Dr. Claire Sharpe becomes a consultant in kidney medicine at King's College London

2012 She discovers that DNA drugs against K-Ras can reduce scarring in kidney disease

2015 Sharpe's research twists and turns on the double helix of the Franklin Effect

The effect of discovering the structure of DNA was to reveal the mechanism by which this molecule could be replicated

The Franklin Effect swells to a steady flow

Streaming through the countless corridors of King's College London,

A rush of inspiration, spreading through the veins of research

It finds Professor Ellen Solomon as she enters the field of genetics

At a time when scientists were realizing that genetic disease is due to errors in the DNA replication and repair process.

Two rivers flow side by side, each carrying the tiniest particles of life, dredging the sands of time, following their respective courses, both shaped by scientific curiosity, constantly refreshed in streams of analytical thought

1952 / 2015

Kings College London

Dr Rosalind Franklin / Professor Mairi Sakellariadou

Molecular biologist and crystallographer / Theoretical physicist and cosmologist

Franklin seeks to understand the fine molecular structure of DNA

Sakellariadou's dream is to understand the fabric of the universe

*(atmospheric singing – and voice collage with names of many women in science)*

**Dr Claire Sharpe:**

Rosalind Franklin 1920 – 1958

She worked in a difficult era for a woman

She understood her science absolutely

and was one of the best around at the time

But none the less never received the accolade that was due to her

And I feel obliged to carry on in her footsteps and put some of those wrongs to right