Министерство образования и науки Российской Федерации
Федеральное государственное бюджетное образовательное
учреждение высшего образования
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и радиоэлектроники»

Л.Б. Кадулина, Л.Е. Лычковская,
Е.Р. Менгардт, О.И Тараканова

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Введение

Настоящее учебно-методическое пособие предназначено для студентов ТУСУР, обучающихся по учебному пособию ‘English for Engineering Faculties’ (авторы Кадулина Л.Б., Лычковская Л.Е., Менгардт Е.Р., Тараканова О.И.). В первом разделе (Supplementary Texts) представлены профессионально-ориентированные тексты для проверки навыков письменного и устного перевода; второй раздел (How to Give a Successful Presentation) содержит рекомендации по подготовке к устной части экзамена – презентации и образцы текстов, используемых в данном виде работы. В приложении (Appendix) даны слова и выражения, полезные при переводе текстов.

SUPPLEMENTARY TEXTS

THE TUNNELING TRANSISTOR

The electron has the pesky ability to penetrate barriers – a phenomenon known as quantum tunneling. As chipmakers have squeezed ever more transistors onto a chip, transistors have become smaller, and the distances between different transistor regions have decreased. So today, electronic barriers that were once thick enough to block the current are now so thin that electrons can barrel right through them.

Chipmakers have already stopped thinning one key transistor component – the gate oxide. This layer electrically separates the gate, which turns a transistor on and off, from the current-carrying channel. Make this oxide thinner and you can induce more charge in the channel, boost the current, and make the transistor faster. But you can't reduce the oxide thickness so much less than roughly a nanometer, which is about where it is today. Besides, too much current will flow across the channel when the transistor is “off”, when ideally no current should flow at all.

It has long been hard to pin down the precise year when the size reductions will end. Industry road maps now project the miniaturization of the MOSFET out to 2026, when gates will be just 5,9 nanometers long – about a quarter the length they are today. Thus we'll be able to find better materials to stanch leaks. But even if we do, we'll need to find a replacement for the MOSFET soon if we want to continue getting the performance enhancements we're used to.

We can't stop electrons from tunneling through thin barriers. But we can turn this phenomenon to our advantage. In the last few years a new transistor design – the tunnel FET, or TFET – has been gaining momentum. Unlike the MOSFET, which works by raising or lowering the energy barrier to control the flow of current, the TFET keeps this energy barrier high. The device switches on and off by altering the likelihood that electrons on one side of that barrier will materialize on the other side.

It won't be the first time the transistor has changed its form. Initially, semiconductor-based computers used circuits made from bipolar transistors. But only a few years after the silicon MOSFET was demonstrated in 1960, engineers realized they could make two complementary switches. These could be combined to make complementary metal-oxide-semiconductor (CMOS) circuits that, unlike bipolar transistor logic, consumed energy only while switching. Ever since the first integrated circuits based on CMOS emerged in the early 1970s, the MOSFET has dominated the marketplace.

In many ways the MOSFET wasn't a big departure from the bipolar transistor. Both control the current flow by raising or lowering energy barriers – a bit like raising and lowering a floodgate in a river. The “water” in this case consists of two kinds of current carriers: the electron and the hole, a positively charged entity that is essentially the absence of an electron in the outer energy shell of an atom in the material.

There are two energy bands for these charge carriers. Electrons with enough energy to flow freely through the material are in the conduction band. Holes flow in a lower-energy band, called the valence band, and they move atom to atom. These bands are fixed, but we can shift the energies by adding impurities to alter the conductivity of the semiconductor. N-type semiconductors, which are doped to contain an excess of electrons, conduct negatively charged electrons; p-type semiconductors, which are doped to produce a deficit of electrons, conduct positively charged holes. If we put these two semiconductor types together, we get a junction with bands that are misaligned, thus creating an energy barrier between them. To make a MOSFET we insert one type of material between two in either an n-p-n or a p-n-p configuration. This creates three regions in the transistor: the source where charges enter the device; the channel; and the drain where they exit.

LEAP OF LIGHT

Moore's Law may get all the attention. But it is the combination of fast electronics and fiber-optic communication that has created “the magic of the network” we have today. The strongly interacting electron is ideal for speedy switches that can be used in logic and memory. The weakly interacting photon is perfect for carrying signals over long distances. Together they have fomented the technological revolution that continues to shape and define our time.

The heart of today's fiber-optic connections is the core: a 9-micrometer-wide strand of glass that is almost perfectly transparent to 1.55-mm infrared light. This core is surrounded by more than 50mm of cladding made of glass with a lower refractive index. Laser signals sent through the core are trapped inside by the cladding and guided along by internal reflection.

Those light pulses zip down the fiber at a rate of about 200,000 kilometers per second, two-thirds the speed of light in vacuum. The fiber is almost perfectly clear but every now and then a photon will bounce off an atom inside a core. The longer the light travels, the more photons will scatter off atoms and leak into surrounding layers of cladding and protective coating. After 50 km about 90 percent of the light will be lost mostly due to this scattering.

Communication engineers therefore need to boost the intensity of the light at regular intervals, but this approach has limitations of its own. The interaction between a powerful, freshly boosted signal and the glass in a fiber can cause distortions in the signal that build up with distance. These distortions are called nonlinear because they don't double if the intensity of the light is doubled. Instead they increase at a faster rate. When the light is intense enough the distortions will drown the signal in noise.

The story of fiber is a saga of finding ways to boost the data rate and the length of transmission despite the scattering and distortion problems.

The very first fiber-optic messages were encoded by simply switching the laser source on and off. Engineers made steady improvements on how quickly that switching could be done. By the mid-1980s, a few years into the dawn of commercial fiber networks the strategy could be used to send several hundred megabits per second through a few tens of kilometers of glass. To keep the signal going after the first 50 km a repeater was used to convert light pulses into electronic signals, clean them up, and then retransmit them with another laser down the next length of fiber.

This electro-optical regeneration process was cumbersome and costly. Fortunately, a better approach soon emerged. David Payne of the University of Southampton in England showed that it was possible to amplify light directly inside an optical fiber instead of using external electronics.

LEDs TRANSFER DATA TO MOBILE DEVICES

Regular LEDs in overhead lighting are being turned into an optical wireless area network that transfers high-speed data from the Internet directly to laptops and other mobile devices – safely and with no loss in quality.

Scientists from the Fraunhofer Institute for Telecommunications demonstrated visible-light communication (VLC) technology that transfers information wirelessly. Their collaborators were industry partners Siemens and France Telecom Labs. The new technology eliminates the need to install a different setup in the home to reap the benefits of VLC-enabled data transfer; the LEDs used for room lighting multitask by acting as data transmitters. With the aid of the modulator the LEDs are turned on and off in rapid succession – imperceptible to the human eye – to transfer information. A simple photodiode on the laptop acts as the receiver.

Using overhead LEDs that can light an area of about 10 sq m, the scientists demonstrated actual data transfer at the speed of 100Mb/s without any loss. They say that, to work, the receiver could be placed anywhere within the 10-sq-m radius. They were successful in transferring four high-definition videos to four laptops simultaneously.

One advantage of the technology is its simplicity: preparing the LEDs to function as transfer media takes only a few components. A disadvantage is that as soon as something comes between the light and the photodiode – for instance, someone's hand held over the diode – the transfer is impaired.

The scientists emphasize that VLC is not intended to replace regular wireless area networks, PowerLAN or the universal mobile telecommunication system, but rather to serve as an additional option for data transfer where radio transmission networks are not desired or not possible. The technology is suitable for hospitals, airplanes and production facilities where radio transmissions often interfere with processes.

In the short term the scientists expect some interesting applications in setting for which electromagnetic waves are either undesirable or merely can not be transmitted. In the mid term, depending on the success of LEDs in home applications one can imagine the add-on effect.

The scientists are developing their systems toward higher bit rates. When using a combination of red, blue, green and white LEDs they were able to transmit 800 Mb/s in the lab – a world record for the VLC method.

THE VOLATILE FUTURE OF STORAGE

Speedy DRAM could replace hard discs for cloud computing. In addition to providing fast access RAMCloud must also ensure that its data is stored as reliably as it were held on disc. In particular, data must not be lost when a server crashes or the power goes down. Data centers typically lose power every few years, which can cause all the information in DRAM to be lost. As mentioned earlier, RAMCloud keeps backup copies of data on disc or in flash memory.

But what if an individual RAMCloud sever failed? To protect against such mishaps RAMCloud keeps multiple backup copies (typically three) of every single piece of data, storing those on different servers. So when a written request arrives at a master, it updates its information in DRAM and then forwards the new data on to several backup RAMCloud servers. This need for replication explains why writing data takes longer than reading it.

In addition to these general measures we had to solve two specific problems to make RAMCloud's backup strategy really bulletproof. The first was what to do if a server loses power before it has made backup copies. RAMCloud deals with that possibility using a small amount of nonvolatile memory on each machine. When new data is written to one machine, the backup machines associated with it collect that data temporarily in some form of fast but nonvolatile memory. Having the data in fast nonvolatile memory at the start ensures that the information can be recovered if a power failure occurs before the data is written to disc or flash.

The second problem is that a RAMCloud cluster with thousands of servers will inevitably experience frequent server crashes. RAMCloud keeps only a single copy of information in DRAM, so data that was stored on a crashed server will be unavailable until it can be reconstructed from the information on the hard disc or flash memories of its backups. If all the crashed machine's data were held on one other disc, it would take several minutes to get it into working memory.

To avoid that long a delay, RAMCloud scatters the backup data for each master across all of the other servers in the cluster, which could amount to thousands of machines. After a crash all of those machines work in parallel to reconstruct the lost data. With the work spread among so many computers, RAMCloud can recover from server failures in just 1 to 2 seconds – so fast that most Web users wouldn't even notice.

RAMCloud represents a new class of storage that simultaneously achieves vast capacity and low latency. It would let something like a million CPU cores within a data center work together on data sets of 1 petabyte or more, where any core can access any data item in 5 to 10 ms. That is one-thousandth of the time it typically takes now.

REFLECTIVE FABRIC IMPROVES FRUIT CROPS

Fruit growers in the UK, France and Italy are harvesting light to improve the quality and yield of their crops. With a specially developed fabric, sunlight that the earth would otherwise absorb can be reflected onto the farmers' fruit trees. The Extenday growing system, developed by J&D Wilkie Lmd. of Kirriemuir, UK, and Jonathan Toye, a New Zealand horticulturist, can improve crop yield by between 10 and 20 per cent the first year and up to 40 per cent in the second year.

Extenday Lmd,, a joint venture of the developers, markets the fabric. Richard Andrews, general manager explained that the fabric contains an additive that enhances its reflective properties, particularly for short-wave radiation, which strongly affects photosynthesis.

The patented fabric has been tested on apple, kiwi and pear crops, and trials on soft fruit crops such as raspberries, blackberries and strawberries are expected. Growers put down the reusable cloth in spring and roll it up in autumn. For use in apple orchards, the company recommends that it be placed on flat or moderately sloping areas.

Extenday is secured using a flexible fixing system. Bungee cords are attached regular intervals to tree trunks or posts. A claw on the fabric hooks to a loop at the end of the cord. The system's flexibility helps reduce soiling of the material and damage caused by farm machinery.

“The material is more than adequately strong enough to withstand being driven on, and has been designed as such,” Andrews said. “To a certain extent, the lifetime and durability of the material will be influenced by the level of care exercised by the grower during usage.”

Because the material is permeable, the soil and tree roots can breathe, and rain can pass through to water the crops. The need for irrigation may be lessened because Extenday reduces evapotranspiration. More even soil moisture also improves nutrient uptake, which benefits the tree.

Grass growth beneath the cloth is minimal, although it is sufficient to cause the cloth to arc, thereby directing more light to the tree canopy. The limited growth also decreases the need for mowing and herbicides,

Extenday fabric helps produce more evenly developed fruit in terms of ripeness and size, and the crop maybe harvested up to 10 days earlier than those cultivated using traditional farming techniques.

The fabric, which weighs 100 g/m, is available in width from 50 to 400 cm at 5-cm intervals. Typical rolls contain 100 or 200 m of material.

TUBULAR TRANSISTORS

Are organic semiconductors doomed to remain slow? Transistors built of organic semiconductors, which slow promise for applications such as large-scale electronics – think wall-size TV screens- perform poorly compared with their silicon counterparts when it comes to speed. The sluggishness arises because organic semiconductors lack the exquisite crystalline order of silicon, so electrons inside the organic material bounce around in it instead of traveling in a relatively straight line.

Now a collaboration of engineers at the University of Illinois at Urbana-Compaign, Columbia University, in NewYork City; and Dupont, in Wilmington, Dely, has found a way to make organic transistors better. The group seeded thin layers of organic semiconductors with conducting carbon nanotubes. The nanotubes make up only about 1 per cent of the hybrid material, so it retains the physical robustness of a normal organic semiconductor. But the nanotubes produce crystalline high-conductivity regions distributed throughout the transistor.

Turning on the transistor connects the nanotube regions, through which the electrons can travel with less rebounding off the underlying atomic structure. The electrons, in effect, take a shorter path through the transistor. The decreased distance increases the device's transconductance – its ability to control current with applied gate voltages – which is directly related to the speed of the transistor. The group's published work demonstrates a 60-fold improvement in transconductance in sample transistors. Although the improvement is not yet enough for commercial applications, the group says further experimentation will bring those within reach.

BURSTLING BUBBLES KILL CANCER CELLS

Delivering drug-loaded nanoparticles to tumors is a brilliant way to kill cancer cells and reduce the drugs' side effects. But the nanoparticles can sometimes also kill healthy cells. Scientists at Rice University are now working on what they say is a more selective and effective technique that will deliver chemotherapy drugs right inside cancer cells without harming normal cells.

The method relies on using lasers to creating tiny bubbles around clumps of gold nanoparticles inside cancer cells. The nanoparticles don't carry drugs. Instead, as the bubbles burst, they temporarily rip open small pores in the cell membranes so that drugs present outside the cells can get in.

Rice's Dmitri Lapotko, a physicist and biochemist, said in a press release: “We are delivering cancer drugs or other genetic cargo at the single-cell level. By avoiding healthy cells and delivering the drugs directly inside cancer cells, we can simultaneously increase drug efficacy while lowering the dosage.”

Specifically, the researchers have found that delivering chemotherapy drugs with nanobubbles was up to 30 times more effective at killing drug-resistant cancer cells than traditional chemotherapy, and required less than a tenth of the drug dose. So far, the team has tested the method on head and neck cancer cell cultures. They've published their results in three separate papers that have recently appeared in the journals.

To make the bubbles, the researchers first have to get the nanoparticles inside cancer cells. They do this by tagging the particles with antibodies that almost exclusively attach to the surface of cancer cells, which then inject the particles. The nanoparticles form clusters just below the cells' protective outer membranes.

Then the researchers zap the cells with short near-infrared laser pulses. The laser's wavelength is tuned to that of plasmons, or electron oscillations, on the surfaces of the gold nanoparticles. The particles convert the light into heat, which evaporates some of the surrounding medium, creating small vapor bubbles that expand and burst within nanoseconds.

In cultures containing a mix of normal cels and cancer cells, the researchers showed that the nanobubble technique only killed cancer cells. Healthy cells are spared because they take up far fewer nanoparticles than the targeted cancer cells. The laser energy isn't enough for the smaller nanoparticle clusters to form bubbles and rupture the membranes off healthy cells.

Animal tests are next.

SOLAR CELLS IN SMARTPHONE SCREENS

A team at the University of Cambridge, led by IEEE Fellow Arokia Nathan, is working toward a simple goal: a mobile phone that requires charging less often. At the Material Research Society's fall meeting in Boston, Arman Ahnood, a researcher on that team, told scientists that eventually, we might see a phone that never needs to be plugged in.

Energy Harvester: A thin-film system harvests energy from wasted light in an OLED display.

To extend the time between charges, Nathan's group built a prototype device that converts ambient light into electricity using an array of solar cells made of thin-film hydrogenated amorphous silicon that's designed to sit within the phone's screen. The photovoltaic (PV) cell takes advantage of the smartphone display's large footprint. In a typical organic light-emitting diode (OLED) display, only about 36 per cent of the light generated is projected out of the front of the screen, says Ahnood. Much of it escapes at the edges of the OLED, where it is useless. So Nathan and his collaborators at his Canadian firm IGNIS Innovation set out to harness this wasted light by putting thin-film PV cells around the display's edges as well.

Making the device work required sidestepping another problem: fluctuations in the voltage provided by the solar cell, which could have damaged the phone's battery. The researchers, who were based at University College London until recently, designed a thin-film transistor circuit to smooth out voltage spikes and extract electricity more efficiently.

And instead of charging the battery directly, which would have involved adding complex circuitry, they worked with the energy group at Cambridge's Centre for Advanced Photonics and Elecronics to integrate a thin-film supercapacitor for intermediate energy storage. This combination of photovoltaics, transistors, and supercapacitor yielded a system with an average efficiency of 11 percent and peak efficiency of 18 percent. If the PV array converts 5 percent of ambient light to electricity, the energy-harvesting system can generate as much as 165 microwatts per square centimeter under the right lighting conditions. For a typical 3.7-inch smartphone screen, that equates to a maximum power output of 5 milliwatts, “which is quite useful power,” says Ahnood, though that's only a fraction of a smartphone's power needs.

FINGERPRINT ID FOR WIRELESS KEYS

The typical fingerprint ID unit is either affixed to the thing it guards – such as an entryway or a computer – or draws its power and communication link through a USB port. But Fairfax, Va, start-up Privaris Inc. wants to move the fingerprint guardian away from the gate and put it into your pocket. The ID unit consists of a small fingerprint scanner placed in a battery-powered device that fits like a fob on a key chain. Best of all, it can communicate wirelessly with either RFID readers or Bluetooth radios.

A typical use for the Privaris device is as an RFID key to control access to a building. You put your finger onto the fob's sensor, and software determines whether it really is your finger. If the sensor recognizes your finger, a LED lights and the device emits its “Open Sesame” signal. Place the fob within a few centimeters of the RFID reader and the door will unlock. The advantage of the biometric sensor in this scenario, in case you missed it, is that someone who steals your key still can't get into the building. The advantages of putting the sensor in a wireless device are its convenience and its compatibility with existing RFID readers.

Privaris's innovation is not in the sensor itself, which is made by a leading fingerprint sensor company, AuthenTec Inc., of Melbourne, Fla. Instead the smarts lie in fitting all the processing power needed to interpret the fingerprint sensor's data into something the size of a key-chain fob, according to Michael M. Kohnoski, Privaris's chief operating officer.

Privaris has also thought through a number of potential vulnerabilities. Because all the fingerprint recognition happens inside the device itself, no data describing your fingerprint, which would be a nice prize for an identity thief, will ever transmitted through the air or over a network. Sniffing the wireless signal won't get a thief anywhere either, because the Bluetooth signal is encrypted, and the RFID signal has such a short range that a person would have to be indecently close to pick it up. A thief also can't steal a Privaris fob and reprogram it, because the fob can be reprogrammed only by the machine that originally set it up, Kohnoski explained. And that would be safely behind the door the thief is trying to breach.

Fingerprint recognition systems can err in two ways. There are false positives, as in "I'm Joe. Why won't you let me in my office?"

The rate of false positives for the Privaris unit can be set from 1 in 1000 to 1 in 100000, depending on the application or your level of paranoia. But increasing security comes at the cost of slightly longer delay between when you put your finger on the sensor and when the device recognizes you – going from less than a second to about 1.5 seconds.

It's the false negatives that bother the average user, because they can cause long queues at entryways as people repeatedly try and fail to get ID systems to recognize them. Privaris doesn't track false negatives but says they shouldn't happen if there was a good "enrollment", when the separate set-up machine read your fingerprint scan and downloaded the data into your wireless device.

INFLATION AND THE TRANSITION TO A MARKET ECONOMY

One of the most intractable problems confronting societies in transition from centralized to free market economics is that of inflation. It is, however, a challenge that such societies must meet if they are to enjoy the material benefits that a market economy can provide.

What exactly is inflation? It is an increase in the average price level of the goods and services produced and sold in an economy. Inflation typically occurs in a market economy for one of two reasons: either people increase their spending faster than producers are able to increase the supply of the goods and services: or thee is a decrease in the supply of goods and services to consumers and/or producers, which drives up prices. Inflation has sometimes been described as an increasing amount of money chasing a shrinking number of goods.

Inflation hits economics in transition hard because price liberalization – the removal of government control of prices – is an essential step toward a market economy. The initial result of such price liberalization is predictable – a wave of price increases for goods that were in chronic short supply. Why? Because the government held their prices artificially low, so demand perennially outstripped supply, or because of other economic distortions and inefficiencies created by government decision-makers. In addition, If people are holding large amounts of money at the time of this transition (since there little of value to buy), the pressure of inflation can be even greater.

Nevertheless, the rewards of enduring the inevitable boot of inflation during this transitional period are substantial. Unfettered by government, the market mechanisms of supply and demand can begin to function. High prices signal strong demand and the market, albeit slowly and haltingly at first, responds with increased production. People's money may have lost value, but what money they have is now real and consumers can buy the goods that are beginning to appear in stores. With supplies increasing, prices stabilize and queues begin to disappear as consumers realize that more and varied products will continue to be available for sale.

Entrepreneurs and investors respond to the new economic freedom by starting new businesses and competing to provide goods and services, thereby creating jobs, expanding supply and causing prices to moderate further.

The key element in this transition is for the government to relinquish its role in setting prices and permit the market forces of supply and demand to establish prices for virtually all goods and services. When such a free market is established, inflation may persist, but it is a far more manageable and less threatening problem than in the early, hard days of economic transition.

The devastation and pain caused by an explosive price rise in a transitional economy is obvious to all. However, are the typically lower rates of inflation in market economics a problem? Would people be better off with no inflation and the same prices from 100 years ago and the same lower incomes that went with them?

No really. If people's income increases 10 times but so do the prices of the things they buy, then they are no better off than before.

The reason people in market economics do care about inflation over shorter periods of time is that as prices rise, income and wealth are redistributed in arbitrary ways unrelated to the output or productivity of workers and firms. For example, people have bought a house and borrowed the money to pay for it at 10 per cent interest rate. Then the rate of inflation rises from 5 percent to 15 percent. They will gain from these events, because the money they repay their loan with isn't worth as much as the money they borrowed to buy a house. In other words, it won't buy as many goods and services. That's good news for people, but bad news for whoever loaned them the money.

For the same reason, those who are on fixed pensions (or receiving other kinds of fixed payments established in long-term contracts) are hurt by the inflation, while those who make the payments required in those contracts come out ahead. Savers and investors are hurt as well because inflation reduces the value of their money. By contrast, people who are able to pay all debts or other contractual obligations with inflated currency will usually gain unless the interest rate and other payments are allowed to vary with the level of inflation.

Nations require savings and a pool of loanable funds to invest in more capital resources – houses, factories and new technologies. By penalizing savers, therefore, inflation can reduce the growth and long-term prosperity of a nation. And in an even broader sense, inflation makes the business and economic world less predictable, which makes investments in other countries with little or no inflation more attractive. Is a company going to build a plant in a country with an unpredictable inflation rate ranging from 10 to 15 percent or in a location with a past record of steady 2 to 5 percent inflation? The answer is the latter. In this sense, inflation makes many more losers than winners by disrupting the economic climate for every individual and business.

For all these reasons government stabilization policies must balance the need to encourage economic growth against the requirement to keep inflation under control.

HOW TO GIVE A SUCCESSFUL PRESENTATION

An essential task at the pre-preparatory stage is to ask yourself the following questions:

- What is the purpose of my presentation?
- What are the main points that I would like to get across?

Start getting ready for your presentation a few weeks before you are due to speak. Collect the materials on which you would like to base your presentation. Make a careful selection from the collected materials.

Here are some tips for the learner to start the presentation process:

- Make the first plan of the presentation (you can modify it later).
- Remember to give your presentation a logical structure:

  Introduction - tell the audience what you're going to say

  Main Body - say it, developing the above mentioned issue(s).

  Conclusions - sum up what you've just said
- Make the first draft of your presentation. Read it carefully. If any of the information is not related to the topic, remove it.
- If there are issues which you cannot express in a precise or clear way, it is probably because you do not really understand them yourself. So it is better not to talk about them.
- Never read from your notes. You should know the material you want to present well enough not to need your notes. If you don't, perhaps you're not ready to give your presentation.
- Keep to the time! Do not exceed the time limit. It is better to shorten the presentation by two minutes than to extend it by two minutes.
- Follow the plan of your presentation! Do not digress! Usually digressions take more time than we think. Successful presenters have "spontaneous digressions" well thought over and well planned.
- Leave time for questions from the audience. Questions may help you to get your message across better.

Some final tips concerning your manner of presentation:

- Speak clearly.

- Make pauses in places which you consider critical for your presentation; this emphasizes the importance of the information you wish to convey to the audience.
- Try to control your body language; avoid excessive gesticulation.
- Maintain eye contact with your listeners but do not focus on one person.
- Don't turn your back to the audience if you want to show something on the screen and don't 'talk to the screen' either.
- Don't stand in the light of a projector covering the screen.
- Don't forget to thank the audience for their attention and encourage them to ask questions. If you are not sure about the answer of if you simply do not know it, don't be afraid to admit that, but suggest the source in which the answer can be found.

The sentences and phrases below follow the logical progression of a well-balanced presentation. This is a list of phrases to help you make a professional presentation in English.

Good presenters always use language (sometimes single words, sometimes phrases) which shows where they are in their presentation. These 'signposts' make it easier for the audience to:

- follow the structure of the presentation
- understand the speaker more easily
- get an idea of the length and content of the presentation.

Welcoming	
Good morning (afternoon, evening) everyone. I'd like to welcome you all here. Thank you all very much for coming today.	- Доброе утро / Добрый *день / вечер.* Я хотел(а) бы поприветствовать вас всех здесь. - Спасибо, что пришли (на презентацию).
Introducing yourself	
Let me introduce myself; my name is … and I am	- Позвольте представиться, меня зовут … и я …
Introducing your presentation	
The purpose of my *presentation / talk* today is to …. In my presentation today I'll be *talking about ... / reviewing...* I'm going to talk about … Firstly, …, after that I'll …, and finally I'll … .	- Цель моей презентации … - В моей презентации я буду *говорить о / делать обзор* ... - Я буду говорить о … - Во-первых, я … , далее …, и наконец я … .

Explaining that there will be time for questions at the end	
If *you have any questions / there are any questions* you'd like to ask, please leave them until the end, when I'll do my best to answer them. Please, feel free to interrupt at any time if you'd like to ask a question. But if you don't mind, I'll deal with questions at the end of my talk.	- Если у вас появятся вопросы, которые вы хотели бы задать, пожалуйста, задайте их в конце презентации, я буду рад(а) ответить на них. - Вы можете прервать меня в любую минуту, если хотите задать вопрос. Но если не возражаете, я отвечу на вопросы в конце своего выступления.
Starting the presentation	
To *begin / start* with … . Let's *start / begin* by looking at … . I'd like to begin by . Let's begin. OK, let's get started.	- Начнём с того, что … . - Начнём с просмотра … - Я хотел(а) бы начать с … - Давайте начнем. - Хорошо, давайте приступим.
Choosing a section of the presentation	
So, that's an overview of	- Итак, перейдем к заключению …
Beginning a new section of the presentation	
Now let's move on ... . Moving on to the next part, I'd like to … .	- А сейчас перейдем к … . - Рассматривая следующий вопрос, мне бы хотелось … .
Referring to visuals	
I'd like you to take a look at this *chart / table / figure* , which shows … If you look at this graph, you'll see ... The figures in this table show ... As you can see from this pie chart … Just have a look at this chart for a moment.	Я хотел(а) бы, чтобы вы взглянули на *эту схему, график, диаграмма, схема, таблица, чертёж / таблицу / этот рисунок,* которая (-ый) показывает … Если вы посмотрите на этот график, то увидите… Цифры в этой таблице показывают… Как вы можете видеть на этой секторной диаграмме… Взгляните на эту диаграмму.
Dealing with difficult questions	
I'll come back to that question later in my presentation. If you don't mind, I'll deal with questions at the end of my talk.	- Если можно, я вернусь к этому вопросу чуть позже. - Если вы не возражаете, я отвечу на вопросы в конце выступления.

Concluding and summarising the presentation	
Well, that brings us to the end of the final section. Now, I'd like to summarise by … . To sum up then, let me …	- Наконец, мы подходим к последней части презентации. Мне бы хотелось подвести итог … . Подводя итог, позвольте мне…
Inviting questions	
That brings the presentation to an end. If *anyone has any questions / there are any questions, I'll be pleased / I'll do my best* to answer them. Now I'm ready to answer your questions. If there are no (more) questions, thank you for your interest.	- Презентация закончена. - Если у кого-либо есть вопросы, я *буду рад / постараюсь* ответить на них. А сейчас я готов(а) ответить на ваши вопросы. Если вопросов (больше) нет, спасибо за проявленный интерес.
Referring to a previous point made	
As I mentioned earlier … .	- Как отмечалось раньше … .
Answering questions	
Sorry, could you say that again, please? If I've understood your question correctly, you would like me to … I'm sorry. I didn't hear you. Would you mind repeating your question?	Извините, не могли бы вы сказать это еще раз? Если я правильно понял(а) ваш вопрос, вы хотели бы, чтобы я…? Извините, я не расслышал(а). Не могли бы повторить ваш вопрос?
Finishing and thanking	
Thank you for your attention. Finally, I'd like *to finish / to end* by thanking you (all) *for your attention / for coming today.*	- Спасибо за внимание. - По окончании презентации я хочу поблагодарить всех *за внимание / за то, что вы пришли на презентацию.*

THE RESEARCHES OF J.C. BOSE

Jagadis Chandra Bose was born in India in 1858. He received his education first in India, until in 1880 he went to England to study medicine at the University of London. Within a year he moved to Cambridge to take up a scholarship to study Natural Science at Christ's College Cambridge. One of his lecturers at Cambridge was Professor Rayleigh, who clearly had a profound influence on his later work. In 1884 Bose was awarded a B.A. from Cambridge, but also a B.Sc. from London University. Bose then returned to India, taking up a post initially as officiating professor of physics at the Presidency College in Calcutta. Following the example of Lord Rayleigh, Jagadis Bose made extensive use of scientific demonstrations in class; he is reported as being extraordinarily popular and effective as a teacher. Many of his students at the Presidency College were destined to become famous in their own right – for example S.N. Bose, later to become well known for the Bose-Einstein statistics.

A book by Sir Oliver Lodge, "Heinrich Hertz and His Successors," impressed Bose. In 1894, J.C. Bose converted a small enclosure adjoining a bathroom in the Presidency College into a laboratory. He carried out experiments involving refraction, diffraction and polarization. To receive the radiation, he used a variety of different junctions connected to a highly sensitive galvanometer. He plotted in detail the voltage-current characteristics of his junctions, noting their non-linear characteristics. He developed the use of galena crystals for making receivers, both for short wavelength radio waves and for white and ultraviolet light. Patent rights for their use in detecting electromagnetic radiation were granted to him in 1904. In 1954 Pearson and Brattain gave priority to Bose for the use of a semi-conducting crystal as a detector of radio waves. Sir Neville Mott, Nobel Laureate in 1977 for his own contributions to solid-state electronics, remarked that "J.C. Bose was at least 60 years ahead of his time" and "In fact, he had anticipated the existence of P-type and N-type semiconductors."

In 1895 Bose gave his first public demonstration of electromagnetic waves, using them to ring a bell remotely and to explode some gunpowder. In 1896 the Daily Chronicle of England reported: "The inventor (J.C. Bose) has transmitted signals to a distance of nearly a mile and herein lies the first and obvious and exceedingly valuable application of this new theoretical marvel." Popov in Russia was doing similar experiments, but had written in December 1895 that he was still entertaining the hope of remote signalling with radio waves. The first successful wireless signalling experiment by Marconi on Salisbury Plain in England was not until May 1897. The 1895 public demonstration by Bose in Calcutta predates all these experiments. Invited by Lord Rayleigh, in 1897 Bose reported on his microwave (millimeter-wave) experiments to the Royal Institution and other societies in England. The wavelengths he used ranged from 2.5 cm to 5 mm. In his presentation to the Royal Institution in January 1897 Bose speculated on the existence of electromagnetic radiation from the sun, suggesting that either the solar or the terrestrial atmosphere might be responsible for the lack of success so far in detecting such radiation - solar emission was not detected until 1942, and the 1.2 cm atmospheric water vapor absorption line was discovered during experimental radar work in 1944. Figure 1 shows J.C. Bose at the Royal Institution in London in January 1897; Figure 2 shows a matching diagram, with a brief description of the apparatus.

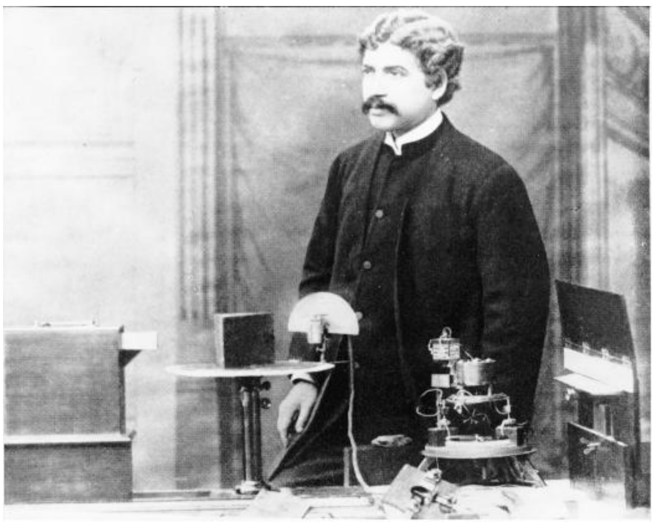
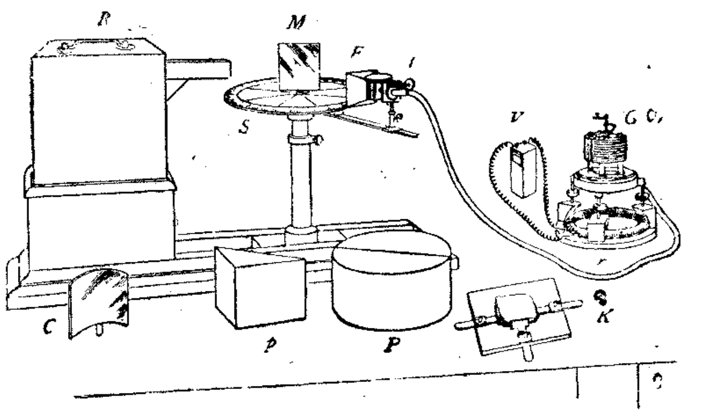


Figure 1. J.C. Bose at the Royal Institution, London, 1897.

By about the end of the 19th century, the interests of Bose turned away from electromagnetic waves to response phenomena in plants; this included studies of the effects of electromagnetic radiation on plants, a topical field today. He retired from the Presidency College in 1915, but was appointed Professor Emeritus. Two years later the Bose Institute was founded. Bose was elected a Fellow of the Royal Society in 1920. He died in 1937, a week before his 80th birthday; his ashes are in a shrine at the Bose Institute in Calcutta.



R, radiator; S, spectrometer-circle; M, plane mirror; C, cylindrical mirror; *p*, totally reflecting prism; P, semi-cylinders; K, crystal-holder; F, collecting funnel attached to the spiral spring receiver; *t*, tangent screw, by which the receiver is rotated; V, voltaic cell; *r*, circular rheostat; G, galvanometer.

Figure 2. Bose's apparatus demonstrated to the Royal Institution in London in 1897. Note the waveguide radiator on the transmitter at left, and that the "collecting funnel" (F) is in fact a pyramidal electromagnetic horn antenna, first used by Bose.

BOSE'S APPARATUS

Bose's experiments were carried out at the Presidency College in Calcutta, although for demonstrations he developed a compact portable version of the equipment, including transmitter, receiver and various microwave components. Some of his original equipment still exists, now at the Bose Institute in Calcutta. In 1985 the author was permitted by the Bose Institute to examine and photograph some of this original apparatus.

Figure 3 (a) shows Bose's diagram of one of his radiators, used for generating 5-mm radiation. Oscillation is produced by sparking between 2 hollow hemispheres and the interposed sphere. There is a bead of platinum on the inside surface of each hemisphere. For some experiments, a lens of glass or of sulphur was used to collimate the radiation - the first waveguide-lens antenna. The lens was designed according to the refractive index measured by Bose at the wavelength in use. Figure 3(b) shows Bose's drawing of such a radiator; the sparks occur between the two outer spheres to the inner sphere, at the focal point of the lens L at the right. Bose was able to measure the wavelength of his radiation with a reflecting diffraction grating made of metal strips.

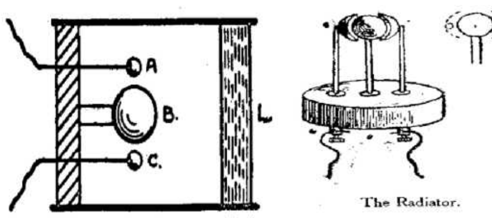


Figure 3. Bose's diagrams of his radiators. (a) shows the radiator used to generated 5-mm radiation, while (b) shows the arrangement with a lens L at the exit of the waveguide . In some designs the mounting stems for the outer spheres could be inclined to adjust the dimension of the spark gaps.

Figure 4 (a) is a photograph of one of his radiating antennas; part of the spark oscillations are generated inside the overmoded circular waveguide. A polarizing grid is built into the antenna, clearly visible at the radiating end of the waveguide. Figure 4 (b) shows a closeup of the dual spark gaps used for the transmitter; the sparks are generated between the 2 outer spheres and the inner sphere. Figure 4 (c) shows both a transmitting antenna (left) and the receiver (right), with a dual prism in between set on the experimental rotating table.

Figure 4(a) *One of Bose's transmitter antennas (being held on the right of the picture). Note the polarizing grid; the spark gap is just visible behind the grid. In the background behind this antenna part of the high voltage equipment used to generate the spark can be seen. At the left of the picture is a receiving horn.*

Figure 4(b) *A closeup of the spark gaps normally mounted inside the transmitting antenna*

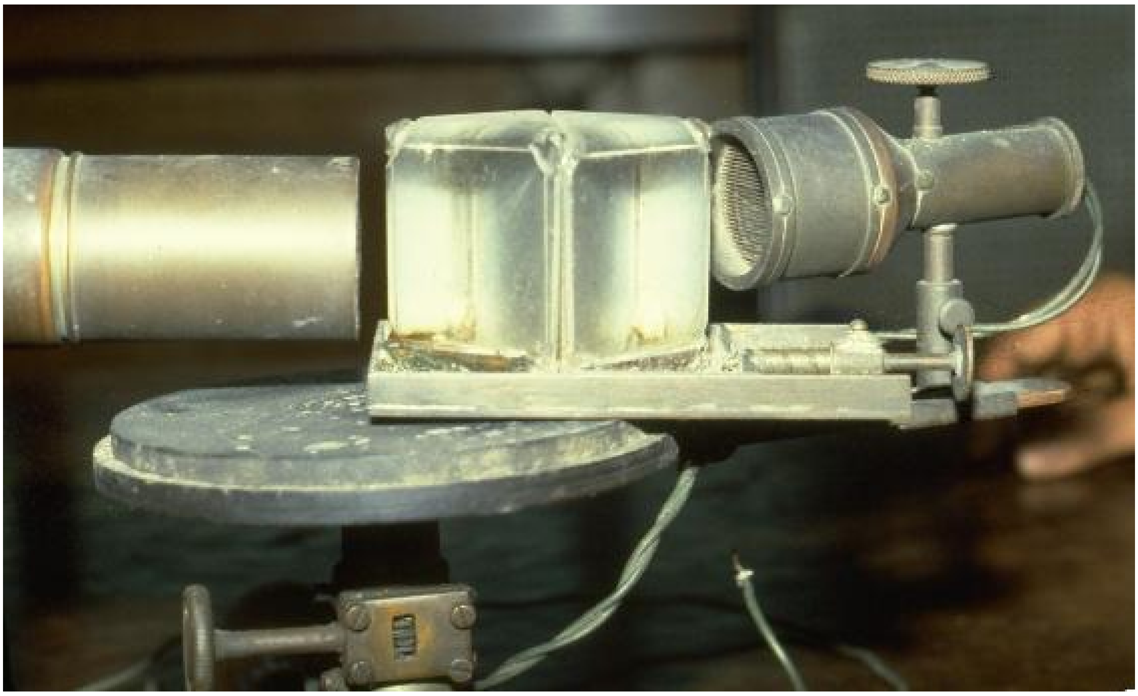


Figure 4(c) *A complete setup showing the transmitting antenna at the left, with the receiving antenna at right. Note the adjustment screw on top of the receiving antenna, which is used to adjust the pressure of the point-contact detector (see Fig. 5). In the center is a rotating table (the "spectrometer circle" of Figure 2) on which various microwave components (prisms, lenses, grids, polarizers etc.) may be mounted for study. A dual-prism attenuator (see below) is shown in this photograph. The arrangement as shown is not yet properly aligned.*

Figure 5 shows two of Bose's point contact detectors. In use, the detector would be placed inside an overmoded waveguide receiving antenna, very much like the transmitting antenna shown in Figure 4, and with a matching polarizing grid.

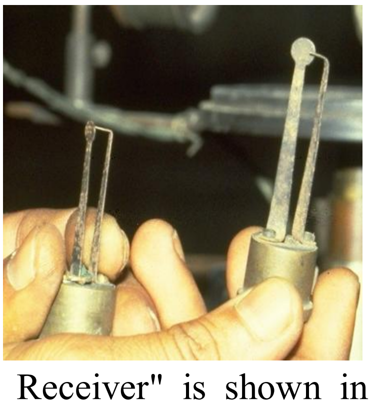


Figure 5. *Two of Bose's point contact detectors, removed from the receiving antennas.*

Bose measured the I-V characteristics of his junctions; an example characteristic curve of a "Single Point Iron Receiver" is shown in Figure 6. The junction consisted of a sharp point of iron, pressing against an iron surface, with pressure capable of fine adjustment. The different curves in Figure 6 correspond to different contact pressures. Bose noted that the junction does not obey Ohm's law, and that there is a knee in the curve at approximately 0.45 volts; the junction becomes most effective at detection of short wavelength radiation when the corresponding bias voltage is applied. He made further measurements on a variety of junctions made of different materials, classifying the different materials into positive or negative classes of substance. In one experiment he noted that increasing the applied voltage to the junction actually decreased the resulting current, implying a negative dynamic resistance.

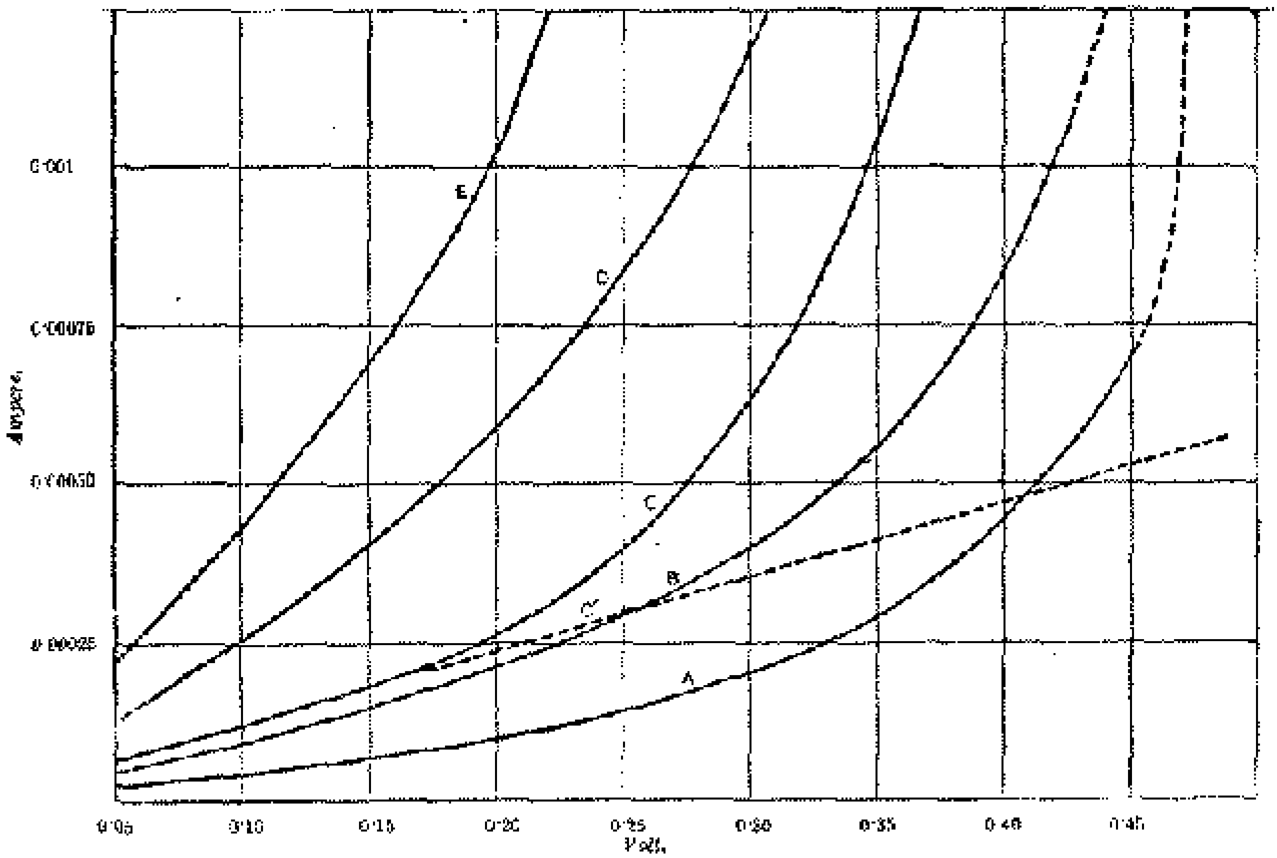
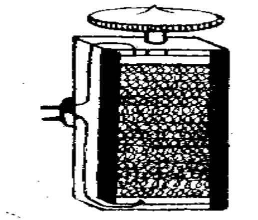


Fig. 52. Characteristic Curves of a Single Point Iron Receiver.
A, B, C, D, E are different curves for different initial currents, C′ is the curve for a constant resistance.

Figure 6. *The I-V characteristics measured by Bose for a Single Point Iron Receiver. Note the similarity to modern semiconductor junctions, with a knee voltage of about 0.4 volts.*

Another of Bose's short-wavelength detectors is the spiral-spring receiver. A sketch of a receiver used for 5-mm radiation is shown in Figure 7; the spring pressure could be adjusted very finely in order to attain optimum sensitivity. The sensitive surface of the 5-mm receiver was 1 by 2 cm. The device has been described recently as a "space-irradiated multi-contact semiconductor (using the natural oxide of the springs)." A surviving, somewhat larger, spiral spring receiver is shown in the photograph Figure 8. The springs are held in place by a sheet of glass, seen to be partly broken in this example.



The Spiral-spring Receiver.

Figure 7. *Bose's diagram of his spiral-spring receiver used for 5-mm radiation.*

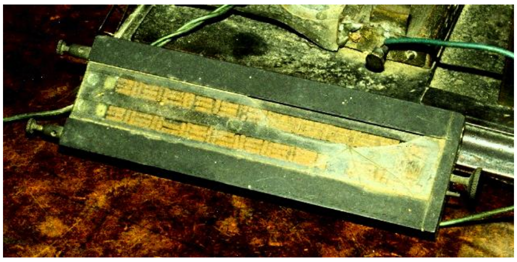
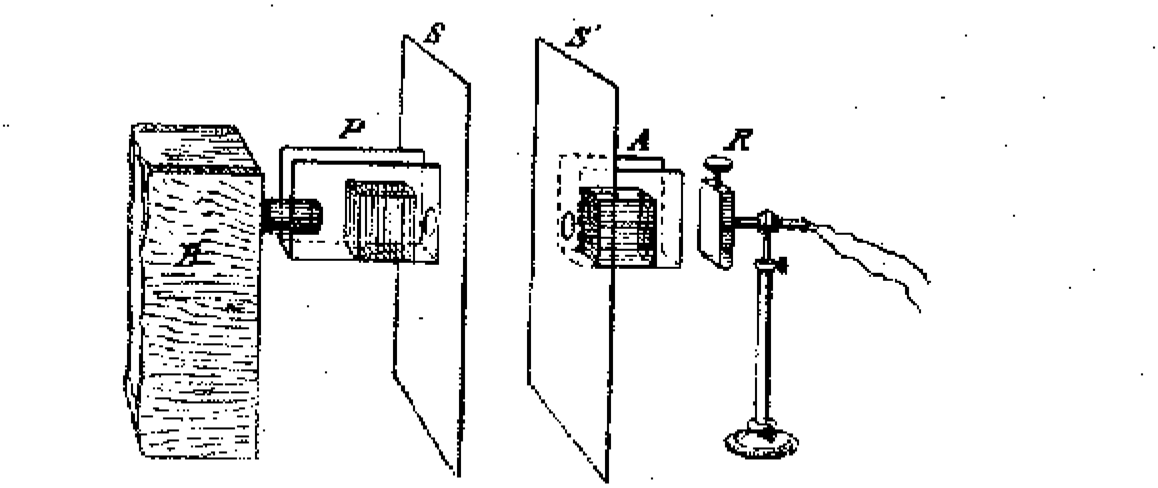


Figure 8. *One of Bose's free-space radiation receivers, recently described as a "space-irradiated multi-contact semiconductor (using the natural oxide of the springs)." The springs are kept in place in their tray by a sheet of glass, seen to be partly broken in this photograph.*

Figure 9 is Bose's diagram of his polarization apparatus. The transmitter is the box at left, and a spiral spring receiver ('R') is visible on the right. One of the polarizers used by Bose was a cut-off metal plate grating, consisting of a book (Bradshaw's Railway Timetable, Figure 10) with sheets of tinfoil interleaved in the pages. Bose was able to demonstrate that even an ordinary book, without the tinfoil, is able to produce polarization of the transmitted beam. The pages act as parallel dielectric sheets separated by a small air gap.



Polarisation apparatus. B, the radiating box; P, the polariser; A, the analyser; S, S', the screens; R, the receiver.

Figure 9. *Bose's diagram of his polarization apparatus. Note the spiral spring receiver 'R' to the right.*

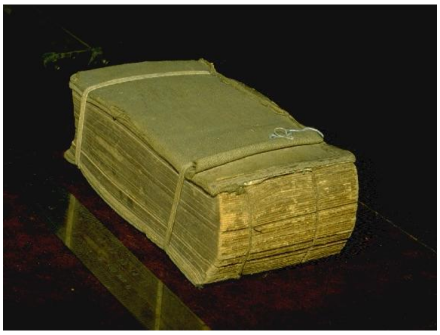


Figure 10. *One of Bose's polarizers was a cut-off metal plate grating, consisting of a book (Bradshaw's Railway Timetable) with sheets of tinfoil interleaved in the pages.*

Bose experimented with samples of jute in polarizing experiments. In one experiment, he made a twisted bundle of jute and showed that it could be used to rotate the plane of polarization. The modern equivalent component may be a twisted dielectric waveguide. He further used this to construct a macroscopic molecular model as an analogy to the rotation of polarization produced by liquids like sugar solutions. Figure 11 shows Bose's diagram of the jute twisted-fiber polarization rotator, and Figure 12 is a photograph of a surviving twisted-jute polarizer at the Bose Institute.

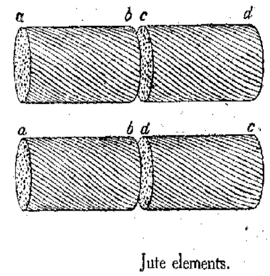


Figure 11. *Bose's diagram of twisted-Jute polarization elements, used to simulate macroscopically the polarization effect of a certain sugar solutions.*

Figure 12. *One of the twisted-jute polarizers used by Bose.*

THE DOUBLE-PRISM ATTENUATOR

Bose's investigations included measurement of refractive index of a variety of substances. He made dielectric lenses and prisms; examples are visible in Figures 13 and 14.

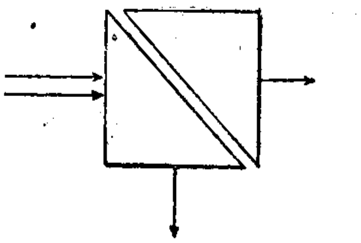


Figure 13. *Bose's 1897 diagram of the double-prism attenuator.*

One investigation involved measurement of total internal reflection inside a dielectric prism, and the effect of a small air gap between two identical prisms. When the prisms are widely separated, total internal reflection takes place and the incident radiation is reflected inside the dielectric. When the 2 prisms touch, radiation propagates unhindered through both prisms. By introducing a small air gap, the combination becomes a variable attenuator to incident radiation; this is illustrated in Bose's original diagram, shown in Figure 13. Bose investigated this prism attenuator experimentally; his results were published in the Proceedings of the Royal Society in November, 1897. Schaefer and Gross made a theoretical study of the prism combination in 1910; the device has since been described in standard texts.

Figure 14. *One of Bose's original double-prism attenuators, with adjustable air gap.*

At the National Radio Astronomy Observatory in Tucson, Arizona a new multiple-feed receiver, operating at a wavelength of 1.3 mm, has recently been built and installed on the 12 Meter Telescope at Kitt Peak. The system is an 8-feed receiver, where the local oscillator is injected into the superconducting tunnel junction (SIS) mixers optically. With an SIS mixer receiver the power level of the injected local oscillator is critical; each of the 8 mixers requires independent local oscillator power adjustment. This is achieved by adjustable prism attenuators. Figure 15 shows 4 of these 8 prism attenuators, installed on one side of the 8-feed system; this can be compared with Figure 14, which is a photograph taken at the Bose Institute in Calcutta in 1985, of an original prism system built by Bose.

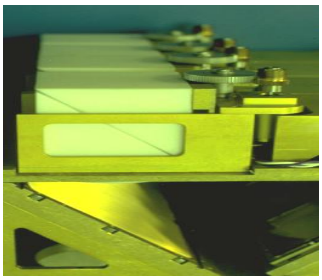


Figure 15. *Four of the 8 double-prism attenuators used to control local oscillator injection into the NRAO 1.3-mm 8-beam receiver in use at the 12 Meter Telescope at Kitt Peak.*

CONCLUSIONS

Research into the generation and detection of millimeter waves, and the properties of substances at these wavelengths, was being undertaken in some detail one hundred years ago, by J.C. Bose in Calcutta. Many of the microwave components familiar today - waveguide, horn antennas, polarizers, dielectric lenses and prisms, and even semiconductor detectors of electromagnetic radiation - were invented and used in the last decade of the nineteenth century. At about the end of the nineteenth century, many of the workers in this area simply became interested in other topics. Attention of the wireless experimenters of the time became focused on much longer wavelengths which eventually, with the help of the then unknown ionosphere, were able to support signalling at very much greater distances.

Although it appears that Bose's demonstration of remote wireless signalling has priority over Marconi, he was the first to use a semiconductor junction to detect radio waves, and he invented various now commonplace microwave components, outside of India he is rarely given the deserved recognition. Further work at millimeter wavelengths was almost nonexistent for nearly 50 years. J.C. Bose was at least this much ahead of his time.

APPENDIX

Useful expressions for translating texts

A

according to - согласно
account for - объяснять
after a while - через некоторое время
after the manner - по способу
a great deal of - много
ahead of time - заблаговременно
allow for - компенсировать
along with - одновременно
and the like - и тому подобное
any longer - уже; больше не
apart from - помимо, кроме
as - как, когда, так как
as a matter of fact - фактически
as close as possible - как можно точнее
as a whole - в целом
as early as - уже; ещё
as for - что касается, относительно
as if - как будто
as in the case - как в случае с
as long as - до тех пор, пока
as regards - что касается
as soon as - как только
as well as – так же как
at a glance - сразу, с первого взгляда
at all - вообще, совсем
at all events - при всех условиях
at least - по крайней мере
at a time - одновременно
at issue - рассматриваемый
at random - наугад; произвольно
at the cost - за счет
at will - по желанию

B

be alike - быть похожим
bear in mind - иметь в виду
because of - из-за, вследствие
be due to - обуславливать(ся)
before long - вскоре
be likely - вероятно
be of use - быть полезным
be of value - иметь значение
beyond doubt - несомненно
beyond question - вне сомнения
bring about - осуществлять, быть причиной
bring into contact - соединять
but for - если бы не
by all means - обязательно
by far - непосредственно
by means of - при помощи
by no means - никоим образом
by then - к тому времени
by turns - по очереди
by virtue of - благодаря, посредством

C

compatible with – совместимый

D

deal with - иметь дело
depending on - в зависимости от
despite - несмотря на
do without - обходиться без
due - должный, надлежащий
due to - вследствие, из-за

E

either ... or – или ... или
end to end - непрерывный
even - даже, ровный, четный
ever since - с того времени

F

far less - гораздо меньше
far more - значительно больше
figure of merit - критерий
first rate- первоклассный
for - для, в течение, так как
for ever - навсегда
for lack of - из-за отсутствия
former - первый
for the rest - в остальном
for the sake of - ради
for the time being - на время, пока

G

get rid of - освобождаться от
give rise to - вызывать
go into operation - вступать в действие
greatly - очень, в значительной степени

H

have nothing to do with - не иметь никакого отношения
half as much - в два раза меньше
hence - следовательно
highly – весьма

I

if any - если таковые вообще имеются

if at all - если это вообще будет
if ever - если когда-л. это бывает
in accordance with – согласно чему-л.
in addition to - в дополнение к
in advance - заранее
in behalf of - для, ради
in common with - совместно
in comparison to - по сравнению с
in consequence of - в результате
in contrast to - в противоположность
in due time - в своё время
in effect - в действительности, в сущности
in evidence - заметный
in excess of - больше, чем
in favour of - в пользу
in fine with - в соответствии
in honour of - в честь кого-л.
in its turn - в свою очередь
in many respects - во многих отношениях
in mind - помнить, иметь в виду
in no case - ни в коем случае
in no time - моментально
in order to - для того, чтобы
in outline - в общих чертах
in part - частично
in particular - в особенности
in point - рассматриваемый
in question - о котором идет речь
in relation to- относительно
in respect of - что касается
in spite of - несмотря на
instead of - вместо того, чтобы
in step - синхронно
in succession - последовательно
in such a way - таким способом
in terms of - в виде, на основе
in the course of - в процессе
in the long run - в конце концов

in virtue of - посредством, благодаря
irrespective of - безотносительно
it goes without saying - само собой разумеется
it is high time - давно пора
it is of interest - интересно
it is safe to say - можно с уверенностью сказать
it is unlikely - маловероятно

L

last but one - предпоследний
liable - подверженный
like - похожий, подобный
likely – вероятно

M

make use of - использовать
means - средство, способ
meet demands - отвечать требованиям
minute – мельчайший

N

needless to say - нечего и говорить
neither … nor- ни… ни
no longer - больше не, уже не
no matter - независимо от
none the less - нисколько не меньше
no sooner than - как только
notably - исключительно, особенно

O

off the point - не по существу
of value - ценный
on account of - из-за, вследствие

on a par - в среднем
on behalf of - от имени, во имя
once - как только, после того как
once and again - неоднократно
on no account - ни в коем случае
on record - зарегистрированный
on the contrary - наоборот
on the one hand - с одной стороны
on the other hand - с другой стороны
on the whole - в целом
other than - кроме, помимо
otherwise - иначе
out-of-date - устаревший
out of place - не на месте
owing to - из-за, вследствие

P

partially - частично
particular - особый, определенный
partly - частично
pay attention - обращать внимание
provided - при условии

Q

quite a few – много

R

rather than - а не
regarding - относительно
regardless - независимо
relative to - относительно
result from - получаться в результате
result in - приводить к

roughly - приблизительно
rule of a thumb - эмпирический метод

S

scarcely - едва
similar to - подобный
since - с, с тех пор, как, так как
so far - до сих пор, пока
so long as - поскольку, пока
somewhat - в некоторой степени
step by step - постепенно
such is the case - так обстоит дело

T

take account of - учитывать
take advantage of - воспользоваться
take into account - учитывать
take part - принимать участие
take place - происходить
take steps - принимать меры
thanks to - благодаря
that is - то есть
that is why - поэтому, вот почему
the former - первый из упомянутых
the latter - последний
the only - единственный
the … the – чем … тем
the very - тот самый
thus - таким образом
to advantage - с успехом
to a great extent - в значительной степени
to be a success - иметь успех
together with - наряду с, вместе с
to some extent - до некоторой степени
to this end - с этой целью

turn out - оказываться
twice as high - в два раза выше

U

under consideration - рассматриваемый
under way - в процессе осуществления
unless - если не
unlikely - маловероятно
until recently - до недавнего времени
until then - до того времени
up to - вплоть до

V

vice versa – наоборот

W

whatever - какой бы ни
whenever - когда бы ни
whereby - тем самым
wherein - в чем
whether… or – или… или
with a glance to - с учетом
with a view to - с целью
without question - бесспорно
with reference to - ссылаясь на
with regard to - с намерением
with respect to - по отношению к
with the exception of - за исключением
worth-while - заслуживающий внимания

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