

Warming up for September



Session 3

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"When the doctor told you to warm up before exercising, I don't think he meant with hot chocolate and hot cross buns."

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What's on the menu today?

- Listening and understanding: a scientist about her project (interview)
- Some grammatical issues (explanation and practice)
- September: a sneak preview (lecturing in English)

2

LISTENING AND UNDERSTANDING

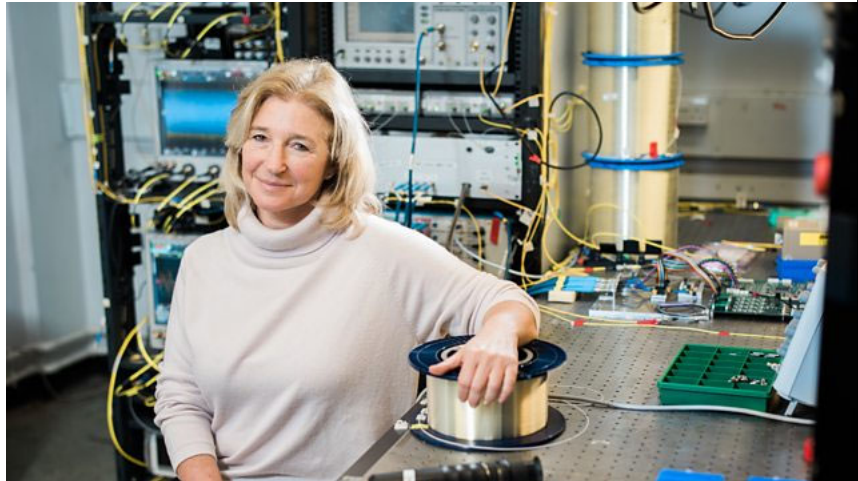
Introduction

Prof. Dr. Polina Bayvel

°1966

UCL

Interviewed by
prof. dr. Jim Al-Khalili
academic professor of physics
at the University of Surrey



Listening

3



KU LEUVEN

3

LISTENING AND UNDERSTANDING

Introduction

What do you know about fibre optics?

speaking

4



KU LEUVEN

4

What was the condition Kao and Hockam imposed for optical fibres to become successful?

(...) optical fibre communication started in Britain. They..., it was proposed as an idea in 1966 in a paper by Charles Kao and George Hockam, and they proposed the idea that optical fibres, if **they could be made of sufficiently pure glass**, could form the universal transmission medium of the future.



Listening

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KU LEUVEN

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Jim says, we “accept or assume” technology “without question, and somehow fail to appreciate” it. Which expression does she use?

Jim

Polina Bayvel, we certainly have you to thank to a large extent for a lot of the development of optical fibres and the technology that **we now take for granted**.

You were born in Kharkhiv, the second largest city in the Ukraine, which was back then still part of the Soviet Union.



Listening

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KU LEUVEN

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What wasn't standard in Polina's youth at school?

Polina Bayvel

That's right, I had a pretty much standard soviet childhood. I went to a regular school. All schools were numbered by and large; my school was school number 99, a pretty standard school, and I went to school at 7 as it was standard. I think, something that wasn't standard was **the fact that I was a daughter of an academic**. My father was ..., played a very huge, enormous influence in my life, erm.. very charismatic, a polymath, and he really influenced...

Jim

...he was a professor of physics.



Listening

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KU LEUVEN

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How is Polina's reaction to Jim's question?



Jim

Well in 1978 Polina you and your family moved to London. (...)

So, coming over to the UK, aged 12 in the late 70s. How easy was it for you to fit in and how did you fit in at school for example?

Polina Bayvel

(...) I was pretty **much isolated from everything**, and as an only child, I had a pretty carefree childhood and I felt I **didn't really particularly want to leave**, you know, being sort of blacked out... (...)

Listening

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KU LEUVEN

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How's Polina's reaction to Jim's question?

How does she say that children *are able to recover easily and quickly from unpleasant or damaging events*?

(...) So I found it quite difficult to **acclimatise** and quite difficult to really feel, feel comfortable. I just began to study English and would probably say: "Hello. I am a young pioneer".

So it was, it was difficult, but children are **resilient**.. I went to a Jewish orthodox school, called Hasmonian, Hasmonian Girls School and everybody really tried to go out of their way to make me feel comfortable and help me with all aspects of language and culture.



Listening

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KU LEUVEN

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What did her parents want her to study?

(...) So, my parents were trying to persuade me to do something practical. So they were pushing me towards **computer science** or **accountancy**, a good practical profession and you know my father thought, you know, "*to be a physicist you have to be absolutely brilliant. You're just not brilliant enough.*"



Listening

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KU LEUVEN

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What does Jim want to know? What is the essence of his question?

You did study electrical..., electronic engineering at University College London. So what **sparked your interest in optical fibres** in particular? I mean, they are sort of the essential infrastructure in our world today, but this certainly wasn't the case back in the 1980s.



Listening

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KU LEUVEN

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While Polina was studying electronic engineering, she wanted to have a job during the summer. Eventually, this turned out to be important. Why?

(...) he picked up the phone and he called the Chief scientist of GC Hurst, he said: "I've got this young lady, could you give her job?" and off I went for an interview and I went for an interview in different labs and I **came across** the optical fibre sensors group where my introduction to optical fibres took place, using optical fibres, not for communications but **for sensing**.



Listening

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KU LEUVEN

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After her Phd Polina got a five months fellowship in an optics lab in Moscow and then came back to the UK to work as a senior systems engineer. What were transatlantic optical fibre cables used for then? And what about the future?

Telephone. Mostly telephony, largely largely telephony. And people were talking about, so the subject, well how to develop **systems with greater capacity** and how to **use optical amplifiers**. And there was lots of discussion about how you would put them under the sea, so I was working on that and also looking at **optical transmission networks**, landline **optical transmission networks**. Could you really make **optical transmission networks** very, very ubiquitous as a means of transmitting..., transmitting data?



Listening

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KU LEUVEN

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What is Jim's question and how does she answer it?



(...) So let's let us talk about the science of optical fibres. How do they work?

Polina

Well, in the simplest possible way, light is **totally internally reflected** down a thin fibre core. [Jim: So just sort of bouncing along inside of them.]

And providing..., and providing the core is made small enough, they have a very low loss, so the core is made out of ..erm.. glass which has a slightly **higher refractive index** than the cladding, and so the light is..., is **contained** within the core [Jim: It doesn't escape out, right?] and it doesn't escape. And the core is about 8 microns in diameter and the cladding is about 125 Micron in diameter, just like a human hair.

Listening

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KU LEUVEN

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Jim speaks of 'loss' in the signal, but what other technical word does he also use?
And what else does he compare the glass fibre with?

Jim

You mentioned that there is less loss, **attenuation** in the signal when you 're sending light through glass fibre compared with sending electricity through a **conducting wire**. But of course these fibres are also cheaper than copper, right? You know, the fact that you've got to send these cables thousands of kilometres.



Listening

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KU LEUVEN

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Cables should not be "affected or influenced" What's the word she uses?

Polina Bayvel

That's right. I mean the cost, the glass, practically costs nothing, it's a few pence a meter. The cost is mainly in the cabling. If you, you know, if you're laying this cable underneath the ocean it has to be pretty **impervious to waves** and [Jim: *Furious fish*] earthquakes and fish and sharks. In fact, very early cables were prone to be snapped up by sharks, because they **emitted frequencies**. [Jim: *Oh, I see, yeah.*] So, the cable carries a central conductor because it has to power the amplifier somehow. The amplifiers, which are, you know, every 50 or 100 kilometres they have to be powered. So they heard the **frequencies from that conductor** and they would be... [Jim: *That would detract them.*]



Listening

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KU LEUVEN

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Polina worked in the industry and then came back to the academic world of the university.

Which are the three reasons she mentions to motivate this choice?

Well, I had a lot of ideas. I mean what I didn't like about industry is the **very short term approach**. They're clearly constantly looking at the bottom line and also the **lack of rigour in planning a research programme**. When there would be a certain idea, it wasn't clear where it came from, who suggested it, why, why you would do it, why you would stop a certain research programme. So it was the lack of rigour and the **lack of complete independence** as a research scientist. Working in industry was frustrating, so I had a lot of ideas and I wanted to be freely able to develop them and so, somebody suggested applying for a Royal Society University Research Fellowship and that's what I did.



Listening

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KU LEUVEN

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She then won a fellowship from the Royal Society and she had some plans. Which are the three subjects that she wanted to bring together? And what problem did she want to deal with?

(...) So I wanted to create a first academic systems engineering Laboratory Group in optical communications where you had to bring together different aspects of **physics** and **non-linear optics** and **electrical engineering** all together in a working system.



Jim

And that's what systems engineering is all about, isn't it; the whole, the whole thing, not just looking at how light goes through a fibre? It's this about how the whole system works together.

Polina Bayvel

You know the problem, the problem at the time was: Can you use **multiple wavelengths of light** to transmit even more information. So today... at that time only one wavelength of light was used.

Listening

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KU LEUVEN

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What word does she use to indicate “a strict thorough way of working”, discipline and method?

But of course back then in the mid-90s it wasn't obvious that a laboratory like that, studying the role of optical fibres, would be so important. So I can imagine getting research grants would have been quite difficult.

Polina Bayvel

Well it was a trendy growth subject and very fast moving, but we were so much ahead of what was happening in the field and so people said well, look all this work is going on in BT Labs and in STL and in Bell Labs and what can you bring and I said, well what we can bring is rigour. We can bring really detailed understanding of the processes that 're involved in transmitting multiple wavelength channels.



Listening

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KU LEUVEN

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What entirely new approach did she start to pioneer around the year 2000?

So we worked on, in the 90s, on wavelength routing and showing that use of wavelengths you could you could route data seamlessly. It needn't be converted back to electronics in order to look at its content and then reconvert it back to optics and potentially the network could be faster and much more efficient. So we just established the chronology. WDM, wavelength division multiplexing, is the use of multiple wavelengths point to point. So your wide motorway. [Jim: Wide, with more lanes, Yep.] With more lanes, wavelength routing is is more, is one step further that you can try and route at data in the optical domain. Could you even more, only kind of leap of imagination, use wavelength as a domain for routing? Just say, you know, London to Paris, wavelength one, I came to a number of colours, London to Paris, wavelength one, London to Rome, wavelength two and so not just point to point transmission, but also for routing. And those networks could be very small. It could be optical networks, say between computers. Or they could be between continents and they're essentially the same type of network. So we wanted to look at, “Could you have wavelength routing so that you could5... wavelengths?”



Listening

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KU LEUVEN

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What does she mean with an “intelligent network”?



You would make wavelength routing even more efficient and we proposed this architecture, called **wavelength routed** optical burst switching. And now ...and we published this idea around 2000 , 2001 And then... We are now trying to see, “Can you have networks which are much more intelligent?” So then, when you have a major event like with the Tokyo Olympics coming up, you want to have capacity when and where it's needed and you want to be able to **reconfigure that capacity** as it's needed, when it's needed, in the amount that it's needed without delay. You know how annoying delay is when you're sitting at home and you're trying to download or trying to watch that programme and it lags.

Why, does she say, has this ambitious project now drawn Microsoft's attention?



(...) It was ambitious and it's still ambitious and you can see that it is ambitious because it takes about 20 years. So our ideas and wavelength routed optical burst switch networks is just now being picked up by Microsoft and being looked at as a solution for **connectivity within data centres**.

Listening

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KU LEUVEN

21

Which of the vocabulary do you remember?

I accept or assume it without question, and somehow fail to appreciate it

I take for granted

He is a person of great and varied learning and knowledge.

He's a polymath

as if the film of her life in the Ukraine was in the dark, had stopped

She was blacked out

able to recover easily and quickly from unpleasant or damaging events

resilient

you make a special effort to do it

You go out of your way

What caused your interest? What was the beginning of your interest?

What sparked it?

It is not affected or influenced by ...

It is impervious to...

It has the tendency to be affected by ...

It is prone to...

The strict thorough way of doing something, discipline, strict order

rigour

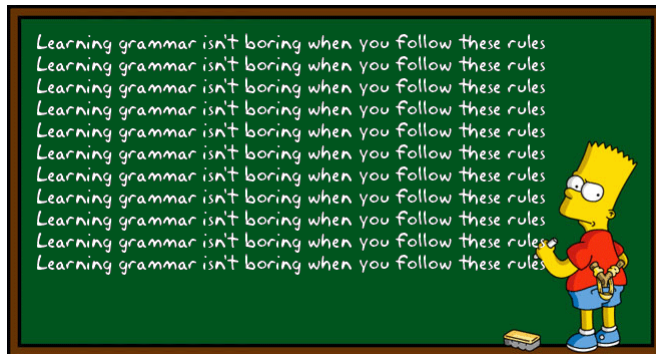
vocabulary

22



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22



The dos and don'ts of "articles"

insert an article when necessary

1. What are **the** factors influencing tool use?
2. Special attention was paid to surface irregularities.
3. **The** committee has been asked to give advice on **the** implications of introducing such a system.
4. To answer this question, I'll first examine (**the**)different theories on **the** applicability of classification algorithms.
5. **The** impact of this legislation can be assessed by comparing Labour market policies of different countries.
6. This study will be of interest to professionals involved in information management.
7. I seek to clarify **an** issue that has been insufficiently explored in **the** literature.
8. In all cases, **the** pronounced increase in variability was revealed by multivariate analysis.

An indefinite article (**a / an**) is used when the noun is **unspecified** and singular

*Joan is **a** researcher (=one of the many) in the electronics department. (specified by the context of a particular university)*

*And he's **a** member (=one of the many) of the Council of lecturers. (there is only one).*

*He conducted **a** study on ... (= First mention, so not yet specified.) The study analysed ... (subsequent mention: we are now talking about a specific study)*

An definite article (**the**) is used to refer to one or more **identified** things or persons

The study is very elaborate. (=second mention)

They emphasise **the** broader social context (=there is only one)

The first studies were conducted in the 60s (=specific reference)

In some instances, *the* has a general meaning.

*The findings suggest that **the** state (=any state) itself may exercise a disproportionate influence upon **the** electoral process (=in general)*

Absence of articles: no article is used in the following cases:

- When the noun is **unspecified** and **plural**

The book will prove useful to lecturers of general physics courses. (= to any lecturer of such a course)

- Instead of *a* with **uncountable nouns**

*He is conducting **research** on several topics. (compare: conducting a study)*

*The author gives substantial **attention** to practical examples.*

*The study provides extensive **evidence** regarding ...*

NOTE that some nouns have both countable and uncountable (more abstract) uses.

compare: *This paper seeks to show that such **an analysis** is possible.*

***Systematic analysis** revealed a positive correlation.*

- When a noun without an article is specified by an of-phrase , *the* is generally added, because it now becomes possible to ask the question *which?*

preventing acquisition

*preventing **the** acquisition **of** information*

investigating implementation

***the** implementation **of** IT in policing*

Absence of articles: no article is used in the following cases:

- When the noun is **unspecified and plural**
- Instead of *a* with **uncountable nouns**
- When a noun without an article is specified by an **of-phrase**, *the* is generally added, because it now becomes possible to ask the question *which?*

preventing acquisition

*preventing **the** acquisition **of** information*

investigate implementation

***the** implementation **of** IT in policing*

!!! This is the general pattern, which does not apply, however, when the noun remains unspecified.

Compare:

*This study examined **effects of** structural and perceptual variables on attitudes towards websites.*

(=some possible effects so unspecified)

Some extra practice: insert an article when necessary

1. Shelley Barnes gave me very useful advice on a quasi-final draught of chapter 2.
2. These studies have opened recent discussions concerning **the** nature of rationality.
3. Better management of soil and water can boost production from cropland that is watered only by rainfall.
4. **An** increase in the size of **the** public sector may increase authority and power at all levels of government.
5. **The** minimum wage variables show **a** decline in **the** employment of each group.
6. During both phases, we first conducted intensive research at two study sites.
7. This work confirms some of the results reported in **the** literature.
8. She's **a** member of **the** American Statistical Association.

insert an article when necessary

1. _____ Corneal thickness was measured using **an** ultrasonic pachymeter.
2. These limitations have rendered **the** technique unsuitable for DNA analysis on **a** routine basis.
3. _____ Proper functioning of PDH is essential for **the** production of acetylcholine.
4. Heparin was used as **an** anticoagulant .
5. These guidelines can serve as **a** benchmark for effective stroke unit care.
6. In addition, **the** study identified considerable interrater variability.
7. **The** distinction between both categories is not at all straightforward.
8. These inconsistencies are **the** subject of this article.
9. **The** most frequently observed symptoms were _____ headache, _____ blurred vision, _____ dizziness, and _____ alteration of consciousness.
10. In most studies, _____ income is used as **a** performance measure.

Academic English for lecturers: a preview

- Spoken English
- The aspects of a lecture / presentation
- Vocabulary and phrasing
- a preview



Video input – see separate MP4-file “slide31.mp4”

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Starting a lecture, in which you continue a previous subject

So, today's lecture is a particularly important one.

We are going to introduce the main physical principle that underlies general relativity.

We'll be spending a bunch of time connecting that principle to the mathematics as the rest of the term unwinds.

- bunch of time (colloquial, spoken English) : a considerable time

- = straighten out, untangle; here: as the term goes on

But today is where we're going to really lay out where the physics is in what is known as “the principle of equivalence”.

lay out = explain or present clearly in the course of this lecture

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Starting a lecture, in which you continue a previous subject

~~So, before I get into that, just a quick recap, so~~ in terms of the technical stuff we did last time.

- before I get started, before we really begin
- recap = when you want to draw people's attention to the fact that you are going to repeat the main points of an explanation, argument, or description, as a summary of it.

The most important thing we did, was to introduce these mathematical objects called Christoffel symbols. Christoffel symbols are those capital gammas. We began by thinking of them as just what you get when you look at the derivative of your basis objects.

Phrases

So, today's lecture is a particularly important one. We are going to introduce ...

define what a..... is.

elaborate the concept of

work out the answer to the problem of..

We'll be spending a bunch of time connecting that principle...

considerable time explaining...

long time discussing...

lot of time dealing with....

But today is where we're going to really lay out

explain...

tackle the problem of...

Phrases (continued)

The most important thing we did, was to introduce ...

to define the concept of...

to compare ...

to analyse...

We began by thinking of them.....

making clear ...

analysing....

investigating....

testing.....

Video input – see separate MP4-file “slide36.mp4”

Another example

We spent our last lecture laying out some of the basic foundations, making a couple of definitions. I want to quickly recap the most important concepts and definitions. (also: I'd like to quickly recap) And then, let me be blunt, I kind of want to get through these definitions, which... I think it's important to do them precisely but there's nothing significantly challenging about them. We just need to make sure they are defined very precisely. So now that you've kind of seen the style of those things, I would like to sort of move through the next batch of these definitions quickly enough that we can start to move into more interesting material. So, a quick recap. I just want to recap some of the most important concepts we went over. (...)

This whole class is essentially a study in spacetime

let me be blunt

straightforward, saying exactly what I think

get through these definitions

complete them, finish the explanation about them

batch

A batch of things or people is a group of things or people of the same kind, especially a group that is dealt with at the same time or is sent to a particular place at the same time. (Collins)

concepts we went over

concepts we dealt with, we explained ...

sources

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