

# PARAGRAPHS FOR ORGANIZING YOUR PRESENTATION

## PORTA-POTTY [BBC102]

ℳ A portable, in-car lavatory has been launched by a British firm for use by people with medical conditions, as well as families with small children. The Indipod, made by Bromsgrove-based Daycar, is aimed at people with bowel and bladder problems. The chemical toilet is housed in an inflatable "bubble" which is powered from the car's cigarette lighter. It is designed to be used in multi-purpose vehicles, four-wheel drives and estate cars.

Ω The Indipod is on display at Naidex 2005, an exhibition of products for disabled people at the NEC in Birmingham. When not in use, the Indipod folds away into a bag the size of a suitcase and weighs 8kg. "When we developed it we thought it would be for families, kids going out for the day or on holiday," Daycar managing director, Barbara May, told the BBC News website. "But we've had an excellent response from people with medical conditions."

⌘ To show of the potential of the Indipod, Daycar did a seven-day trip from John O'Groats to the southern tip of Italy without getting out of the car. "For people with bowel disease, incontinence or bladder problems, this product is not a luxury, it's a necessity," said Mrs May. "It's giving them back their social lives and their freedom."

℥ The company says that the chemicals break down waste into a "sweet smelling, inoffensive liquid", which can be disposed of at the end of a journey. It says that there is no residual smell in the vehicle once the Indipod has been used, and that one sachet of chemicals is enough for one person's use for about eight days. The bubble or "private sanitary sanctuary" inflates to an area about 1.2m high by a metre wide and is sufficient to accommodate two people, according to Mrs May. "You could have a parent and child or a disabled person with a helper," she said. If there is luggage or shopping in the back of the vehicle the bubble expands around it and occupies only empty space. Once it is no longer required, the power cord is disconnected and it can be packed away into its bag.

ℹ As it is thought that up to a million people in Europe have either bowel or bladder problems, the potential market for this device is large. Daycar says it has already received interest from people in Belgium and Italy. Perhaps the most far-flung and unusual order came from a man in Australia who wanted to buy an Indipod for his wife's birthday.

## LEDs WORK LIKE BUTTERFLIES' WINGS [BBC101]

ℳ When scientists developed an efficient device for emitting light, they hadn't realised butterflies have been using the same method for 30 million years.

⌚ In 2001, Alexei Erchak and colleagues at the Massachusetts Institute of Technology (MIT) demonstrated a method for building a more efficient light emitting diode (LED). Most light emitted from standard LEDs cannot escape, resulting in a low extraction efficiency for light. The LED developed at MIT used a two-dimensional (2D) photonic crystal - a triangular lattice of holes etched into the LED's upper cladding layer - to enhance the extraction of light. In addition, layered structures called Bragg reflectors were used to control the emission direction. This device structure potentially offers a huge increase in performance relative to standard types.

✂ Pete Vukusic and Ian Hooper at Exeter have now shown that swallowtail butterflies evolved an identical method for signalling to each other in the wild. Swallowtails belonging to the *Priniceps nireus* species live in eastern and central Africa. They have dark wings with bright blue or blue-green patches. The wing scales on these swallowtails act as 2D photonic crystals, infused with pigment and structured in such a way that they produce intense fluorescence. Pigment on the butterflies' wings absorbs ultra-violet light which is then re-emitted, using fluorescence, as brilliant blue-green light. Most of this light would be lost were it not for the pigment being located in a region of the wing which has evenly spaced micro-holes through it. This slab of hollow air cylinders in the wing scales is essentially mother nature's version of a 2D photonic crystal.

⌚ Like its counterpart in a high emission LED, it prevents the fluorescent colour from being trapped inside the structure and from being emitted sideways. The scales also have a type of mirror underneath them to upwardly reflect all the fluorescent light that gets emitted down towards it. Again, this is very similar to the Bragg reflectors in high emission LEDs. "Unlike the diodes, the butterfly's system clearly doesn't have semiconductor in it and it doesn't produce its own radiative energy," Dr Vukusic told the BBC News website "That makes it doubly efficient in a way. "But the way light is extracted from the butterfly's system is more than an analogy - it's all but identical in design to the LED."

⌚ The above is just one example that demonstrates that studying natural designs can help scientists improve man made devices.

## **WRITING HYPOTHESES: A STUDENT LESSON**

*Based on articles on <http://www.accessexcellence.org/>*

⌚ Most students believe that they are going to be experimenting anytime they are given a laboratory assignment in science. However, more often than not, students are doing something other than experiments. This is not necessarily bad. A good deal of science is observational and descriptive. For example, the study of bio-diversity usually involves looking at wide variety of specimens and maybe sketching and recording their unique characteristics. However, there are other times when we need to teach students how scientists work and how to verify things which others may say or believe is so without any proof.

Ω To learn about what is not known or to verify a notion, an actual experiment may be conducted. It does not matter that the experiment has been done a thousand times before and that the result is already known. What matters is that you don't know the results and that you can independently find a verifiable answer. In real experiments, real hypotheses should be written before the actual experiment.

⌘ A hypothesis is a tentative statement that proposes a possible explanation to some phenomenon or event. A useful hypothesis is a testable statement which may include a prediction. The key word is testable. That is, you perform a test of how two variables might be related. This is what you are doing when you do a real experiment. You are testing variables. Usually, a hypothesis is based on some previous observation such as noticing that in November many trees undergo color changes in their leaves and the average daily temperatures are dropping. Are these two events connected? How? One needs to make a hypothesis about why this is the case and then design an experiment to test the hypothesis.

∩ We note that a hypotheses should not be confused with a theory. Theories are general explanations based on a large amount of data. For example, the theory of evolution applies to all living things and is based on wide range of observations. However, there are many things about evolution that are not fully understood such as gaps in the fossil record.

∩ In conclusion, any laboratory procedure you follow without a hypothesis is really not an experiment. It is just an exercise or demonstration of what is already known.

## **GOLD MEDAL FOR A COMPUTER PROGRAM THAT PLAYS A CHILD'S GAME** [BBC104]

∩ A British computer programmer has been awarded a gold medal for a game which plays the children's game, dots and boxes. David Bochenski won the accolade at the 10th Computer Olympiad, held in Taiwan. The winning program - dubbed Deep Beige - was an improved version of the program which won silver at the same competition in Austria in 2003.

Ω The Computer Olympiad pitted programs against each other at various games, including chess and backgammon. Mr Bochenski's chosen game - dots and boxes - is a more advanced version of noughts and crosses, involving players alternating turns connecting dots on a grid with the objective of completing squares. (Noughts and Crosses is a game that has been played in the United Kingdom for several centuries - even if it's precise history seems unknown. The game has become known (perhaps more popularly) as Tic Tac Toe in American English. It was the first game to be played by computers and ran on the EDSAC machine built in 1949.)

⌘ Mr Bochenski, 23, from Nottingham, designed Deep Beige as part of university project several years ago. His success was noticed by a local technology company, 360, which has since employed him. But Mr Bochenski has continued improving Deep Beige in his spare time. He said: "My bosses actively encourage this 'after hours' kind of hobby as they help generate new ideas and performance improvements which can also help in my day job."

☞ Mr Bochenski secured gold by beating two other programs from the UK and a US competitor. He said: "What set my program apart from the rest was probably the opening strategy which is quite advanced. "All the competitors were very strong, if not perfect, at the end game." Mr Bochenski plans to "retire" from the world of dots and boxes, and try a new game.

☞ "I hope now, with the help of some of my colleagues to turn my attentions to Go, which is a game with more possibilities than chess. "Despite computers being able to at least be on a level with the world's greatest chess players, there does not currently exist a Go program that can beat even novice professional humans. "This presents quite an interesting prospect."

## WHY MIND-READING MOM'S ARE BEST <sup>[BBC103]</sup>

☞ How a mother reads her baby's emotions may be more important for the child's development than the family's social status. A team from the Economic and Social Research Council studied more than 200 mothers and their babies. Half of the women left school at 16 and were unemployed or in low-skilled jobs. The interplay between mothers and their babies was assessed when the babies were at eight, 14 and 24 months old. The researchers made videos of mother-and-child play sessions, and noted what was said by the women at the time. The mother's comments were deemed appropriate if she appeared to be "reading" her child's emotions correctly, such as remarking that the baby was content when quietly playing with a toy. Other mothers seemed to misread their babies, perhaps by saying he or she was upset or tired when the child showed no signs of this.

☞ When the babies were assessed at 24 months, those born to mothers from poorer backgrounds did score less well in language and play tests. The researchers also found that those in the lowest 10% were more likely to have mothers in the lowest of the social and work brackets. But the researchers, led by Dr Elizabeth Meins of the University of Durham ,said that even though these links were significant, they were not strong. In addition, factors such as post-natal depression and how much support the mother had were found to have little effect on the child's talking and playing abilities.

☞ But the researchers said they did find a definite link between mothers who could read their baby's emotions - labelled as "mind-minded" mothers - and the development of children by the age of two. Infants whose mothers fell into this category had higher test scores and were less likely to be in the bottom 10%. Dr Meins said: "The links between 'mind-mindedness' and children's language and play abilities were strong. This suggests that, regardless of background, social support or maternal depression, if a mother really understands her baby at eight months, it's an important indication of development by the age of two."

☞ Dr Meins told the BBC News website being 'mind-minded' could also help mothers. "We found is that if you try and see if there's a reason why your baby might be crying, rather than it simply being a random event, it might help you cope." She said the new information about the importance of maternal intuition would help inform the work of initiatives such as Sure Start. But she added: "Little was known about which aspects of such schemes may help, because the reasons for the link were poorly understood."

⌘ Dr Sandra Wheatley, of the British Psychological Society, said the findings fitted in with what was known already. And she added: "It makes sense that how well you get on with your family, and how loved and understood you are will give you a better grounding than having millions of pounds in the bank." But she said new mums should not expect to be immediately able to understand their babies. "It takes some time to get to know somebody, whether it's a colleague or a friend - or your baby. "You may have been carrying them for nine months, but you don't know them instinctively."

## HISTORY OF LIGHTING <sup>[WIKI-LIGHT]</sup>

☞ With the discovery of fire, the earliest form of artificial lighting used to illuminate an area were campfires or torches. As early as 400,000 BCE, fire was kindled in the caves of Peking Man. Prehistoric people used primitive oil lamps to illuminate surroundings. These lamps were made from naturally occurring materials such as rocks, shells, horns and stones, were filled with grease, and had a fiber wick. Lamps typically used animal or vegetable fats as fuel. Hundreds of these lamps (hollow worked stones) have been found in the Lascaux caves in modern-day France, dating to about 15,000 years ago. Oily animals (birds and fish) were also used as lamps after being threaded with a wick. Fireflies have been used as lighting sources. Candles and glass and pottery lamps were also invented.[1] Chandeliers were an early form of "light fixture".

∂ A major reduction in the cost of lighting occurred with the discovery of whale oil.[2] The use of whale oil declined after Abraham Gesner, a Canadian geologist, first refined kerosene in the 1840s, allowing brighter light to be produced at substantially lower cost.[3] In the 1850s, the price of whale oil dramatically increased (more than doubling from 1848 to 1856) due to shortages of available whales, hastening whale oil's decline.[3] By 1860, there were 33 kerosene plants in the United States, and Americans spent more on gas and kerosene than on whale oil.[3] The final death knell for whale oil was in 1859, when crude oil was discovered and the petroleum industry arose.[3]

⌘ Gas lighting was economical enough to power street lights in major cities starting in the early 1800s, and was also used in some commercial buildings and in the homes of wealthy people. The gas mantle boosted the luminosity of utility lighting and of kerosene lanterns. The next major drop in price came about in the 1880s with the introduction of electric lighting in the form of arc lights for large space and street lighting followed on by incandescent light bulb based utilities for indoor and outdoor lighting.[2][4]

∩ Over time, electric lighting became ubiquitous in developed countries.[5] Segmented sleep patterns disappeared, improved nighttime lighting made more activities possible at night, and more street lights reduced urban crime.

☉ Color (American English), or colour (Commonwealth English), is the characteristic of human visual perception described through color categories, with names such as red, orange, yellow, green, blue, or purple. This perception of color derives from the stimulation of cone cells in the human eye by electromagnetic radiation in the visible spectrum. Color categories and physical specifications of color are associated with objects through the wavelength of the light that is reflected from them. This reflection is governed by the object's physical properties such as light absorption, emission spectra, etc.

☿ The color of an object depends on both the physics of the object in its environment and the characteristics of the perceiving eye and brain. Physically, objects can be said to have the color of the light leaving their surfaces, which normally depends on the spectrum of the incident illumination and the reflectance properties of the surface, as well as potentially on the angles of illumination and viewing. Some objects not only reflect light, but also transmit light or emit light themselves, which also contributes to the color.

♯ A viewer's perception of the object's color depends not only on the spectrum of the light leaving its surface, but also on a host of contextual cues, so that color differences between objects can be discerned mostly independent of the lighting spectrum, viewing angle, etc. This effect is known as color constancy.

⊖ Given the above discussion of the viewer's perception, a few generalizations of the physics of colour can be stated. (1) Light arriving at an opaque surface is either reflected "specularly" (that is, in the manner of a mirror), scattered (that is, reflected with diffuse scattering), or absorbed – or some combination of these. (2) Opaque objects that do not reflect specularly (which tend to have rough surfaces) have their color determined by which wavelengths of light they scatter strongly (with the light that is not scattered being absorbed). If objects scatter all wavelengths with roughly equal strength, they appear white. If they absorb all wavelengths, they appear black (3) Opaque objects that specularly reflect light of different wavelengths with different efficiencies look like mirrors tinted with colors determined by those differences. An object that reflects some fraction of impinging light and absorbs the rest may look black but also be faintly reflective; examples are black objects coated with layers of enamel or lacquer. (4) Objects that transmit light are either translucent (scattering the transmitted light) or transparent (not scattering the transmitted light). If they also absorb (or reflect) light of various wavelengths differentially, they appear tinted with a color determined by the nature of that absorption (or that reflectance) (5) Objects may emit light that they generate from having excited electrons, rather than merely reflecting or transmitting light. The electrons may be excited due to elevated temperature (incandescence), as a result of chemical reactions (chemoluminescence), after absorbing light of other frequencies ("fluorescence" or "phosphorescence") or from electrical contacts as in light emitting diodes, or other light sources.

ℳ To summarize, the color of an object is a complex result of its surface properties, its transmission properties, and its emission properties, all of which contribute to the mix of wavelengths in the light leaving the surface of the object. The perceived color is then further conditioned by the nature of the ambient illumination, and by the color properties of other objects nearby, and via other characteristics of the perceiving eye and brain.

# SOCRATES

☉ Socrates (c. 470 – 399 BC) was a classical Greek (Athenian) philosopher credited as one of the founders of Western philosophy, and as being the first moral philosopher, of the Western ethical tradition of thought. An enigmatic figure, he made no writings, and is known chiefly through the accounts of classical writers writing after his lifetime, particularly his students Plato and Xenophon. Other sources include the contemporaneous Antisthenes, Aristippus, and Aeschines of Sphettos. Aristophanes, a playwright, is the only source to have written during his lifetime.

Ω The beliefs of Socrates, as distinct from those of Plato, are difficult to discern. Little in the way of concrete evidence exists to demarcate the two. The lengthy presentation of ideas given in most of the dialogues may be the ideas of Socrates himself, but which have been subsequently deformed or changed by Plato, and some scholars think Plato so adapted the Socratic style as to make the literary character and the philosopher himself impossible to distinguish. Others argue that he did have his own theories and beliefs. There is a degree of controversy inherent in the identifying of what these might have been, owing to the difficulty of separating Socrates from Plato and the difficulty of interpreting even the dramatic writings concerning Socrates. Consequently, distinguishing the philosophical beliefs of Socrates from those of Plato and Xenophon has not proven easy, so it must be remembered that what is attributed to Socrates might actually be more the specific concerns of these two thinkers instead.

℞ Perhaps his most important contribution to Western thought is his dialectic method of inquiry, known as the Socratic method or method of "elenchus", which he largely applied to the examination of key moral concepts such as the Good and Justice. It was first described by Plato in the Socratic Dialogues. To solve a problem, it would be broken down into a series of questions, the answers to which gradually distill the answer a person would seek. The development and practice of this method is one of Socrates's most enduring contributions, and is a key factor in earning his mantle as the father of political philosophy, ethics or moral philosophy, and as a figurehead of all the central themes in Western philosophy. The Socratic method has often been considered as a defining element of American legal education.

Ω To illustrate the use of the Socratic method, a series of questions are posed to help a person or group to determine their underlying beliefs and the extent of their knowledge. The Socratic method is a negative method of hypothesis elimination, in that better hypotheses are found by steadily identifying and eliminating those that lead to contradictions. It was designed to force one to examine one's own beliefs and the validity of such beliefs.

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[BBC103] Based on article in <http://news.bbc.co.uk/2/hi/health/4578963.stm>

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