A1. Making Choices, Diversity and Bioethics

Chapter objectives

Bioethics can be defined as the study of ethical issues and decision-making associated with the use of living organisms.

This chapter is an introduction which aims to show that:

1. Bioethics is not about thinking that we can always find one correct solution to ethical problems. There can be different choices made after ethical reflection.

2. Fundamental ethical principles can aid decision-making.

3. Bioethics is learning how to balance different benefits, risks and duties.

A1.1. Did you make any difficult choices recently?

Society is facing many important dilemmas about the use of science and technology. These decisions affect the environment, human health, society and international policy. In order to resolve these issues and to develop principles for decision making, we need to involve wisdom from many fields such as anthropology, sociology, biology, medicine, religion, psychology, philosophy, environmental sciences and economics. Science and technology occurs in the context of societies that have different philosophical and religious values.

The term bioethics reminds us of the words biology and ethics. New technology can be a catalyst for us to think about life issues. Some examples include environmental pollution, organ transplantation, genetic

engineering, and assisted reproductive technologies. These have stimulated research into bioethics in the last few decades.

We cannot avoid making decisions about these issues due to the rapid development of science and technology as well as the increasing deterioration of our environment. These decisions must be made by everyone regardless of their social or economic status in life. The more possibilities we have, the more decisions we have to make. An extensive education is no guarantee that we can make better decisions. We often do not use what we have learned in textbooks in real life. It is also important to look at how we can find some balance when faced with conflicting ideals.

A1.2. Autonomy

Q1. Look around the class and see something you, and each other person has done to make them look different to other persons? What have you and others done to look the same?

Autonomy is a word that comes from the Greek for "self-rule", and it was first used to apply to the autonomy of city-states nearly 3,000 years ago. Today it is usually applied to individuals. Why would we have self-rule? Let us take an example. It is easy to see that people are different, if we look at our faces, sizes and the clothes that we wear. This is also true of the personal choices that we make. We may decide to play soccer, read a book, or watch television. We may be pressured by people around us to behave in one way, but ultimately it is our choice. There is a duty to let people make their own choices, and also corresponding responsibilities of individuals towards society.

The challenge of respecting people as equal persons with their own set of values is a challenge for us all. Autonomy is also expressed in the language of rights, by recognizing the right of individuals to make choices.

One of the assumptions of modern ethics is that all human beings have equal rights. In 1948 the Universal Declaration on Human Rights was agreed at the United Nations, and following that it has

been used in International Conventions on different expressions of human rights, and in the laws and constitutions of many countries. It states that there are universal human rights, which should be protected, and recognized. We can argue for the foundation of human rights from secular philosophy or religion. This is different from saying everyone is of equal use to the world. The concept of human rights tries to separate human beings from the concept of how useful a person is.

Q2. If you visit a doctor do you make treatment decisions on your own or in discussion with other family members, and the doctor?
Q3. What are the limits to personal choice?
Q4. What factors could we use to make such decisions in our daily lives?
Q5. When we make decisions for ourselves do we also have responsibility for what happens?
Q6. When is the legal age of responsibility in your country?

A1.3. Justice

Our own autonomy is limited by balancing our desires with respect for the autonomy of other individuals in society, and in our world. With every increase in rights comes a proportionate increase in responsibilities (duties to use that right or power in a responsible manner). Those who claim that individual autonomy comes above societal interests need to remember that a major reason for protecting society is that it involves many lives. We should give every member in society equal and fair opportunities in life: this is justice. John Rawl's book *"A Theory of Justice"* proposes that a just world would be organized in a way that people would not be so disadvantaged no matter which position they were born in, socially and genetically.

The ethical principle of social justice and legal justice may be different because legal justice has to define the minimum common

norms to stop the abuse of people. We may be ethically expected to do better than that.

Different people have different goals and can have different values. Diversity is part of what we call being human. We should not expect all people to balance the same values in the same way all the time. Diversity of attitudes and characters of human individuals are represented in any one society. It is a paradox that although not everyone has the same opinion, we are in fact not that different. A failing of human thought is that people view their society as being different from another, with sweeping generalizations. Such thinking is often tied to discrimination.

Future generations are also an essential part of society. People's well-being should be promoted, and their values and choices respected but at the same time, limits must be placed on the pursuit of individual autonomy. This is called intergenerational justice or equity. Different theories of ethics are discussed in other chapters in this book.

Q1. "All human beings have equal rights." Do you agree or disagree with this statement? What is the difference between the theory, the laws on human rights, and the description of the real world?

Q2. What things can you see that your grandchildren might not be able to see in the world when they live?

Q3. What can you do to make the situation in the world better for

others? Now and in the future?

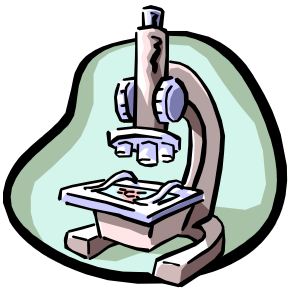
A1.4. Benefits

Many medical and industrial technologies are challenging because they involve technology with both benefits and risks. A fundamental way of reasoning that people have is to balance doing good against a risk of doing harm. Risk assessment and cost-benefit analysis are tools commonly used in environmental science, economics and medicine (see specialized chapters for applications).

Most people believe human beings are spiritual beings, sharing emotions such as love and hate, greed and generosity. One of the philosophical ideas of society is to pursue progress. This is a powerful argument for further research into ways of improving health and agriculture, and living standards. To attempt to do good is called the principle of beneficence.

Benefits may be promoted by those marketing a technology, but there are usually possible risks that there could be a harm. A beneficial technology should be made to overcome a problem in a better way than now. We always have to ask who benefits and who is at risk of harm.

Q1. Think of cases where we need to balance the benefits of some action that restricts the autonomy of persons to make free choices?



Q2. Choose one example of a technological advancement, and in a class group, identify the benefits and risks of this new technology. Have different people say one benefit and one risk, going around the class. How many can you think of? Are the benefits and risks similar for different technologies?

A1.5. Risks and Precaution

The precise outcome of what we do in nature or medicine is not always certain. This uncertainty can be called a risk of failure or chance of success. Ignorance of the consequences should make us act with caution in using new techniques. In our actions we try to minimize or avoid doing harm. Balancing the benefits and risks of scientific technology are not always easy, but a first step is to identify the possible benefits and risks to different people and parts of our world. Many of the things we do today have not been used for many years, like driving cars, taking chemical drugs, or even going to school.

The **precautionary principle** has been defined in various ways, but a working definition suggested by UNESCO is: When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. Morally unacceptable refers to harm to humans or the environment that is threatening to human life or health, or serious and effectively irreversible, or inequitable to present or future generations, or imposed without adequate consideration

of the human rights of those affected. The judgment of plausibility should be grounded in scientific analysis. Analysis should be ongoing so that chosen actions are subject to review. Uncertainty may apply to, but need not be limited to, casuality or the bounds of the possible harm. Actions are interventions that are undertaken before harm occurs that seek to avoid or diminish the harm. Actions should be chosen that are proportional to the seriousness of the potential harm, with consideration of their positive and negative consequences, and with an assessment of the moral implications of both action and inaction. The choice of action should be the result of a participatory process.

There is a risk of harm from not using new technology also, if we do nothing new and just continue the current ways. A failure to attempt to do good is a form of doing harm.

Q1. Can you think of any technology that you think is to risky to be used now? If you can, think about the current technologies we use in that area for that goal? Looking back, do you think the current technology causes harms also? How can we assess technology?

A2. Ethics in History and Love of Life

Chapter objectives

This chapter aims to show that:

1. Concepts of bioethics can be seen in literature, art, music, culture, philosophy, and religion, through history.

2. Bioethics includes both medical ethics and environmental ethics, and problems of different scales.

3. There are various theories of ethics, and respect or love of life is a common thread between them.

A2.1. Definitions of Ethics and Morals

In this chapter the word ethics is used, although some writers may use the term morals.

Definitions adapted from UNESCO/IUBS/Eubios Bioethics Dictionary

Ethics is a system of moral principles or standards governing conduct.

1. a system of principles by which human actions and proposals may be judged good or bad, right or wrong;
2. A set of rules or a standard governing the conduct of a particular class of

human action or profession;
3. Any set of moral principles or values recognized by a particular religion, belief or philosophy;
4. The principles of right conduct of an individual. Ethical behavior requires the ability to reason, to understand the consequences and to make choices about one's actions. [Latin *ethicus* or Greek *ethikos* pertaining to "ethos" or character].

Traditional ethics was divided into substantive ethics or meta ethics. Substantive ethics deals with "what are the rules?" and includes the utilitarian and Kantianism concepts, often both agree on practical applications. In Kantianism actions must subscribe other people as "ends in themselves" and not as means to the ends of others, or for self-gratification. In utilitarianism actions are assessed on the basis of their anticipated consequences (good actions maximize happiness or minimize unhappiness).

Moral

1. of or concerned with the judgment of the goodness or badness of human actions and character; that is, pertaining to the discernment of good and evil 2. the lesson or principle contained in or taught by a fable, story, or event 3. rules or habits of conduct, especially sexual, with reference to standards of right and wrong.

Moral philosophy is designed to teach goodness or correctness of character and behavior; that is, instructive of what is good and bad according to an established code of behavior.

Morality is the generally accepted standards of right and wrong conduct.

A2.2. Theories of Ethics

One distinction between theories of ethics through history is whether they focus on the **action**, the **consequences**, or the **motives**. Action based theories may also be **deontological** theories, which examine the concepts of rights and duties. Whereas consequence-based theories are **teleological** ones, which are based on effects and consequences. If we use the image of walking along the path of life, a teleologist tries to look where decisions lead, whereas a deontologist follows a planned direction.

When faced with seemingly complex moral choices to analyze these it is necessary to break down ethical dilemmas to manageable problems. For example, if we give a person dying of cancer the drug marijuana to ease the pain, we can focus upon these three aspects, the action of giving the drug (which in most countries is illegal), the consequences that the pain may be eased while using the drug (though there is scientific uncertainty on the effects), or the motive that we want to help. However, we can also focus on any of three aspects with a different view, for example, the action to give a drug that is not fully understood (if any are!), the consequence that others in the room may not like the smell, or the motive to respect the person's choice. The theories below focus on different parts of the total ethical equation needed to approach bioethics. In other words despite the presence of different ethical theories, in reality most of us use a mixture of these when attempting to solve moral dilemmas.

A number of religious based theories of ethics are deontological because they follow religious principles or laws. Despite the scientific world view that is prevalent among academics, sociological research shows that close to 90% of the people in the world find religions to be a much more important source of guidance in life than science. In questions of ethics,

often people refer to religious, or deontological ethical norms and values. Any theory of bioethics that will be applied to peoples of the world must be acceptable to the common trends of major religious thought, and must also be tolerant of differences.

Moral theories which focus on the **act** rather than consequences consider moral rules. There are different types of rules. Instrumental rules are those that prescribe an action believed to contribute to the attainment of a goal, for example, make sure you wash the vegetables well before eating them (so you do not get sick). When it comes to a restaurant however, the restaurant has to follow some instrumental rules prescribed by authority, for example, the toilet should not be in the kitchen. The problem is to decide which rules should be followed, as some rules do not bring benefit to anyone.

Utilitarianism is one consequentialist ethical theory that makes us think about the greatest good (pleasure) for the greatest number, and the least harm (pain) for the least number. However, sometimes it is very difficult to assign values to these pains and pleasures for different people. How do we balance protecting one person's autonomy or interests with protecting everyone else's autonomy or interests?

Q1. Do you think that "the greatest good for the greatest number" can be achieved?

Aristotle in *Nicomachean Ethics* wrote that morality is the pursuit of a "final good" or "supreme good". This may be accepted, but the question remains as to how to define what is the final good? The final good was often interpreted as happiness, which leads us to one of the main teleological theories, utilitarianism. Utilitarianism looks at the consequences of an action, and is based on the work of Jeremy Bentham (1748-1832) and John Stuart Mill (1806-1873). There are historical similarities to other scholars in different cultures, for example what Mo Tzu had taught in China in the 6th century B.C. *"The principle of utility asserts that we ought always to produce the maximal balance of happiness/pleasure over pain, or good over harm, or positive value over disvalue."*

Initially philosophers who followed this way of thinking focused on the value of happiness; however, recently other intrinsic values including friendship, knowledge, health, beauty, autonomy, achievement and success, understanding, enjoyment and deep personal relationships have been included. Utilitarianism may appear cold and calculating, but it has been said by its founders and others to be an expression of brotherly love. Utilitarianism is internally coherent, simple and comprehensive and can resolve dilemmas. We can also argue for the happiness of potential people, thus applying it to questions of human reproduction

However, there are probably no pure consequentialists. If there is little difference in consequences, most people would consider it wrong to break a promise, and would decide based on that commitment. All societies accept some type of property rights, and most do not accept stealing from the rich to give to the poor, even though this would help more people. However, many societies accept differential tax scales, taxing the higher income earners increasingly more. Most people appreciate good motives over bad ones, although the consequences may be the same. Also consequentialist thinking might allow violations of human rights, and could excessively limit autonomy.

Another ethical problem of utilitarianism is that the interests of the majority outweigh the interests of a minority, because utility should be maximized. In this way it is consistent with democracy, and the system of referendums to decide public policy and law. Making most people happy most of the time is more important, even though a few persons or organisms may be unhappy. However, to make people happy is one of the central goals of love.

Virtue ethics mean that the moral decision is judged by the intentions of the person, for example, the intention of jumping in the river to save the drowning person was a good intention. Unfortunately both persons died would be a consequence of that. Another consequence could be both are saved, or the attempt did not work.

Confucius (c.551-479 BCE) was a philosopher of ancient China. The teachings of Confucius were recorded by his students, especially in the book known as Lun Yu (or in English: *Analects*). Confucius stressed the importance of acquiring virtue and acting according to proper moral behavior. His teaching places special emphasis on the importance of family, and on filial obligations towards parents. The father-son relationships is one of the Five Relationships. The five relationships are: relationship between a father and son, ruler and minister, husband and wife, elder brother and younger brother, friend and friend. This framework defined by Confucius had profound impact upon the countries and cultures of East Asia.

Buddha is the title of Gautama Shakyamuni, born in Nepal, approx 6th century BCE. Gautama was born to a wealthy family, and at first his parents shielded him from the unpleasantness of the outside world. However, eventually Gautama was faced with real-life examples of sickness, poverty, old age and suffering. These things troubled him, and he set out to examine the problem of suffering in the world and how to eliminate it. A key point in

his teaching is that if an individual is unable to break free from the cycle of suffering in this lifetime, that individual is reborn to continue the quest for the release from suffering (Karma). Buddha's teachings focus on the problem of suffering, its causes, and ways to reduce and elminate it. In a more general sense, the term "buddha" is applied to other individuals who have managed to achieve the release from the cycle of suffering. The two major branches of Buddhism are Theravada (school of the Elders) and Mahayana (lit. "Great Vehicle"). Buddhist ethics is very influential in East Asia. There are useful texts on ethics or morals such as the ten commandments of Judaism, five pillars of Islam and Buddha's Eight-fold path to wisdom. For more examples of philosophy, Western and Eastern religions please see general introductions to Ethics and Religion.

An alternative theory of ethics is based on obligations and is shaped from the work of Immanuel Kant (1724-1804). Although he wrote from a Christian background, like utilitarianism, it uses secular arguments which are widely applicable. Kant argued in the *Critique of Practical Reason* that morality is grounded in pure reason, not in tradition, intuition, conscience, emotion or attitudes such as sympathy. We could see this as following the tradition of Francis Bacon, in *Of Love*, where he wrote “It is impossible to love and be wise”. Kant regarded human beings as creatures with rational powers to resist desire, the freedom to resist desire, and the capacity to act by rational considerations. He said we must act for the sake of obligation and made categorical imperatives, one being “I ought never to act except in such a way that I can also will that my maxim become a universal law”. In general, Kant has a problem with conflicting obligations, for example, between two promises if both are absolute.

Another famous imperative of Kant is "One must act to treat every person as an end and never as a means only", was also re-worded with love. In Doctrine of Virtue he restricts respect to a refusal to abase any other

person as a mere means to my ends, and construes love as making another's ends my own. However, if someone agrees to do something for someone else, as in work, it is ethically acceptable if the person is treated with respect. Kant considered beneficence more rational than love, and in *Foundations of the Metaphysics of Morals*, he wrote, "...love as an inclination cannot be commanded. But beneficence from duty, also when no inclinations impels it and even when it is opposed by a natural and unconquerable aversion, is practical love, not pathological love; it resides in the will and not in the propensities of feeling, in principles of action and not in tender sympathy; and it alone can be commanded".

Q2. Have you read any of the classic books on ethics? For example, J.S. Mill's book "Utilitarianism is only 16 pages long! We can actually read some books on ethics from Greece or China for example, written 2,500 years ago. Why do you think these writings survived so long?

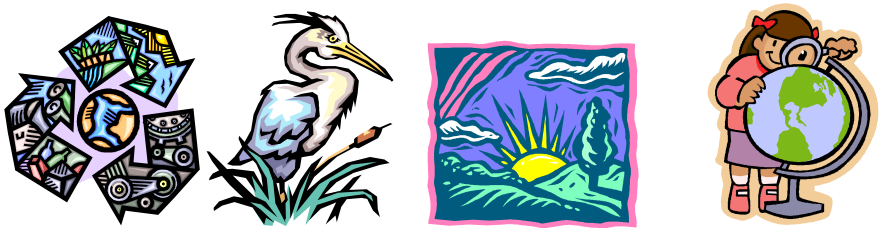
A2.3. Global and Local Ethics

A popular phrase in the environmental movement is "Think Globally, Act Locally". There are large and small issues that we can apply ethical analysis to. We can think of problems that involve a single person. We can think of global problems. One example is the depletion of the ozone layer. This results in increased UV radiation which affects all living organisms. This problem could be solved by individual action to stop using ozone-depleting chemicals, if alternatives are available to consumers. However, global action was needed in order to control the problem, and still is. The Montreal Protocol, an international convention to stop the production of many ozone-depleting chemicals is one of the examples of applying universal environmental ethics.

Another problem is greenhouse warming, which results mainly from energy use. Although we can urge governments and industries to make better policies to reduce greenhouse gas emission, this problem can only be solved by individual action to reduce energy use. We could do this by consuming less, turning off lights, building more energy efficient buildings and shutting doors. These are all simple actions that everyone must do if we are concerned about the future of our planet. At present, energy consumption could be reduced by 50-80% through lifestyle change. New technology may help, but lifestyle change can have a more immediate effect. Global citizens should be conscious about how they use resources.

Sometimes if we perform some action, we will find it easier to perform another. There is the idea of a slippery slope. This expression envisages a slope where once footing is lost it cannot be regained. While we may not do any direct harm with the application we have now, once we accept doing one thing and drawing a line from another, later on we may find

an inability to draw a line. Considering the boundary between treating short persons to become average height and making people tall to play basketball easier.



A2.4. Historical theories of bioethics

Bioethics is both a word and a concept. The word comes to us only from 1970 when first used in English by Van R. Potter in a book called *Bioethics: A Bridge to the Future*, yet the concept comes from a human heritage thousands of years old. This heritage can be seen in all cultures and religions, and in ancient writings from around the world. We in fact cannot trace the origin of bioethics back to their beginning, as the relationships between human beings within their society, within the biological community, and with nature and God, are formed at an earlier stage than our history can tell us.

There are at least three ways to view bioethics:

1. **Descriptive bioethics** is observations and descriptive interpretations of the way people view life, their moral interactions and responsibilities with living organisms in their life.
2. **Prescriptive bioethics** is to inform or try to tell others what is ethically good or bad, and what principles are most important in making such decisions. It may also be to say that someone or something has rights, and that others have duties to them.
3. **Interactive bioethics** is discussion and debate about 1 and 2 above between people, groups within society, and communities.

Developing and clarifying prescriptive bioethics allows us to make better choices, and choices that we can live with, improving our life and society. The choices that need to be made in the modern biotechnological and genetic age are many, extending from before conception to after death - all of life. The timing of reproduction, contraception, and marriage choice are not new. Euthanasia, a good death, is also an old choice, forced upon us by our mortality.

In order to inform our prescriptive bioethics we need to describe the bioethics that people have been following, and the bioethic that they have today, i.e. to have *Bioethics for the People by the People*.

We can find various definitions of bioethics. The simplest being consideration of the ethical issues raised by questions involving life ("bio"). We could include all issues of environmental ethics and medical ethics, as well as questions I face each day, like "What food should I eat?", "How is the food grown?", "Where should I live and how much disturbance of nature should I make?", "What relationships should I have with fellow organisms including human beings?", "How do I balance the quality of my life with development of love of my life, other's lives and the community?", and so many more you can think of. The history of bioethical reasoning is influenced by both our genes, and the environmental and social forces that shaped and continue to shape these genes into the people, society and

cultures that we have. We now have the power to change not only our own genes, but the genes of every organism, and the power to remodel whole ecosystems of the planet, which has made many focus on biotechnology applications; however, the key questions are more basic. We have been destroying ecosystems with some technologies. New technology has nevertheless been a catalyst for our thinking about bioethics, which have been stimuli for research into bioethics in the last few decades. In the past many of these questions would be simply called ethics, but in popular debates today the term bioethics is broad.

A2.5. Love and ethics

The "love of life" is the simplest and most all encompassing definition of bioethics, and it is universal among all peoples of the world. Love is the biological heritage given to us by our genes, the capacity that evolved in us to allow us to overcome selfishness that destroys harmony within a community. Our social heritage also gives us love, as the society tries to pursue harmony between individuals and communities. Love is the message of our spiritual heritage, across each culture they say God is love. Ethics is the concept of love, balancing benefits and risks of choices and decisions.

The balancing of principles, self-love (related to the principle of self-rule, autonomy), love of others (justice), loving life (do no harm) and loving good (beneficence) can provide us with a vehicle to express our values according to the desire to love life. However, in the end, we are left with a simple fact of life, there are often no clear black and white answers to our dilemmas. Rarely can most real life situations be seen in simple balck and white. As a society we need to understand the diversity which is universal, and tolerate with love what we can. There comes a time for protection of others, but we can remember the spirit of love which says do not judge.

Empedocles (who lived in Sicily, 5th century B.C.) assumed that in nature there are positive forces which he called, Love and Hate, or Harmony

and Discord. These forces are what cause the four elements (earth, air, fire and water) to intermingle and later to separate. Love causes the elements to be attracted to each other and to built up in some particular form or person. The 1997 movie *The Fifth Element*, took up this theme, with the fifth and essential element to the universe being love. Empedocles considered that love was a governing principle which held things in unity.

There have been more books written about the subject of love than any other subject. A selection of quotations about love is presented in the appendix below, suggesting that love of others as a principle of ethics in literature is universal in scope.

Appendix: Quotations on Love

Confucius, *Analects* (China, 6th Century B.C.)
To love a thing means wanting it to live.
Can there be a love which does not make demands on those who are the objects of love?

Erich Fromm, *The Art of Loving* (Germany, 1956)
If I truly love one person I love all persons, I love the world, I love life. If I can say to somebody else, 'I love you', I must be able to say 'I love in you everybody, I love through you the world, I love in you also myself'.

Mo Tzu (China, 6th Century B.C.)
It should be replaced by the way of universal love and mutual benefit...It is to regard other people's countries as one's own. Regard other people's families as one's own. Regard other people's person as one's own. Consequently, when feudal lords love one another, they will not fight in the fields. When heads of families love one another, they will not usurp one another. When individuals love one another, they will not injure one another. When ruler and minister love each other, they will be kind and loyal. When father and son love each other, they will be affectionate and filial. When brothers love one each other, they will be peaceful and harmonious. When all

people in the world love one another, the strong will not overcome the weak, the many will not oppress the few, the rich will not insult the poor, the honoured will not despise the humble, and the cunning will not deceive the ignorant. Because of universal love, all the calamities, usurpations, hatred, and animosity in the world will be prevented from arising.

Mahatma Gandhi (India, 1927)
Love is the strongest force the world possesses and yet it is the humblest imaginable. The more efficient a force is, the more silent and subtle it is. Love is the subtlest force in the world.
...To see the universal and all-pervading Spirit of Truth face to face one must be able to love the meanest of creation as oneself.
...The path of self-purification is hard and steep. To attain to perfect purity one has to become absolutely passion-free in thought, speech and action; to rise above the opposing currents of love and hatred, attachment and revulsion.

Pierre Teilhard de Chardin, *The Phenomenon of Man* (France, 1959)
Love alone is capable of uniting living beings in such a way as to complete and fulfill them, for it alone takes them and joins them by what is deepest in themselves.

Lao Tsu, Tao Te Ching (China, 6th century B.C.)
Here the source of a man's strength lies not in himself but in his relation to other people. No matter how close to them he may be, if his center of gravity depends on them, he is inevitably tossed to and fro between joy and sorrow. Rejoicing to high heaven, then sad unto death - this is the fate of those who depend upon an inner accord with other persons whom they love. Here we have only the statement of the law that this is so. Whether this condition is felt to be an affliction or the supreme happiness of love, is left to the subjective verdict of the person concerned.

Charles Darwin, *The Descent of Man* (England, 1875)
It is certain that associated animals have a feeling of love for each other,

which is not felt by non-social adult animals. How far in most cases they actually sympathize in the pains and pleasures of others, is more doubtful, especially with respect to pleasures.

John Stuart Mill, *Utilitarianism* (England, 1861)
In the golden rule of Jesus of Nazareth, we read the complete spirit of the ethics of utility. To do as you would be done by, and to love your neighbour as yourself, constitute the ideal perfection of utilitarian morality.

R.M. Hare, *Utilitarianism in Childress* (England, 1981)
Utilitarianism is the extension into philosophy of the Christian doctrine of agape.

Confucius, *Analects* (China, 6th Century B.C.)
62. Zigong asked: "Is there a single word such that one could practice it throughout one's life?" The Master said "Reciprocity perhaps? Do not inflict on others what you yourself would not wish done to you?"
5.11. Tzu-kung said, "What I do not want others to do to me, I do not want to do to them." Confucius said, "Ah Tz'u! That is beyond you".

Hillel, *The Babylonian Talmud* (Seder Mo'ed) (Persia, 30 A.D.)
What is hateful to you, do not to your neighbour that is the whole Torah, while the rest is the commentary thereof; go and learn it.

Jesus Christ, *Gospel according to St. John 15: 12-13* (Palestine, c. 27 A.D.)
My commandment is this: love one another, just as I love you. The greatest love a person can have for his friends is to give his life for them.

Martin Luther King, Jr. (USA, 1961)
Agape is more than romantic love, agape is more than friendship. Agape is understanding, creative, redemptive, good will to all men. It is an overflowing love which seeks nothing in return. Theologians would say that it is the love of God operating in the human heart. So that when one rises

to love on this level, he loves men not because he likes them, not because their ways appeal to him, but he loves every man because God loves him. And he rises to the point of loving the person who does an evil deed while hating the deed that the person does. I think this is what Jesus meant when he said "love your enemies". I'm very happy that he didn't say like your enemies, because it is pretty difficult to like some people. Like is sentimental and it is pretty difficult to like someone bombing your home; it is pretty difficult to like somebody threatening your children; it is difficult to like congressman who spend all of their time trying to defeat civil rights. But Jesus says love them, and love is greater than like.

Soren Kierkegaard, *Works of Love* (Denmark, 1847)
Erotic love is determined by the object; friendship is determined by the object; only love to one's neighbour is determined by love. Since one's neighbour is every man, unconditionally every man, all distinctions are indeed removed from the object.
The category neighbour is just like the category human being. Everyone of us is a human being and at the same time the heterogeneous individual which he is by particularity; but being a human being is the fundamental qualification.

Boethus, *The Consolation of Philosophy* 3 (Rome, 524 A.D.)
Who would give a law to lovers? Love is unto itself a higher law.

Plautus, *Curculio* (Rome, 2nd century B.C.)
Find me a rational lover and I'll give you his weight in gold.

Fyodor Dostoyevsky, *Notes from Underground* 2.4. (Russia, 1864)
With love one can live even without happiness.
Virgil, *Eclogues* III (Italy, 37 B.C.)
Love conquers all.

Victor Hugo, *Les Miserables* (France, 1862)
The supreme happiness of life is the conviction that we are loved.

Erich Fromm, *The Sane Society* (Germany, 1955)
Erotic love begins with separateness, and ends in oneness. Motherly love begins with oneness, and leads to separateness.

Aristotle, *Nicomachean Ethics* (Greece, 4th century B.C.)
Those who love because of utility love because of what is good for themselves, and those who love because of pleasure do so because of what is pleasant to themselves, and not in so far as the person is the man he is, but in so far as he is useful or pleasant. And thus these friendships are only incidental; for it is not as being the man he is that the loved person is loved, but as providing some good or pleasure. (VIII, 3.1156a14-19)
Perfect friendship is the friendship of men who are good, and alike in virtue; for these wish well alike to each other qua good, and they are good in themselves. Now those who wish well to their friends for their sake are most truly friends; for they are so disposed by reason of the friends themselves, and not incidentally. (1156b7-11)

Leo Tolstoy, *Anna Karenina* (Russia, 1873-6)
If so many men, so many minds, certainly so many hearts, so many kinds of love.

Maharishi (India, 1970)
All love is directed to the self...The purpose of love is the expansion of the self.

Euripides, *Alcestis* (Greece, 5th century B.C.)
You love your life; but then, so do all men!

St. Paul, *Paul's First Letter to the Corinthians 13:1, 4-7* (Turkey, 53 A.D.)
I may be able to speak the languages of men and even of angels, but if I have no love, my speech is no more than a noisy gong or a clanging bell. (1) Love is patient and kind; it is not jealous or conceited or proud; love is not ill-mannered or selfish or irritable; love does not keep a record of wrongs;

love is not happy with evil, but is happy with the truth. Love never gives us; and its faith, hope and patience never fail. (4-7)

Paul Tillich, *The Eternal Now* (USA, 1963)
One cannot be strong without love. For love is not an irrelevant emotion; it is the blood of life, the power of reunion of the separated.

Sophocles, *Oedipus at Colonus* (Greece, 401 B.C.)
One word frees us of all the weight and pain of life: That word is love.

St. John, *First Letter of St. John 4: 7-8, 12* (Palestine, 1st century A.D.)
Dear friends, let us love one another, because love comes from God. Whoever loves is a child of God and knows God. Whoever does not love does not know God, for God is love. (7-8)
No one has ever seen God, but if we love one another, God lives in union with us, and his love is made perfect in us. (12)

Dalai Lama XIV, *The Power of Compassion* (Tibet, 1995)
The basic aim of my explanation is to show that by nature we are compassionate, that compassion is something very necessary and something which we can develop. It is important to know the exact meaning of compassion. Different philosophies and traditions have different interpretations of the meaning of love and compassion. Some of my Christian friends believe that love cannot develop without God's grace; in other words, to develop love and compassion is based on a clear acceptance or recognition that others, like oneself, want happiness and have the right to overcome suffering. On that basis one develops some kind of concern about the welfare of others, irrespective of one's attitude to oneself. That is compassion.

Moses Maimonides, *Prayer of a Physician* (Palestine, 11th century)
Endow me with strength of heart and mind so that both may be ever ready to serve the rich and the poor, the good and the wicked, friend and enemy.

Jean-Paul Satre, *The Words* (France, 1964)
When we love animals and children too much, we love them at the expense of men.

Han Yu (China, 8th century, A.D.)
Universal love is called humanity. To practice this in the proper manner is called righteousness. To proceed according to these is called the Way. To be sufficient in oneself without depending on anything outside is called virtue. Humanity and righteousness are definite values, whereas the Way and virtue have no substance in themselves.

Saint Augustine, *On the Trinity* VII, x, 14 (Numidia, 400-416)
Love ... is a certain life which couples or seeks to couple together some two things, namely him that loves and that which is beloved.

J.C.F. von Schiller, *Phantasie an Laura* (Germany, 18th century)
Love guides the stars towards each other, the world plan endures only through love.

Saint Jerome, *Letter to Eustochius* (Palestine, 4th century)
It is hard for the human soul not to love something, and our mind must of necessity be drawn to some kind of affection.

Thomas Aquinas, *Commentary on Divine Names* (Italy, 13th century)
A thing is said to be loved, when the desire of the lover regards it as his good. The attitude of disposing of the appetite to anything so as to make it its good is called love. We love each thing inasmuch as it is our good.

Dante Alighieri, *Purgatorio* (Italy, 13th century)
Neither Creator nor creature, my son, was ever without natural or rational love.

Joseph Fletcher, *Situation Ethics* (USA, 1966)
Love is freedom to put human need before anything else.

The Beatles, *The End* (England, 1969)
And in the end, the love you make is equal to the love you take.

Sting, Police (England, 1979)
Love can mend your life but it can break your heart.

Stevie Wonder, *Heaven is 10 zillion light years ago* (USA, 1980s)
Why can't the light of Godshine love in every soul?

Buddha, *Gradual Sayings* A.iii.443 (India, 6-4th century B.C.)
(A description of six praiseworthy results that inspire a monk to develop the perception of suffering with regard to all conditioned phenomena):
1. the perception of nirvana will become established among all conditioned phenomena,
2. the mind will turn away from all realms,
3. the monk will see the peace which is nirvana,
4. inherent tendencies [to defilements and rebirth] will be destroyed,
5. the monk will have completed his tasks, and
6. the monk will have served the teacher with acts of love.

Friedrich Nietzsche, *Thus Spoke Zarathustra* (Germany, 1883-92)
We love life, not because we are used to living but because we are used to loving.

Possible student activities

Activity 1: Discuss these questions on values, and reflect upon where values come from.

What are values? What are your personal values?
Why do you value them? What are the values in your society?
How do you make choices? Are your choices based on your values?
What values would be useful in society?

Activity 2: Define each of the following words:

Science and Technology Assisted Reproductive Technologies
Decision making Deterioration
Morality Organ Transplantation
Conflicting Ideals Genetic Engineering

Activity 3. Define each of the following terms:

Ethics	Global Problems	
Depletion		
Ozone Layer	UV radiation	
Individual action		
Energy Efficient	Energy Consumption	
Lifestyle Change		
Ozone-Depleting Chemicals	International Convention	
Universal		
Environmental Ethics	Greenhouse warming	Ban

Activity 4: Try to make a poster in a small group.

1. *Make a poster suggesting ways we can save energy.*
2. *Write a letter to your local newspaper expressing your concern about:*
   - *A. depletion of the ozone layer*
   - *B. greenhouse warming*
3. *Write an argumentative essay on lifestyle change. Are you willing to make a lifestyle change or not? Defend your point-of view.*

A3. Moral Agents

Chapter objectives

This chapter aims to explain what a moral agent is, and why it is important to decide what is a moral agent. It also compares the characteristics and changes in the genomes of humans and chimpanzees.

A3.1. Differences between individuals

All people are members of Homo sapiens, one of the millions of species alive on Earth. There is a long history of coexistence of different species together on the earth, in a variety of ecological systems. When it comes to moral issues, fundamentally we should ask whether humans are a special form of life. Are humans different from other living creatures? By comparing humans with other species, we may be able to understand both the differences and similarities between living organisms.

Q1. Do you think you have a responsibility towards animals? Plants? Bacteria? Fungi? Rocks? What does responsibility mean?

A3.2. Capacity to feel pain

In most people's minds there are some differences between animals and plants. One significant difference between some animals and plants is the capacity to feel pain as we know it. Beyond the motivations behind what we are doing, another important criteria we use in judging the use of animals is avoiding the infliction of **pain.**

Pain is more than simple sensation of the environment. While plants do send ionic potential signals in response to harm, similar in some ways to action potentials in animal nerves, the difference is in the processing of those signals to become the perception of pain. Some distinguish pain from "suffering", but they are both departures from the ideal of avoiding harm. Suffering can be defined as prolonged pain of a certain intensity, and it is claimed that no individual can suffer who is incapable of experiencing pain. The capacity for suffering and/or enjoyment has been described as a prerequisite for having any moral interests.

Judging pain is subjective, and there are parallels in the way animals and humans respond. Many of the neurotransmitters are similar between higher animals and humans. It is possible that animals do have a different quality of "pain", as the frontal region of the cerebral cortex of humans is thought to be involved in feelings of anxiety, apprehension, suffering and other components of pain. This region is much smaller in animals, and if surgically treated in humans it can make them indifferent to pain. There are differences seen in the types of pain receptors; some respond to mechanical stimuli, some to noxious or irritant chemicals, and some to severe cold or heat.

Q2. What animals feel pain (are sentient)?

Q3. Is pain always bad? Is causing pain bad

Q4. Do different people feel the same amount of pain?

Q5. If we anesthetise a mouse so it does not feel pain, do you think we can do whatever we like to that mouse? What are some of the other factors that are important in deciding how we think it is ethical to treat animals?

A3.3. Can animals think?

It is accepted that humans possess unique moral wills, and most want to exercise choice and their autonomy. People have been conducting psychological experiments and observing animal behaviour in attempts to answer whether animals also have some capacity for free moral judgment. Based on animal research, it has been discovered that some animals are clearly self-aware such as higher apes, and some whales and dolphins.

Chimpanzees have been taught to communicate in human languages, for example sign language or computer symbols. Some mothers also taught their babies how to "talk" to humans. This has given us a new way of looking at other species. Behaviour is determined by genes, environment, and moral choices.

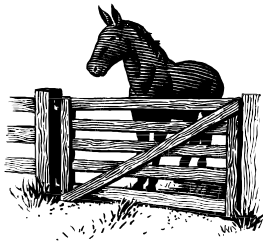
In 1993 a book called "**The Great Ape Project**" <http://www.greatapeproject.org/> was published calling for equal rights for chimpanzees, gorillas, and orangutans with human beings (who are also a higher primate species). It is claimed that these four species of higher

primates form a more natural group to confer ethical duties on, rather than humans as the only species having rights.

Q6. Discuss the Great Ape Project in class. Can you think of any reasons to think that we have more duties to human beings than other primates?

Q7. In almost all societies a moral rule is we do not eat humans. What about for other species?

Q8. Do you think we should eat whales? How much do you think dolphins and whales can think? How does intelligence depend on the environment?



A3.4. Genome Comparison of Chimps and Humans

We can compare the genetic differences between human beings and other animals. Our closest genetic relation is the chimpanzee followed by the gorilla. Also, the origins of our selfish and altruistic behaviour are fundamental to how we behave, and these behaviours are seen among all living organisms to different degrees.

On 1 September, 2005, the first comprehensive comparison of the genetic blueprints of humans (*Homo sapiens*) and chimpanzees (*Pan troglodytes*) showed that our closest living relatives share perfect identity with 96 percent of our DNA sequence, was reported by an international research consortium (the Chimpanzee Sequencing and Analysis Consortium) in the journal *Nature*. The chimp sequence draft represents the first non-human primate genome and the fourth mammalian genome described in a major scientific publication. A draft of the human genome sequence was published in February 2001, a draft of the mouse genome sequence was published in December 2002 and a draft of the rat sequence was published in March 2004. The essentially complete human sequence was published in October 2004.

"As our closest living evolutionary relatives, chimpanzees are especially suited to teach us about ourselves," said the study's senior author, Robert Waterston, M.D., Ph.D., chair of the Department of Genome Sciences of the University of Washington School of Medicine in Seattle. "We still do not have in our hands the answer to a most fundamental question: What makes us human? But this genomic comparison dramatically narrows the search for the key biological differences between the species." The 67 researchers who took part in the Chimp Sequencing and Analysis Consortium share authorship of the *Nature* paper.

The DNA used to sequence the chimp genome came from the blood of a male chimpanzee named Clint at theYerkes National Primate Research Center in Atlanta. Clint died in 2004 from heart failure at the relatively young age of 24 (most chimps live closer to 40-50 years old), but two cell

lines from the primate have been preserved at the Coriell Institute for Medical Research in Camden, N.J.

The consortium found that the chimp and human genomes are very similar and encode very similar proteins. The DNA sequence that can be directly compared between the two genomes is **almost 99 percent identical**. When DNA insertions and deletions are taken into account, humans and chimps still share 96 percent of their sequence. At the protein level, 29 percent of genes code for the same amino sequences in chimps and humans. In fact, the typical human protein has accumulated just one unique change since chimps and humans diverged from a common ancestor about 6 million years ago.

To put this into perspective, the number of genetic differences between humans and chimps is approximately 60 times less than that seen between human and mouse and about 10 times less than between the mouse and rat. On the other hand, the number of genetic differences between a human and a chimp is about 10 times more than between any two humans.

The researchers discovered that a few classes of genes are changing unusually quickly in both humans and chimpanzees compared with other mammals. These classes include genes involved in perception of sound, transmission of nerve signals, production of sperm and cellular transport of electrically charged molecules called ions. Researchers suspect the rapid evolution of these genes may have contributed to the special characteristics of primates, but further studies are needed to explore the possibilities.

The genomic analyses also showed that humans and chimps appear to have accumulated more potentially deleterious mutations in their genomes over the course of evolution than have mice, rats and other rodents. While such mutations can cause diseases that may erode a species' overall fitness, they may have also made primates more adaptable to rapid environmental changes and enabled them to achieve unique evolutionary adaptations, researchers said.

Despite the many similarities found between human and chimp

genomes, the researchers emphasized that important differences exist between the two species. About 35 million DNA base pairs differ between the shared portions of the two genomes, each of which, like most mammalian genomes, contains about 3 billion base pairs. In addition, there are another 5 million sites that differ because of an insertion or deletion in one of the lineages, along with a much smaller number of chromosomal rearrangements. Most of these differences lie in what is believed to be DNA of little or no function. However, as many as 3 million of the differences may lie in crucial protein-coding genes or other functional areas of the genome.

A small number of other genes have undergone even more dramatic changes. More than 50 genes present in the human genome are missing or partially deleted from the chimp genome. The corresponding number of gene deletions in the human genome is not yet precisely known. For genes with known functions, potential implications of these changes can already be discerned.

For example, the researchers found that three key genes involved in inflammation appear to be deleted from a common ancestor of humans and chimps in the chimp genome, possibly explaining some of the known differences between chimps and humans in respect to immune and inflammatory response. On the other hand, humans appear to have lost the function of the *caspase-12* gene, which produces an enzyme that may help protect other animals against Alzheimer's disease.

The researchers found six regions in the human genome that have strong signatures of selective evolutionary changes over the past 250,000 years. One region contains more than 50 genes, while another contains no known genes and lies in an area that scientists refer to as a "gene desert." Intriguingly, this gene desert may contain elements regulating the expression of a nearby protocadherin gene, which has been implicated in patterning of the nervous system. A seventh region with moderately strong signals contains the *FOXP2* and *CFTR* genes. *FOXP2* has been implicated in the acquisition of speech in humans. *CFTR*, which codes for a protein involved in ion transport and, if mutated, can cause the fatal disease cystic fibrosis, is

thought to be the target of positive genetic selection in European populations (i.e. it was favoured because if you have only one copy of the mutated allele you have resistance to certain infectious diseases).

The chimp and human genome sequences, along with those of a wide range of other organisms such as mouse, honey bee, roundworm and yeast, can be accessed through the following public genome browsers on the Internet: (GenBank) at NIH's National Center for Biotechnology Information (NCBI); the UCSC Genome Browser (www.genome.ucsc.edu) at the University of California at Santa Cruz; the Ensembl Genome Browser (www.ensembl.org) at the Wellcome Trust Sanger Institute and the EMBL-European Bioinformatics Institute; the DNA Data Bank of Japan (www.ddbj.nig.ac.jp); and EMBL-Bank (www.ebi.ac.uk/embl/index.html) at the European Molecular Biology Laboratory's Nucleotide Sequence Database.

Q9. Does it change your opinion of chimpanzees to know there are less than 100 genes different between them and humans?

Q10. How much do you think behaviour is genetically, socially and/or environmentally influenced, and how can we study this?

A4. Ethical Limits of Animal Use

Chapter objectives

There is a long history of special relationships between other animals and humans, for example, the use of animals in farming or as domestic companions. Uses of animals in factory farming and scientific experiments has stimulated interest in whether animals have particular rights.

This chapter aims to show:

1) the factors that people use to claim that animals have rights.

2) the ways society regulates the use of animals;

3) sources of the intrinsic and extrinsic value of living organisms.

A4.1. What are animal rights?

Animals are used in many ways by people. Do animals have a right to live without pain caused by people? Do they have a right to live free? If animals have rights then human beings have corresponding duties towards them. While we would all agree that we have some duties to animals, there is

disagreement about just how many and what kind of duties we have. We come across these issues every day when we eat meat, play with our pets, or use products made from, or tested by, animals.

Animals which feel pain are called sentient animals. In practice one important criteria we use in judging the use of animals is how much pain is caused. Let us consider some of the factors that people use to discuss animal rights.

Q1. Can you think of the ways animals are used in society? What are some examples of cruelty to animals we see in society?

A4.2. Intrinsic and extrinsic ethical factors for ethical use of animals

We can think of ethical factors within an organism itself (intrinsic factors), and others that are external to it (external factors). A summary of some factors for judging animal use is in the table below. We can see there is value in something being alive when we observe the way most people protect life. Various qualities in animals increase their ethical status, including the capacity to feel pain, self-awareness, being conscious of others, and an ability to plan for the future.

Intrinsic Ethical Factors	**Extrinsic Ethical Factors**
- Pain - Self-awareness - Conscious of others - Ability to plan for the future - Value of being alive	- Human Necessity / Desire - Human sensitivity to animal suffering - Brutality in Humans - Effect on other animals - Religious status of animals - What is natural

Many extrinsic factors are important in deciding whether it is ethical to use animals or not. Destruction of nature and life by humans is caused by two human motives - **necessity** (needs) and **desire** (wants). It is more ethically acceptable to cause harm if there is some necessity for survival than if there's simply desire for more pleasure.

If we are going to harm life, a departure from the **ideal of doing no harm**, or love of life, it should be for a very good reason. Such a reason might be survival, and we can see this as natural - all organisms consume and compete with others. Plants compete with each other for space to grow, animals eat plants or other animals, bacteria and fungi also compete for resources and space - sometimes killing other organisms, at other times competing without killing, and also cooperating in mutual symbiosis (see section B1.3). This distinction is required ever more as human desire continues to destroy the environment of the planet, including many endangered animal species, and even whole ecosystems.

Other extrinsic factors that are important include human sensitivity to suffering, or the effects of upsetting other animals. Being cruel to animals may also lead to brutality towards people. There is debate over what is the natural way to treat animals, as it changes between culture.

Certain religions give special status to some animals, for example, Hindu religion gives cows a high status so that few Hindu persons will kill cows for food. This also means that in India animals are not used in school

experiments. There is a trend in all countries for less use of animals in schools for teaching, and experimentation.

Q2. Do you agree or disagree that it is sometimes necessary to harm animals so that you can live?

Q3. Do we need to test the safety of cosmetics and personal hygiene products using animals?(Cosmetics are used by both men and women, e.g. deodorants). Have you heard of any shops which claim not to sell cosmetics tested on animals?

Q4. Who decides what is necessity and what is desire? At home? At school? In your country?

A4.3. Animal Experiments

The issue of animal **experiments** has caused more debate than eating animals. It is a little ironic because in most countries the scale of animal use for food is much greater than it is for experimentation, and eating animals is a choice based on desire more than necessity. That desire is supported by long standing cultural traditions and cuisines. However, from a moral point of view, some animal experiments are done with the hope of directly saving human life in medical research. On the other hand, luxury products such as cosmetic testing can be said not to be necessary. In the past decade, there have been less animal experiments conducted, and we can expect more ethical alternatives to continue to be developed using alternative methods for testing product safety. These may also prove cheaper and more efficient. These alternatives include computer models, use of isolated cell culture, and comparisons to already existing data.
Some **factors** used in guidelines to assess whether or not animals should be used in experiments, include:

- Aim of the experiment
- Realistic potential to achieve goals
- Species of animal
- Possible pain
- Duration of discomfort or distress
- Duration of experiment (in terms of lifespan)
- Number of animals
- Quality of animal care
- Available alternatives to the experiment
- Credibility of the researchers

At the practical level, the feeling of pain is the first major guiding principle for animal treatment. There is a debate about self awareness, which would be necessary for animals to express autonomy, and about whether they are capable of thinking, or a certain degree of perception and cognition. These

concerns are one reason why researchers try to choose the animals "lower" on the evolutionary scale for experiments and product testing.

Q5. What are the differences between using an animal killed accidentally and one that was grown and killed especially for an experiment? Do you think we should kill animals for experiments?

Q6. It is a requirement in certain schools to dissect animals in biology class. If you don't think it is ethical to do so, do you think that you can tell your teacher that you don't want to dissect an animal because it goes against your beliefs? Would you dissect an animal just in order to pass a course?

Q7. Discuss what benefits and what you learnt from any animal experiments you may have done in class? Did it change your attitude towards animals? Did it make you more or less sensitive to animals?

Q8. Can you find examples of medical advances in which animal research was essential?

Q9. What is the proper way to look after animals used in experiments? Are there any special treatments given to dead animals in your country? In Japan, a shrine is often made to pay respect to experimental animals, and remembrance services are held annually at many universities. Do you think that cultural practice could work in your country?

A4.4. Eating meat and farming

Some people choose not to eat animals. A vegetarian is a person who does not eat animals. A vegan is one who doesn't eat any animals or animal products (milk, eggs, etc.) or use animal products (e.g. leather). It can have some health advantages to eat less meat to lower the level of saturated fat, especially in middle-aged persons living in countries where people eat too much. Some choose not to eat animals for moral or religious reasons. Eating more plants also has environmental advantages as food and energy is wasted in the transfer from plants to animals. However, except for South Asia, most people today say it is natural for us to eat some meat or fish. Even if we do eat animals we should minimize the harm we cause. Many people will continue to eat animals, and practical ethics must improve the ethical treatment of all animals.

One area of particular concern is whether farm animals should be kept in a field, a caged box, or a **factory farm.** The confinement of animals, such as veal calves, pigs and poultry in small cages has led some countries to set minimum enclosure areas for each animal. It has been illegal to use so-called "battery cages" in Switzerland for chickens since 1992, but concerned countries need to also reduce demand by restricting imports or products from such farms.

Each society has to decide how much more they are prepared to pay for better treatment of animals, such as the costs of eliminating battery farming. Another example is using the protein bovine growth hormone in cows to

make them produce about 10% more milk. Thus there is some cost in production of not using new animal treatments such as bovine growth hormone to produce cheaper milk or meat. It is also important to consider the effects of policies on the different communities involved in agriculture, as well as the rights of consumers and the animals themselves.

Q10. Do you know any vegetarians? Why did they choose not to eat meat?

Q11. What do you know about factory farms? What are the ethical and health advantages and disadvantages of factory farming in different environments? Do you think it is wrong to keep animals in small cages?

Q12. Do you have some animal products in the supermarkets close to you that are priced because of claimed ethical advantages? Do you think organic food (food grown without the use of artificial pesticides, fertilizers or genetic modification) is better for you? What about free range eggs compared to ones made in a battery chicken farm?

Q13. What are some ethical and ecological differences between obtaining food from destruction of natural habitat for the purposes of farming, and the hunting of wild animals in their natural habitat?

A4.5. Zoos

Another ethical question that can be asked is whether we should keep animals in zoos. **Zoos** and wildlife parks have value in preservation of endangered species, and in gaining public support for conservation campaigns. An understanding of life and ecology can make people appreciate animals more. There is a trend for zoos to give animals greater space and freedom which meets more of the natural requirements of animals.

Q14. Do you have local animal parks to visit? Do you think zoos and wildlife parks help to preserve endangered species?

Q15. Should we capture animals for the purpose of keeping them in zoos, and under what conditions would the capture and keeping of animals be ethical?

Q16. Do you think that anyone should be able to do fishing for recreation? What do you think about hunting of animals for fun, such as fox hunting or hunting deer for their antlers as a trophy?

Q17. In a few places where tourism is essential for the money to keep a wildlife park, the park may allow some trophy hunting of wild animals. How would you balance the ethical issues of the individual animals versus the ecosystem-wide issue of the financial survival of the wildlife park? What are some alternatives for financial survival of the park?

Ethics Activity 1. Can you think of intrinsic, and extrinsic ethical factors that could be weighed whether you should use the following animals in biology classes?

a) Dissection of cow eyeball.
b) Frog dissection.
c) Keeping woodlice at school.
d) Catching butterflies to bring to school.
e) Other cases you have used in class.

A5. Ethics and Nanotechnology

Chapter objectives

This chapter aims to:

1. Define nanotechnology.

2. Give an idea of spending on nanotechnology by developed and developing nations.

3. Overview potential effects of nanotechnology on relations between humans & with the environment.

A5.1. Nanoparticles, Nanoscience and Nanotechnology

Recently a tiny technology termed "Nanotechnology" has created a fevered pitch for many scientists and technologists around the world. There is a fantastic long history of advancements in science and technology. Like radio transmitters, computer transistors and genetic modification, nanotechnology has quite astounding potential to revolutionise our way of life on Earth, possibly to a greater extent than any technology which has come before it.

"Nano-" refers to one-billionth – for example, 1 nanometre = 10^{-9} metres, or one-billionth of a metre – the tiny scale of atoms and molecules. A nanoparticle (Figure 1) is a very tiny state of matter which has dimensions in the range less than 100 x 10^{-9} metres, or 100 nanometres. Organic

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molecules with different electrical and mechanical properties and which are amenable to manipulation at this scale are known as fullerenes, named after poet and inventor Buckminster Fuller. Examples include carbon nanotubes and buckminsterfullerene (C_{60}), a soccer ball shaped arrangement of carbon atoms. Nanoscience is the study of phenomena and manipulation of such materials at atomic, molecular, and macromolecular sizes, a scale at which the properties of matter are significantly different. The great physicist Richard Feynman's 1960 talk *"There's Plenty of Room at the Bottom"* was the first to hypothesise that atoms and molecular systems could be potentially manipulated into useful structures and devices.

Nanotechnology is therefore the design, characterization, production and application of structures, devices and systems at the scale of atoms and molecules, by controlling the shape and arrangement of nano-scale configurations dependent upon their technological utility. The term was defined in detail by Eric Drexler in his 1986 philosophical work *"Engines of Creation: The Coming Era of Nanotechnology"*. The concepts and potentials he outlines are truly mind-boggling, including an end to most human labour and the instant manufacture of any materials from computerised input of the component elements.

Q1. Describe the nano scale. Are there tiny particles smaller than nanoparticles?

***Activity**:* Ask the students to look through a clinical microscope at a microscopic slide, then look at the same slide without the use of the microscope. What scales are involved? How and why can we more clearly see the matter on the slide through a microscope than using the naked eye?

A5.2. Funding for Nanotechnology

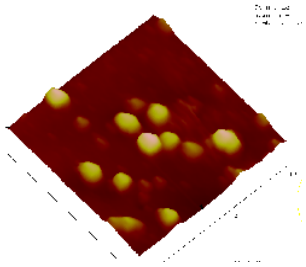
Nanotechnologies are attracting increased investment from governments and industry around the world. Total global spending is thought to be around $6.25 billion at present, but this is set to rise. The USA's 21st century Nanotechnology Research and Development Act (2003) allocated almost $3.7 billion to fund nanotechnologies during 2005-2008. This compares with just $750 million spent in 2003. Between 2001 and 2003, the Japanese Government doubled its nanotechnology funding to $800 million. Within Europe, about $1.25 billion is currently spent on nanotechnology research and development per annum, and the UK has allocated about $81.9 million per year from 2003 to 2009.

Developing countries have also ventured into huge budgeting for nanotechnology research. On one hand it increases their market economy, but the budget of a country should not be at the expense of the poor or the basic needs of common humans. At this juncture in the progress of nanotechnology, there is a need for public awareness and dialogue in each country with development and venture investment into nanotechnologies. The good fruits of science and technology should reach all the people of the world irrespective of caste, creed, class, religion or region. The application of these materials in the industrial, biomedical and environmental fields are yet to be studied in detail, but immediate promise is being shown in field of medical diagnostics and therapeutics (BioNanotechnology). The classic theoretical example is the injection of nanoparticles into the bloodstream to sweep the arteries clear of cholesterol.

The other major development attracting massive research is a branch of the technology known as 'molecular electronics' – the construction of miniature networked computers from arrangements of organic molecules including fullerenes, DNA, pieces of micro-organisms and other microscopic electrochemical analogues of circuits, gears, logic gates, diodes, resistors, switches and transistors. The existence of life and the DNA storage of information imply that the physics and chemistry *can* be made to work if only we could more efficiently manipulate the components. Molecular computers will eliminate the coming bottleneck in the miniaturisation of microchips, but the power of such machines may also remove

some of the existing barriers to the evolution of artificial intelligence. This is a global project with great uncertainties, and may well involve ethical risks to humanity proportional only to the potential benefits.

Figure 1: Nanoparticles can be seen using a scanning probe microscope.



A5.3. Molecular Assemblers

Presently more nanomaterials are synthesized by *'top down'* chemical and physical methods. But Drexler's original vision was of the *'bottom-up'* approach to engineering at the nano scale. He envisaged self-replicating 'molecular assemblers'. Similar to recent attempts at creating artificial life, this approach tries to incorporate biological and evolutionary characteristics such as replication, heredity, learning, adaptation and self-organisation. The potential future engineering of molecular assemblers is great cause for ethical concern, because of the risks of them running out of control by accident or terrorism. The potential applications of nanotechnology to warfare and weapons of mass destruction are discussed in detail in the 'Peace and Peacekeeping' chapter. Endowing technologies with the characteristics of life is inviting them to enter into competition with other forms of life such as ecosystems and human biology. Nanotechnology has been the first technology to ignite fears of an end to *all* carbon-based life on Earth, with the theoretical 'gray goo catastrophe' in which replicating molecular assemblers dismantle all of the carbon molecules they come into contact with to make more and more of themselves in an open-ended chain reaction.

A5.3. Balancing the Ethics of Nanotechnology

As ethicists our concern is to investigate the potential benefits of new

technologies… with the risks and potential consequences. Legitimate concerns have recently been explored, but the precautionary principle must investigate the potential benefits as well as the risks that nanotechnology poses. Benefits for developing countries have not been clearly defined by the developed nations, threatening to derail the development of this field in low-and middle income countries as was the case with genetically modified crops. This consequence can be avoided by increasing public awareness of the risks and benefits of nanotechnology and by encouraging governments in the developing world, in consultation with their people, to balance the risks and benefits of nanotechnology for themselves. It must be remembered however that it is very difficult to unlink scientific discovery from subsequent technological use of that information. Scientists and engineers should be bound by ethical considerations and codes of professional conduct (such as the Hippocratic Oath in medicine) which deter some of the potential negative impacts of their research. Barriers to the development of technology include whether to do the science (research and development stage), whether to publish the information (academic journals and media editors), and the ethics of engineers (design, engineering and production stages).

Some potential benefits:

- Will Nanotechnologies help in developing renewable energy sources?
- Will Nanotechnology reduce hunger in the developing Countries?
- Will Nanotechnology promote good health (free from TB, HIV/AIDS etc.)?
- Will Nanotechnology improve water and sanitation conditions in the world?
- Will Nanotechnology eradicate child labour?

Some potential consequences:

- Are there risks of accidents when dealing with replicating molecular assemblers?
- Will nanotechnology be used in military technologies or terrorist situations?

- Will nanotechnology cause harm to ecological systems?
- Will nanotechnology be harmful when breathed in?
- How will nanotechnology impact human labour markets?

Q2. Are you for or against huge funding for nanotechnology in developing countries? Why?

Q3. Think that you are a nanotechnology researcher. If an ordinary person comes to you and asks about your work will you tell the facts about the technology or will you like to convince him of the advantages of that technology?

Q4. List the major research laboratories and scientists in your country where nanoscience and technology research are in progress.