Pregnancy EXPLAINED

Complete guide to the development of your unborn child

- The miracle of life as it unfolds, stage by stage, in utero
- Detailed account of the first 7 days of your baby's life
- Revealed: how doctors work out your baby's DUE DATE…
  …and why your baby can recognise your favourite TV soap
- Learn when your baby's heart first beats… *you'll be surprised*
  …and when he or she becomes sensitive to pain and light
- Discover why you DON'T have to eat for TWO…
  ….and how much weight you can expect to gain in pregnancy
- Based on the advice of leading medical experts
- Fully referenced 18 page guide…with more than a dozen pictures and anatomical illustrations

PLUS… Glossary of 37 'need-to-know' medical and pregnancy terms DEFINED in *plain* English

Society for the Protection of Unborn Children

Contents

About this Guide

Thank you for taking the trouble to download our guide.

First and foremost we hope it will provide helpful information and reassurance to expectant mothers.

We are aware too that the wealth of information it contains may benefit teachers and students wishing to learn more about the development of the unborn child, or the biological aspects of human reproduction.

You may, of course, fit into neither of the above categories, but simply wish to know more about this fascinating subject area.

Whatever your reasons, we hope you learn something new and helpful, and your appreciation for the beauty, uniqueness and value of human life is enhanced.

And if you like what you see… please don't forget to tell others!

Month # 1

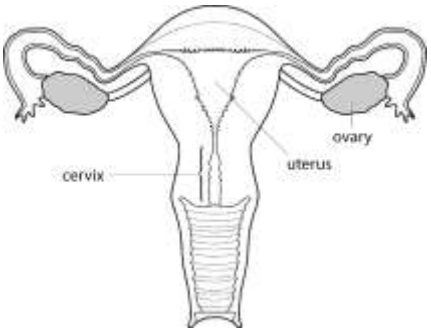
A NEW human life begins when a single cell, formed from the father's sperm and the mother's egg comes into being at Fertilisation.

Conception

And fertilisation normally occurs in the mother's Fallopian (or ovarian) tube, which leads from the uterus (womb) to the ovary.

The uterus is the size and shape of a large pear: it is made of muscle and it stretches to allow the baby's growth throughout the months of pregnancy.

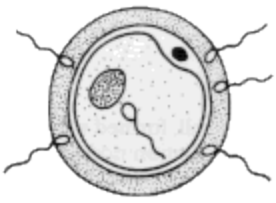
A woman ordinarily has two tubes and two ovaries, one at each side of her uterus.



Every month one of the ovaries in turn releases an egg (ovum) which passes slowly along the tube towards the womb cavity.

If the egg is not fertilised within 12 hours or so of being released, it dies; it cannot develop further.

But if sexual intercourse occurs just before or at the time when an egg has been released from the ovary - then sperm cells may travel up to the Fallopian tube and one may fertilise the egg.


Day 1: Fertilisation.
0.14mm

When fertilisation is completed and the nuclei of egg and sperm have combined, a **new human being** comes into existence and is capable of further development.

Fertilisation (which is also called Conception) marks the beginning of the human lifespan.

A consultant specialising in the care of pregnant women puts it this way: "Life does not begin with birth. When born, we are already nine months old..."[1]

Eye, Hair and Skin Colour

Sperm and ovum are termed gametes (from a Greek word for "marriage partners").

When they "marry" they make one completely new cell - the human embryo - with 46 chromosomes carrying a fresh, unique combination of genes.

At fertilisation (or conception) this human embryo is about 0.1mm in diameter.

Since characteristics come from both parents the zygote is never the same as, or part of, the mother, but is a genetically distinct individual.

The colouring of hair, skin and eyes, the sex of the new human being … even factors influencing height and build, are determined at fertilisation (conception).

Boy or Girl?

A baby's sex is determined at fertilisation too.

A chromosome from the father's sperm determines whether the child is male or female.

If an X chromosome is present the baby is a girl. If a Y chromosome is carried by the sperm instead, the baby is a boy.

Twins

Occasionally two eggs are released by the ovary and fertilised.

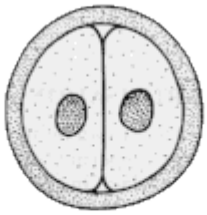
This results in *fraternal* twins who are different in appearance and may be of different sexes because their genes form from two eggs and two sperm cells.

Rarely, one embryo splits into two and both cells develop separately, as *identical* twins, similar in appearance.

"They have the same genetic make-up and apparently the whole genetic message is the same in both of them. Nevertheless, they are obviously different human beings."[2]

Implantation in the womb

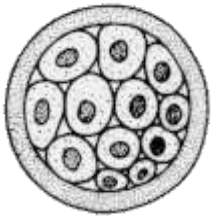
After fertilisation the single cell splits into two, then the two cells double to four, four to eight, eight to sixteen and so on. Because the cell cluster looks superficially like a berry it is called the morula (Latin for "mulberry"), but the new life is always biologically human (species homo sapiens).



Day 2: Zygote divides 0.14mm

The journey along the Fallopian tube continues slowly for about four days.

By the time the womb cavity is reached, the cell cluster becomes hollow and fluid-filled, and is referred to as the blastocyst.



Day 3: Morula. 0.14mm

However, this is not an inert clump of cells but a busily developing human individual … organisation into different parts and functions is already taking place.

Meanwhile the uterus is forming a spongy lining within which the embryo will implant. To achieve this the embryo burrows into the wall of the womb and is covered over by the lining of the womb.

This begins around 6 days after fertilisation and is completed within the next 7 days.

Once implantation occurs, the embryo sends out a hormonal signal which prevents the mother's period.

This is usually her first indication of pregnancy.

Estimating *when* your child is conceived

Generally a woman does not know the exact date of her baby's conception. When she misses a period she may take a pregnancy test - and if positive – ought to see a doctor promptly to obtain professional care for herself and her child.

The doctor takes the date of the first day of the mother's last menstrual period as the starting-point for calculating when the baby is likely to be born – 40 weeks from her last period.

The length of the pregnancy (or gestation) is often expressed as the time since the beginning of the last menstrual period.

However, since fertilisation only occurs when the ovum (egg) is released from the ovary, roughly two weeks from the beginning of the last period, the baby's actual (*conceptional*) age is also two weeks less.

Full-term delivery occurs 38 weeks after conception (fertilisation), but 40 weeks after the mother's last menstrual period.*

*In this guide all developments of the embryo and foetus are dated from the time of conception unless stated otherwise.

Protection and life support inside the womb

During and after implantation the embryo develops a protective, fluid-filled capsule which surrounds and cushions its developing body to prevent injury.

This capsule is commonly known as the ‘amniotic sac’.

Embryo and fluid are enclosed in two membranes, an inner amnion and an outer chorion.

The chorion is covered in root like tufts, some of which form the early placenta.

The placenta is an organ made by the baby and its mother which transfers nutrients from the mother's bloodstream and removes waste products from the child’s.

The placenta also produces hormones to maintain the pregnancy.

In the ninth month it will alter the mother's hormonal balance and triggers off the birth process - although exactly how the process of labour is started is still unknown.

The baby is connected to the placenta by the umbilical cord, the lifeline channelling nourishment in and taking wastes out, which will be cut close to the baby's abdomen at birth and will leave the mark of the navel.

During pregnancy the baby obtains oxygen from the mother's blood via cord and placenta, so does not drown in the surrounding fluid.

Body development

By 25 days from fertilisation the body is developing. Head and trunk appear and tiny arm buds begin to form, followed by leg buds. The early embryo seems to have a "tail", but this is really a protective covering for the spinal cord.

Because the central nervous system (brain. spine and spinal cord) is so important, governing sensory and motor functions, the embryo's body is designed for rapid growth of head and back.

Day 29:
Crown to rump, 5.0mm

By 21 to 25 days the baby's heart is beating. Other internal organs are present in simple form and functioning as they grow.

Early facial features appear. The doctor who performed the first-ever blood transfusion to an unborn baby has described the embryo at the end of the first month from fertilisation:

"By 30 days, just two weeks past mother's first missed period, the baby - one quarter of an inch long - has a brain of unmistakable human proportions, ***eyes, ears, mouth, kidneys, liver****, an umbilical cord and a heart pumping blood he has made himself."*[3]

Month # 2

The embryo increases in size from 5mm at four weeks to 4Omm by the end of the eighth week.

Growing

The baby in the womb is usually measured from the top of the head to the bottom of the spine (crown-rump lengths).

Day 42:
Crown - rump 23.0-23.5mm

Hands and feet

By the sixth week from fertilisation tiny fingers appear, followed within days by the toes.

By the seventh week the baby has individual fingerprints; no two sets of fingerprints are ever the same. Even in utero the baby has unique characteristics.

Eyes and ears

By six weeks the eyes which appeared in simple form in the first month develop lens and retina; the eyelids start to take shape.

The ears continue to develop: by seven weeks the outer ear is present, and the inner ear, with its hearing and balancing mechanisms, is well established (see page 10 'Hearing')

Movements

Spontaneous movements begin at seven weeks: "By 45 days, about the time of the mother's second missed period, the baby's skeleton is complete in cartilage, not bone, at first; ... he makes

the first movements of his body and new-grown limbs, although it will be another 12 weeks before his movements are strong enough to be transmitted through the insensitive uterus to be detected by the mother's sensitive abdominal wall."[4]

Brain function

Brain waves have been recorded by EEG (electro- encephalograph) in the human embryo 40 days after fertilisation.[5]

Response to touch

Human embryos of five weeks gestational age have been seen to move away from an object touching the mouth area.

Day 35:
Crown to rump 12.0-14.0mm

The sensitive area extends to include the rest of the face in the sixth and seventh weeks and the palms of the hands and soles of the feet in the eighth and ninth weeks respectively.[6]

A British study shows that the baby's movements begin at the same time as sensory nerves begin to grow into the spinal cord in the second month of pregnancy; the nerve fibres respond to touches to the skin and movement of the limbs: at this stage the baby's sensory nerves "appear to be more sensitive than those of the adult or new-born baby."[7]

From embryo to foetus

At around eight weeks the baby's cartilage skeleton begins to turn into bone. The body is essentially complete. Now the baby can be referred to as the foetus - a Latin term meaning "young, offspring."

Latin- or Greek-derived names are given to human beings at successive phases of development, e.g. "zygote" for the newly-conceived, "neonate" for new-born baby, "adolescent" for growing-up teenager, "geriatric" for a pensioner.

These terms simply identify different stages in the human lifespan, which begins at fertilisation.

Month # 3

By the end of the twelfth week the baby measures almost 90mm crown to rump (3.54 inches) and weighs 45g.

Development

The baby's face, at first broad, now becomes narrower; the eyes are closed for protection from about 10 weeks until the sixth month. Whether the unborn child is a boy or girl, is now obvious.

Sensitivity

Two British consultants, one caring for pregnant women and the other for children after birth, describe human development at this stage: "Nine weeks after conception the baby is well

enough formed to bend his fingers round an object in the palm of his hand. In response to a touch on the sole of his foot he will curl his toes or bend his hips and knees to move away from the touching object.

At **12 weeks** he can close his fingers and thumb and he will open his mouth in response to pressure applied at the base of his thumb."[8]

From a simple, generalised response to stimulation at 6 weeks gestational age, the foetus develops an almost complete range of responses to touches on the skin by 12 weeks.[9]

Feeling pain

The brain and nerve fibres must be functioning for anyone to feel pain.

Brain cells which are essential for consciousness in the adult are known to be present in the foetus by 10 weeks.

Nerve fibres which transmit pain impulses are known to be present before fibres inhibiting pain are completed.

According to a scholarly study of the available evidence, this "implies that the first trimester foetus may be more susceptible to pain than slightly older subjects."[10]

The first trimester of pregnancy is the first three months.

In other words, if the baby can experience pain before the body's mechanisms to suppress pain have developed, this means that the baby may be able to feel pain at an earlier stage than was previously thought, and perhaps even more keenly in the first three months of pregnancy than later.

The same study concludes that there is a likelihood that the:

"…foetus has started to acquire a sentient capacity perhaps as early as six weeks, certainly by nine to ten weeks of gestation.

Anatomical examination of such foetuses indicates the probability that differentiation sufficient for reception, transmission and perception of primitive pain sensation has already occurred."[11]

Practising for life outside the womb

"**At 11 weeks after conception the foetus starts to swallow the surrounding amniotic fluid and to pass it back in his urine.** He can also produce complex facial expressions and even smile."[12]

Swallowing prepares the baby for taking in milk after birth.

Thumb-sucking has also been recorded in the foetus.[13] Foetal breathing movements have been detected as early as 11 weeks [14].

Although the baby does not breathe air inside the fluid-filled amnion, these movements help develop the respiratory organs.

Months # 4 to 5

By sixteen weeks the baby measures 140mm (5.5 inches) from crown to rump, just over one third of the size he or she will be at full term, and weighs around 200g.

Enlargement of baby and uterus

The heart now pumps 30 litres of blood a day.

The uterus expands and changes shape to accommodate the growing baby; pregnancy begins to show externally.

The doctor can tell approximately how advanced the pregnancy is by locating the fundus (the top part of the uterus between the Fallopian tubes, which stretches upwards towards the mother's chest as the uterus expands).

Hearing

There is evidence that from four months the foetus responds to sound.

Doctors testing unborn children for deafness, while monitoring their reactions to noise with ultrasound, have observed eye movements and "blink-startle" responses in foetuses of 16 to 32 weeks gestation.[15]

The authors of a textbook on the unborn which is used in medical schools world-wide explain why the foetus can hear while immersed in fluid:

> "The ears of the foetus function as early as the fourth month, and there is evidence that it hears a good deal. One might object that if a person dives under water and someone else talks to him he hears only a muffled sound.
>
> This is true. The sound is muffled by the cushion of air remaining in the auditory canal outside the ear drum.
>
> But the foetus living in the amniotic fluid has no muffling air cushions around its ear drum - and water conducts sound better than air does. The silent world of the foetus (or, below the surface of the ocean) is a fantasy, unfounded in reality."[16]

The baby hears sounds from the outside world as well as from the mother’s heart and digestive system:

> "In fact the inner ear of the foetus is completely developed by mid-pregnancy, and the foetus responds to a wide variety of sounds. He is surrounded by a constant very loud noise in the uterus - the rhythmical sound of the uterine blood supply punctuated by the noises of air passing through the mother's intestine.

> Loud noises from outside the uterus such as the slamming of a door or loud music reach the foetus and he reacts to them."[17]

Tests using different types of music indicate that the baby even appears to have preferences:

> "A four- or five-month-old foetus definitely responds to sound and melody - and responds in very discriminating ways. Play Vivaldi out loud and even the most agitated baby relaxes ... In a film made at the City of London Maternity Hospital, Yehudi Menuhin demonstrated that it was possible to contact the unborn via music."[18]

Babies learn to recognise their mothers' voices whilst in the womb [19] and even to recognise stories which are read to them in the womb.[20]

New-born babies whose mothers watched Neighbours during pregnancy have been seen to stop crying and become alert when they hear the theme tune after birth.[21]

Sensitivity to light

From the sixteenth week the foetus responds to light. If a blinking light is shone on to the mother's abdomen, the foetal heartbeat fluctuates.[22]

> "In late pregnancy, some light penetrates through the uterine wall and amniotic fluid, and foetal activity has been shown to increase in response to bright light."[23]

The womb is a more stimulating environment than some people think; its occupant is alert and responsive.

Month # 5… and Beyond

After 20 weeks the baby is 190mm (7.5 inches) from crown to rump and weighs 460g. Head hair, eyebrows, eyelashes and nails are growing.

To protect the baby's skin from prolonged contact with the amniotic fluid, a greasy substance called vernix covers the body.

Between this stage and birth the baby will gain weight and will develop an insulating layer of fat beneath the skin.

He or she will also receive maternal antibodies against some infections as a temporary protection until the infant's own immune system is better developed.

Waking and sleeping

Foetal activity is affected when the mother is tired or under stress.[24] The baby is usually most notably active when the mother is lying down at night.

The mother feels the baby's kicking and may notice sharp movements when the baby gets hiccups after drinking the amniotic fluid or practises its breathing movements. In later pregnancy the foetus has been observed to show "behavioural states" - waking, calm sleeping, and "rapid eye movement sleep" which is associated with dreaming in adults.[25]

The quest for comfort

The baby still has some room to manoeuvre inside the womb and seeks the position which feels most comfortable:

"It is very easy to demonstrate now with ultrasound that the babies make the most of all the space and room available to them ... We know that foetal comfort determines foetal position, that changes in maternal position provoke baby to seek a new position of comfort."[26]

Survival outside the womb

If the baby is born too early, there is still a good chance that he or she will survive, given special medical care.

A document from the Royal College of Obstetricians and Gynaecologists (the professional body of doctors who treat pregnant women) states: "In 1984, 72 per cent of liveborn infants of 22 to 27 weeks' gestation born at the Bristol Maternity Hospital survived, as did 64 per cent of infants of 500 to 999 grammes birthweight."[27]

These percentages had increased from previous years. With advances in technology and in understanding of human foetal development, premature babies' chances of survival are improving.

These figures refer to the length of the pregnancy from the time of the mother's last menstrual period. and not to the age of the baby from fertilisation. which would usually be two weeks less. (see section above 'Estimating when your child is conceived')

Birth

Labour and delivery

In the last weeks of pregnancy the baby lies head downwards, as the head is normally the first part to emerge at birth.

Occasionally, if a baby's position of personal comfort is not changed to fit in with the normal birth process, there may be a "breech" presentation - rear end first - which needs medical attention.

The mother's labour begins as (following hormonal signals including that from the placenta) the muscular uterus contracts to expel the baby. The cervix (neck of the womb) gradually opens to allow the baby to pass into the vagina (birth canal).

The amnion tears and releases its fluid (this is often referred to as "the waters breaking").

Contractions become more frequent as the baby is pushed through the cervix and vagina. If the mother has attended ante-natal classes she will have learned what to expect and how to control her breathing and pushing process.

A midwife and/or a doctor supervises the mother and baby during labour. The baby's father may wish to be present to lend support and encouragement and to see his baby from the moment of birth.

After labour, which varies in length but usually lasts some hours, the baby is born. A gasp and a cry are the sign the lungs are working.

The umbilical cord is cut and the baby is examined and weighed. Normal birthweight is approximately 3,400 grammes or about 7½ lb, but considerable variations sometimes occur because of genetic factors, health problems and outside influences such as the mother's smoking during pregnancy.

Finally the membranes and placenta are expelled. The baby no longer needs a direct life support system as he or she can now breathe air and take milk.

The same before and after birth

After delivery babies who have been studied in utero show the same individual behaviour that was observed while they were in the womb: "After birth you see many babies sleeping in the odd positions that they chose to rest in within the uterus prior to birth ... The good drinkers in utero are the good drinkers in the nursery and the dainty, tedious swallowers in utero are the tedious ones out of the uterus as well ... The behaviour traits also bridge the birth."[28]

From the one-celled zygote to the multi-million-celled infant and adult, every human being is a distinct individual.

Mother and baby

Ante-natal care

A doctor caring for a pregnant woman has two patients, the mother and the baby. As soon as he or she is aware of the pregnancy, the doctor must take the needs of both into account.

The doctor should know about a pregnancy as early as possible so that any medicines prescribed are safe for both patients.

This is particularly important as the pregnancy may, of itself, cause symptoms such as headaches and fatigue for which the mother may seek medical treatment.

If the mother has "morning sickness", caused by normal hormonal responses to pregnancy, the doctor may suggest an antacid. Tablets of iron and folic acid (a B vitamin) are routinely prescribed to prevent anaemia.

Pregnancy can also lead to an increased sense of well-being and contentment. Many women find that their complexions improve and they feel more relaxed as a result of the hormonal changes in their bodies.

During pregnancy the mother should invited for regular ante-natal checks on her weight and blood pressure, and on her baby's heartbeat, growth and position in the uterus (womb).

Arrangements will be made for the baby's birth at home or (more likely) in hospital. Mother and perhaps father may also attend parentcraft classes: there they will learn how the baby develops, how to care for mother and child before and after birth, and how to cope with the process of birth itself.

The mother does not need to "eat for two" in the sense of increasing her food intake.

Adequate amounts of protein, vegetables, fruit and milk should be taken (particularly milk, since calcium is needed to make the baby's bones).

The doctor may advise on any special dietary needs. During pregnancy a mother can expect to gain around 12kg or 1.9 stones (allowing for baby, placenta, fluid and her own physical changes), but weight gain should not be excessive.

Foetal breathing movements are substantially decreased if the mother smokes cigarettes during pregnancy. There is evidence that prematurity, stillbirth and slower development may be related to this practice.[29]

Moderate amounts of alcohol taken in early pregnancy may affect the child's growth and development (including that of the brain); heavy drinking carries a still higher risk.[30]

During the first three months of pregnancy the developing baby may be harmed by certain infections and drugs.

However, by the end of the third month the baby is less likely to develop a disability because the body is well developed.

Post-natal care

Mother and baby will be visited by the midwife for some days after the birth to check that all is well with both of them.

Six weeks after the birth a post-natal examination is undertaken to be sure that the uterus has regained its former shape and that the mother is otherwise in good health.

Glossary

amnion	the fluid-filled membrane enclosing the baby in the womb.
ante-natal	before birth.
blastocyst (Greek, "sprout pouch')	the hollow, fluid-filled ball of cells which is the developing embryo at one week after fertilisation.
cervix	neck of the womb.
chorion	the outer capsule containing amnion, fluid and baby within the womb.
chromosome	part of a cell nucleus, made of DNA, carrying the genes; each species of animal and plant has a characteristic number of chromosomes per cell, except in reproductive cells which have only half that number to allow for their combination at fertilisation.
differentiation	development of cells to perform specialised functions (making nerves, bones, organs etc.).
DNA (deoxyribonucleic acid)	threadlike molecule in the nucleus of a living cell which can reproduce itself and transmit hereditary characteristics.
EEG (electroencephalograph)	an instrument which detects and records brain activity.
embryo (Greek, "to teem within")	stage of human development during the first eight weeks after fertilisation.
fallopian tubes (or ovarian tubes)	two tubes, one on each side of the womb, leading from the womb to the ovaries; fertilisation normally takes place in one of the Fallopian tubes.
fertilisation	the joining of sperm with ovum, completed when their nuclei are combined, to make a genetically new individual.
foetus (Latin, 'young, offspring')	the developing human from eight weeks after fertilisation up to birth.

fraternal twins	twins who are not identical because they develop from separate egg and sperm cells.
full-term delivery	birth of a baby after a completed nine-month pregnancy (i.e. not a premature birth).
fundus	the top part of the womb, lying between the Fallopian tubes, which expands upwards as pregnancy advances and enables the doctor to assess the length of pregnancy.
gamete (Greek, "marriage partner")	reproductive cell; egg or sperm.
gene	a factor influencing inheritance of particular characteristics (e.g. brown eyes).
hormone	substance produced by an organ or a gland which influences other organs or the whole body.
homo sapiens (Latin, "thinking man")	the human species.
identical twins	Identical twins result from an early embryo splitting in two – each resulting embryo having identical DNA.
labour	the process of expelling baby, membranes and placenta from the womb.
morula (Latin, "mulberry")	an early stage of human embryo development after about four days of life, when the growing cell cluster looks like (but is not) a berry.
ovary	the egg-producing organ; normally a woman has two ovaries which take turns to release one egg per month.
ovum	egg (plural ova).
placenta	a temporary organ within the uterus which transfers nourishment and

	oxygen from the mother, removes waste products from the baby, and makes hormones to maintain and end pregnancy. Expelled after the baby is born, it is then also known as the "afterbirth".
post-natal	after the baby has been born.
prematurity	the baby is born before 37 completed weeks since the mother's last period and needs special care.
sentient capacity	the ability to feel sensations such as pain.
stillbirth	the baby is born dead.
trimester	a three month period of pregnancy. The first trimester covers the first to the third months; the second trimester the fourth to the sixth months; and the third trimester the seventh to the ninth months.
ultrasound	a technique for viewing the unborn child: high-frequency sound waves directed through the mothers abdomen send back signals which are converted to images on a screen.
umbilical cord	a temporary lifeline connecting the unborn child with the placenta, channelling nourishment from the mother and removing wastes from the baby.
uterus	the womb; *in utero* (Latin) in the womb.
vagina	the birth canal.
vernix	a greasy coating protecting the unborn baby's skin from prolonged contact with the fluid in the womb.
zygote (Greek, 'joining')	the new, one-celled being formed when sperm fertilises egg; the zygote of the species Homo sapiens is a human being at the earliest stage of life.

References

1. J.M. Beazley, "Assessment of life in utero", *Nursing Times*, 8 May 1980.
2. Jérôme Lejeune, quoted in Professor Jérôme Lejeune and Professor Sir Albert William Liley, *The Tiniest Humans*, editor Robert Sassone, 1977. Library of Congress No. 77-7681 1, p.69. *The Tiniest Humans* is composed from transcripts of testimonies given by Professors Lejeune and Liley to the Sub-Committee on Constitutional Amendments of the Committee on the Judiciary, US Senate, 93rd Congress, 2nd Session. 7 May 1974. and the Royal Commission on Contraception, Sterilisation and Abortion, New Zealand, 1977.
3. Sir William Liley, quoted in *The Tiniest Humans*, as above, p. 16.
4. Sir William Liley, quoted in *The Tiniest Humans*, as above. p.16.
5. H. Hamlin, Life or Death by EEG, *Journal of the American Medical Association*, 12 October 1964.
6. T. Humphrey, "Some correlations between the appearance of human fetal reflexes and the development of the nervous system", *Progress on Brain Research* (1964). 4. 93-135.
7. "Earliest feelings help to develop the senses", *New Scientist*, 7 May 1987. reviewing the research of Maria Fitzgerald published in *Nature*. 9 April 1987. vol. 326, p. 603.
8. H.B. Valman and J.F. Pearson. "What the foetus feels", *British Medical Journal*, 26 January 1980.
9. I.D. Hogg, "Sensory nerves and associated structures in the skin of human foetuses of 8 to 14 weeks of menstrual age correlated with functional capability". *Journal of Comparative Neurology* (1941), 75. 371-410.
10. Peter McCullagh, *The Fetus as Transplant Donor--Scientific, Social and Ethical Perspectives*, John Wiley & Sons 1987. p. 132.
11. *ibid.*
12. H.B. Valman and J.F. Pearson, *op.cit.*
13. Sir William Liley. quoted in *The Tiniest Humans*, as above, p.31.
14. J.M. Beazley. *op.cit.*
15. J.C. Birnholz et al. "The development of human fetal hearing", *Science* (1983), 222. 516-518.
16. M. Furuhjelm et al. *A Child is Born*, Delacorte Press/Seymour Lawrence 1977. p. 116.
17. H.B. Valman and J.F. Pearson, *op.cit.*
18. Thomas Verny with John Kelly, *The Secret Life of the Unborn Child*, Sphere Books. 1987. pp. 7-8. 26.
19. A.J. DeCasper & W.P. Fifer, "Of Human Bonding: Newborns Prefer their Mothers' Voices". *Science*, 208. 1174-1176.1980.
20. A.J. DeCasper & M.J. Spence, "Prenatal maternal speech influences newborns' perception of speech sound", *Infant Behaviour and Development*, 9, 133-150, 1986.
21. P.G. Hepper,, "Fetal 'Soap' Addiction", *The Lancet*, p.1347. 11 June 1988.
22. Sir William Liley, "The Fetus as a Personality", *The Australian and New Zealand Journal of Psychiatry* (1972), 6, 99-105.
23. H.B. Valman and J.F. Pearson, *op.cit.*
24. *ibid.*
25. J.O. Drife, "Can the foetus listen and learn?", *British Journal of Obstetrics and Gynaecology* (1985), 92, 777-779.
26. Sir William Liley, quoted in *The Tiniest Humans*, as above, p.23.
27. Royal College of Obstetricians and Gynaecologists, *Preterm Labour and its Consequences*, 1985, p. 295.
28. Sir William Liley, quoted in *The Tiniest Humans*, as above.
29. F. Manning, "Meeting of Royal College of Physicians and Surgeons", *Family Practice News*, 15 March 1976.
30. J.W. Hanson et al. "The effects of moderate alcohol consumption during pregnancy on fetal growth and morphogenesis". *Pediatrics* (1978), 92, 3, 4574W.

Published by the Society for the Protection of Unborn Children (SPUC), 3 Whitacre Mews, Stannary Street, London SE11 4AB