6. SCIENCE AND TECHNOLOGY: A CURSE OR A BLESSING?

INTRODUCTION

1. **What are the scientists’ prime concerns at present?**
2. **Do we have the right to interfere with the laws of Nature/God’s creation? Where is the threshold we shouldn’t cross? Will there be any warning signs?**
3. **Think about the following areas of science and scientific methods, techniques and experiments and discuss them in groups of four. Which of them**
   a) **are beneficial (because they can restore, repair or replace damaged tissue or organs)?**
   b) **may raise ethical questions?**
   c) **should be prohibited?**
   d) **are generally harmless?**
   e) **are potentially harmful?**

organ transplantation, the cloning of animals/humans, bringing back extinct animals using DNA, plastic surgery, AI, artificial insemination, space exploration, genetic engineering, microchip implants, surrogacy, cryonics,

4. **Match the expressions in the box with the above concepts. Note that some expressions can be associated with more than one concept.**

5. **Discuss the following questions in pairs/groups.**
   a) **Which invention/discovery do you consider the greatest achievement of the last 100 years? Why?**
   b) **Which of the following inventions/discoveries of 2014-2016 can become the biggest game-changer:** solar roadways serving as power houses, driverless cars, bioplastic from banana peels, shoes enabling one to walk on the ceiling, metal-eating plants, machines extracting images/thoughts from your brain, mind-control cursors, artificial blood, discovery of an exoplanet

   **How could they be misused?**

6. **Put the following steps of a scientific method in the correct order. What would happen if you omitted any of these steps?**

   **EXPERIMENT**
   **EVALUATION/CONCLUSION/GENERALISATION**
   **BACKGROUND RESEARCH**
   **APPLICATION**
   **OBSERVATION AND QUESTION**
   **HYPOTHESIS**

7. **Now listen to the recording “A step ahead”? and identify the above steps.**
8. Read the following text and think about real-life examples of the statements below.

**WHY DID IT HAPPEN?**

When two events are related, one may be the cause of the other. E.g., the dog barks when the postman delivers letters. Here, the dog’s bark is one effect of the postman’s delivery.

There are four vital points to be considered when two events are presumed to be related.

1. **Causal relationships have direction.** In such a relationship the first event is seen as causing the second. E.g., the postman will cause the dog to bark, but the barking will not cause the postman to come. *The order of the two parts of such statements cannot be reversed.*

2. **Not all relationships have causal links;** some may be only a coincidence. Unfortunately, relationships are often assumed to be cause/effect ones when they are not. E.g., the dog may bark because it wants to be fed, and this may be at the same time as the postman is delivering letters. *Examine statements carefully to make sure they are not just two independent actions.*

3. **A cause may have more than one effect.** When the postman comes, the barking may be one effect; the letters are obviously another. Often, research emphasizes one effect while ignoring other effects of the same action. *If you fail to look at all the effects, your conclusions may be distorted.*

4. **Events do not happen in a vacuum.** Related events. E.g., it may be that the dog barks when anyone carrying a bag comes to the door; or it may be that the letter box squeaks and this irritates the dog. *The cause is often identified simply because it is the obvious one, though other factors may in fact influence the relationship.* (279 words)

? What would happen if one mistook coincidence for a cause-effect relationship?

When may failing to look at all possible consequences have fatal consequences?

9. Which of the following mysteries that keep scientists busy could have a plausible explanation: the placebo effect, extrasensory perception, near-death experience, UFO, déjà vu, ghosts, intuition?

**PLAYING GOD: THE ARTILECT WAR**

(by Prof. Dr. Hugo de Garis, Head of Starlab's Artificial Brain Project)

1 Read the first extract (Building the artilect) and answer the following questions:

a) Why does the author feel alarmed?

b) What makes his point relevant?

A. Building the artilect

(I) For years, my techno-optimism has been offset by a growing sense of alarm concerning a new technological trend. I believe that 21st century technologies will allow the creation of “artilects” (artificial intellects) with intellectual capacities many times greater than those of humans. I will attempt to explain why I think computers will be powerful enough to enable the building of true artilects in this century rather than later.

(II) As computers keep getting smarter, human beings will notice that, for example, their household robots are getting increasingly smarter. People will be asking themselves “Should the development of such smart robots be stopped at a certain level or should any constraints be placed on them? If progress should be stopped after reaching a certain intelligence level, can it be stopped?”
(III) When I talk about the issue of species dominance, many people find it too science-fiction-like. I am a researcher in the field of AI. I am helping to pioneer this new field by evolving neural network circuit modules and putting them together to make artificial brains. My neural circuits grow in billionths of a second. Thus, I can grow many of them, each with slightly different abilities by eliminating the poorer performing circuits and allowing the superior circuits to self-replicate. I call this process “evolutionary engineering”.

2. The following extract is entitled “Cosmists and Terrans”. Who do you think they are?

B. Cosmists and Terrans

The question most thinking people will be asking themselves within a few decades will be “Is humanity prepared to see its dominant status be undermined by the artilects?” Can we always be sure that they will treat human beings in a way that will make us feel secure, or, would we always harbour the suspicion that they might one day decide that human beings are so inferior that we should be exterminated? I see the debate polarising into two very opposite ideologies.

The first of the two opposed groups, “Cosmists”, will be in favour of building artilects. One of their main motivations will be awe at the enormity of what artilects could do. The Cosmists will feel that they have a duty to construct the next rung of the evolutionary ladder. The second group, “Terrans”, will be opposed to the construction of artilects. To the Terrans, the highest priority will be to ensure that there is zero risk that the human species will be exterminated by the artilects. The Terrans will probably allow artificial-brain-based computers to reach a certain intelligence level, and then freeze further research, arguing that building artilects at least as intelligent as us would be too dangerous for human beings to tolerate.

The problem with the construction of artilects is that their complexities will be so great that their attitudes and behaviors towards human beings will be unpredictable, and hence potentially dangerous.

3. Underline the version that is true for you, then give reasons for your standpoint.

I am more of a Terran/Cosmist because ____________________________________________

________________________________________________________________________________

________________________________________________________________________________

4. Discuss the following points.

a) Which values/categories might development of powerful artificial intelligence undermine/upset?

b) Read the following quotation. How might the four “blows” to humanity have affected our self-perception and behaviour on an individual scale and on a group scale?

The scientific revolution has resulted in a number of assaults on man’s egocentric conception of himself. Copernicus showed that our world is not the centre of the universe; Darwin showed that man is part of the same evolutionary stream as animals; and Freud showed that man is not fully the master of his own mind. The emergence of artificial intelligence is yet another challenge to man’s self-concept.

5. Use your own ideas to complete the following sentences.

a) Despite all the scientific progress made so far, ____________________________________
b) Genetic engineering may provide substantial benefits in areas such as biomedicine or food production. However, _________________________________________________________
c) Although AI has not yet become a reality, __________________________________________
d) Some scientific discoveries may lead to exaggerated publicity with unrealistic expectations. For example, _________________________________________________________

SCIENCe AND TECHNOLOGY – LANGUAGE WORK

1. Fill in the missing nouns that usually collocate with the following lists of verbs.

confirm, construct, formulate, prove, rule out, rebut/refute: H_ _ _ _ _ _ _ _ S
conduct, coordinate, undertake: R E _ _ _ _ _ H
produce, yield, discuss, forecast, observe: R E _ _ _ _ _ S (plural)
adopt, employ, favour, pursue: A P _ _ _ _ _ H
raise, dismiss, express, voice: O B_ _ _ _ _ _ _ S (plural)

2. First, complete the sentences with most suitable verbs in the correct form without referring to the box below. Then look at the list of words in the box and make any necessary corrections.

Italian scientists have been _______________ vineyards that are _______________ to classical music. This is the first time anyone has ____________ the effects of music on vines. The scientists have _____________ that sound exposure has some positive effects on vine growth.

In 1973, D. Retallack _______________ a similar experiment. Ms Retallack, who _______________ plants to different sounds and styles of music, watched the plants and ____________ their progress daily. Her results were similar to those ___________ from the experiments performed in the 1940s to ____________ the effects of background music on factory workers.

Establish conduct expose investigate record obtain examine study

3. Think about different inventors and their inventions or branches of science. Which of them
   • had to take huge risks?
   • succeeded against the odds?
   • showed a lot of dedication and stamina?
   • did something (seemingly) pointless?
   • explored new ways of solving current problems?

4. Match neutral expressions with their academic counterparts.

<table>
<thead>
<tr>
<th>basically</th>
<th>almost</th>
<th>only</th>
<th>try</th>
<th>mainly</th>
<th>finally</th>
<th>explain</th>
<th>rough</th>
</tr>
</thead>
<tbody>
<tr>
<td>attempt</td>
<td>ultimately</td>
<td>approximate</td>
<td>primarily</td>
<td>account for</td>
<td>solely</td>
<td>virtually</td>
<td>essentially</td>
</tr>
</tbody>
</table>

5. Put the underlined nouns into plural.

one analysis – a number of ______________
one radius – two _______________
one ______________ - several criteria
one ______________ - three _______________
6. Complete the words with Latin prefixes to make the sentences meaningful. Choose the expressions from the box below.

<table>
<thead>
<tr>
<th>Semi-</th>
<th>auto-</th>
<th>tele-</th>
<th>trans-</th>
<th>retro-</th>
<th>ambi-</th>
<th>proto-</th>
<th>alter-</th>
<th>ampl-</th>
<th>anti-</th>
</tr>
</thead>
</table>

a) In the future, there will be many more ________commuters working for their companies without ever having to leave their homes.
b) Attitudes to robotic intelligence are _______valent; on the one hand, there is fear that non-protein life forms will threaten the planet, on the other, there is hope that man will always stay in control.
c) ______lucent light bulbs give out a dimmer, softer light.
d) Linc, developed in 1961-3, was the first functional __________type of a personal computer.
e) In ________spect, it was the wrong time to start that experiment.

7. Put the verbs in brackets into the correct form. Then discuss the predictions with your partner.

By the end of this century, we (LAND) __________________ a spaceship on Mars.
In a hundred year’s time, we (PRODUCE) ____________ babies outside the womb on a regular basis.
We (NOT BE) _______________ contacted by intelligent life forms from other planets.
By the end of the millennium techniques (BE DEVELOPED) _____________ to redesign human DNA.
The development of computers will continue until they (BE) ______________ more intelligent than humans.

8. Circle the correct preposition in these expressions.

a) no limit of/on
b) a good chance of/from
b) to have in store from/for
c) on/at the expense to/of
d) at/on the turn of/on the centuries
e) at/by far the most
f) keep ahead of/from

9. Complete the sentences with the correct expressions from 8.

(1)____________________, when people began to look back at the past hundred years, few mentioned the video game as being a major player in that period. The boom started with Space Invaders, which was (2)______________________ influential game on the market in the 1970s. This now seems very dated compared with the new 3D games and virtual reality systems on offer. There seems to be (3)_______________ the complexity of the modern video game as the manufacturers battle it out to (4)___________________ each other. The problem is that children spend time on them (5)___________________ other forms of recreation like sport. What is worse, video games are often extremely violent and one wonders what the manufacturers (6)__________________ us next. Fortunately, there is (7)___________________ legislation being introduced in the future.

10. Add or replace prefixes or suffixes to turn the underlined adjectives into their opposites.

consistent results – __________________ predictable consequences - __________________
stressful environment – __________________ audible sound - __________________
similar outcomes – __________________ productive measures - __________________ (2 options!)
11. Look at the following example:

There are different systems of communication in the animal world; each system of communication is distinctive.

a) Rewrite the sentences below. Choose from the following words to replace the underlined expressions.

<table>
<thead>
<tr>
<th>that/those</th>
<th>one/ones</th>
<th>do/does/did</th>
<th>one…the other</th>
<th>the former…the latter</th>
</tr>
</thead>
</table>

a) A. Turing’s idea of defining AI is a fairly simple idea.
b) In simulating intelligent behaviour, the most difficult problems are the problems concerning “common sense” and “general knowledge”.
c) When trying to define intelligence, Turing asked the question: “Will the interrogator in the imitation game decide wrongly as often as he decides when the game is played with a man and a woman, or will he make fewer mistakes? The possibility that he will make fewer mistakes seems more likely at present.
d) Machines depend on humans as much as humans depend on machines.
e) Cybernetics and systems theory study the same problem, the problem of organisation independent of the material in which it is embodied.
f) Each advance in cybernetics was marked by many travels back and forth between machine, man and society; in the 1940’s the first step forward led from the machine to the living organism, transferring from the machine to the living organism the ideas of feedback and finality.
g) There are two kinds of antivirus programs: virus shields and virus scanners. While virus shields detect viruses as they are infecting your PC, virus scanners detect viruses once they have infected the machine.

12. Fill in the most appropriate words.

When ____________ an experiment, you should take into ____________ as many factors as possible, or you may ____________ at a wrong conclusion. Research ____________ that rewards may work in the short ____________ but may have damaging effects in the long ____________ . Aging is an i______________ process, i.e., it cannot be undone. Some ____________ to UV radiation may ____________ vitamin D production, however, excessive UV radiation is ____________ with different types of skin cancer. The shortwave UV radiation ____________ for 95% of the UV radiation that reaches the Earth’s surface. The association brings together researchers from different disciplines to look at problems from a new ____________ . Scientists often pursue their research ____________ of the harm it may cause. According to M. Horkheimer, progress widens the gap between knowledge and moral action, and in this ________ progress is ____________ as a supreme expression of evil.