



Dear Reader,

In the age of technology and information overload, finding relevant information that accurately and honestly covers some of life's most difficult and controversial issues can be challenging. We have put together a curriculum that attempts to address the most important questions surrounding the topics of abortion, embryonic stem cell research and euthanasia.

The following resource is intended for high school teachers, youth leaders and church groups as they address and teach these issues. Many high schools will use them prior to a visit from a Right to Life Speaker, and following the visit so as to put the speaker's visit in context.

We at The Right to Life Association of Toronto hope that you will find this resource a complement to the programs already in existence. Teachers are permitted to photocopy the booklet and use it at their discretion, provided that acknowledgement is given to the Association.

We kindly accept donations for the curriculum and will provide more copies to teachers and youth leaders upon request.

To obtain more Learning the Life Issues Curriculums, or to request a speaker to your school, parish or youth group, please call us at 416-483-7869 or visit us at our web-site at [www.rtl-toronto.org](http://www.rtl-toronto.org).

We hope that this is a useful tool to all who attempt to understand and teach the Life Issues.

For a Culture of Life,

Natalie Hudson  
Executive Director

## Expectations:

- To allow students the opportunity to realize just one aspect of the marvellous reality of the development of the unborn.
- To appreciate the ways in which technology has made our knowledge of pre-natal life possible.



## Wiring the Brain From Time Magazine

Rat-a-tat-tat. Rat-a-tat-tat. Rat-a-tat-tat. If scientists could eavesdrop on the brain of a human embryo 10, maybe 12 weeks after conception, they would hear an astonishing racket. Inside the womb, long before light first strikes the retina of the eye or the earliest dreamy images flicker through the cortex, nerve cells in the developing brain crackle with purposeful activity. Like teenagers with telephones, cells in one neighborhood of the brain are calling friends in another, and these cells are calling their friends, and they keep calling one another over and over again, "almost," says neurobiologist Carla Shatz of the University of California, Berkeley, "as if they were autodialing."

But these neurons (as the long, wiry cells that carry electrical messages through the nervous system and the brain are called) are not transmitting signals in scattershot fashion. That would produce a featureless static, the sort of noise picked up by a radio tuned between stations. On the contrary, evidence is growing that the staccato bursts of electricity that form those distinctive rat-a-tat-tats arise from coordinated waves of neural activity, and that those pulsing waves, like currents shifting sand on the ocean floor, actually change the shape of the brain, carving mental circuits into patterns that over time will enable the newborn infant to perceive a father's voice, a mother's touch, a shiny mobile twirling over the crib.

At birth a baby's brain contains 100 billion neurons, roughly as many nerve cells as there are stars in the Milky Way. Also in place are a trillion glial cells, named after the Greek word for glue, which form a kind of honeycomb that protects and nourishes the neurons. But while the brain contains virtually all the nerve cells it will ever have, the pattern of wiring between them has yet to stabilize. Up to this point, says Shatz, "what the brain has done is lay out circuits that are its best guess about what's required for vision, for language, for whatever." The electric signals that are transmitted between the neurons begin to modify the original "best guess" layout of the circuits and refine them. As the child develops in the womb, the increased sensory experiences assist this process.

Scientists are also beginning to identify some of the genes that guide neurons as they migrate from one region of the brain to the other making their connections. Consider the problem faced by neurons destined to become part of the cerebral cortex. Because they arise relatively late in the development of the mammalian brain, billions of these cells must push and shove their way through dense colonies established by earlier migrants. "It's as if the entire population of the East Coast decided to move en masse to the West Coast," marvels Yale University neuroscientist Dr. Pasko Rakic, and marched through Cleveland, Chicago and Denver to get there.

But of all the problems the growing nervous system must solve, the most daunting is posed by the wiring itself. After birth, when the number of connections explodes, each of the brain's billions of neurons will forge links to thousands of others. First they must spin out a web of wire like fibres known as axons (which transmit signals) and dendrites (which receive them). The objective is to form a synapse, the gap-like structure over which the axon of one neuron beams a signal to the dendrites of another. Before this can happen, axons and dendrites must almost touch. And while the short, bushy dendrites don't have to travel very far, axons (the heavy-duty cables of the nervous system) must traverse distances that are the microscopic equivalent of miles.

What guides an axon on its incredible voyage is a "growth cone," a creepy, crawly sprout that looks something like an amoeba. Scientists have known about growth cones since the turn of the century. What they didn't know until recently was that growth cones come equipped with the molecular equivalent of sonar and radar. Just as instruments in a submarine or airplane scan the environment for signals, so molecules arrayed on the surface of growth cones search their surroundings for the presence of certain proteins. Some of these proteins, it turns out, are attractants that pull the growth cones toward them, while others are repellents that push them away.

Up to this point, genes have controlled the unfolding of the brain. As soon as axons make their first connections, however, the nerves begin to fire, and what they do starts to matter more and more. In essence, say scientists, the developing nervous system has strung the equivalent of telephone trunk lines between the migrants. "It's as if the entire population of the East Coast decided to move en masse to the West Coast," marvels Yale University neuroscientist Dr. Pasko Rakic, and marched through Cleveland, Chicago and Denver to get there.

Now it has to sort out which wires belong to which house, a problem that cannot be solved by genes alone for reasons that boil down to simple arithmetic. Eventually, Berkeley's Goodman estimates, a human brain must forge quadrillions of connections. But there are only 100,000 genes in human DNA. Even though half these genes--some 50,000--appear to be dedicated to constructing and maintaining the nervous system, he observes, that's not enough to specify more than a tiny fraction of the connections required by a fully functioning brain.

Reference.... Time Magazine, February 3<sup>rd</sup>, 1997 cover story. Modified for classroom use.



### Questions for Students:

1. What is the cause of the sound that scientists are picking up from inside the unborn child's brain?
2. How early is the sound detected?
3. Is the sound that is detected like random static that is heard on the radio? Explain why or why not?
4. What are glial cells?
5. Wiring the brain is referring to the actual wires, or axons, laid down by the brain that connect all of the nerve cells. How does this process of "wiring the brain" take place?
6. How many connections will actually be made in the process of "wiring the brain"?

### Activities:

1. Unborn children have been operated on while still in the womb. Research one of these incredible pre-natal surgeries and report to the class your findings.

Include the following in your report:

- A) Age of the child.
- B) Medical condition that the child and/or mother are suffering.
- C) Chances of survival.
- D) Type of surgery that was performed.
- E) Effects of the surgery on the health of the mother and child.
- F) Immediate and long-term results of the surgery.
- G) Visual images of the surgery.

### For Teachers:

Answers or questions on "Wiring the Brain":

1. The sound is made by the neurons that are transmitting electrical messages back and forth across the brain.
2. The sound is detected as early as 10 to 12 weeks after conception.
3. Scientists are starting to understand that the static sound is not random, but an organized flow of electricity that actually carves out patterns in the brain, like waves making lines in the sand.
4. Glial cells are the cells that make up a honeycomb structure within the brain that encapsulate the neurons and provide them nourishment.
5. Axons, long fiber-like wires, that actually transmit the neural signals, have to travel distances that are equivalent to miles in the brain. They are led by growth cones, amoeba-like creatures that move through the brain with what might be considered radar and sonar equipment searching their surroundings for attractive proteins.
6. Quadrillions of connections will be made in this way.

## The Life Principles

### Grade 11

#### Expectations:

- For students to consider happiness and whether it is a universal desire that is present in all men and women of all faiths and cultures.
- Students consider how questions of one's happiness relates to the issues of abortion and euthanasia?
- Students should reflect whether the means of attaining happiness are universal?



We all desire happiness. What does "happiness" mean? Does happiness come from eating pleasurable things like a giant bowl of ice-cream? Does happiness consist in having the perfect job, the beautifully decorated apartment or a room full of family and friends?

Aristotle, a prominent Greek philosopher, once wrote that "all [people] desire happiness." He noted that happiness is the only thing that human beings desire "for its own sake." Everything else is desired for the purpose of happiness. Happiness, then, is our ultimate goal. It is the sake for which we exist and for which we are created. But not everyone is happy. That is because there are different kinds of happiness. In fact, we experience happiness on four different levels. True human happiness will consist in making choices that involve all four levels of happiness. Read on...

#### Happiness Level One

**Happiness 1 is finding happiness in the physical pleasure and possession of material things.** Happiness Level 1 is about gaining physical gratification through the fulfillment of our five senses. This level of happiness is good. But, if we only live for instant gratification, we soon become bored.

Suffering has little meaning at this level. When we are deprived of pleasures and possessions, we feel pain and experience suffering. We question suffering and fail to see how any good can come from pain.

#### Happiness Level Two

**Happiness 2 is finding our meaning and purpose in ego-gratification.** We are happy when we are successful, in control, popular or admired. It is the "ego high" we feel when we win a soccer game, graduate from high school, or get a fabulous job promotion.

Happiness 2 is good. Humans need to work toward goals and finish projects. But, we have to be careful if happiness is found only in achievement or ego-gratification because we'll be living in constant competition with other people. If things don't go our way, or we embarrass ourselves, or we fail, we can sink into depression. If pain or illness causes us to lose some control or become dependent on others, we begin to see life as useless or meaningless.

**Suffering** is seen as something to be avoided at all costs--we may begin to live in fear of suffering because it inhibits our ability to achieve.

#### Happiness Level Three

**Happiness 3 is the ability or desire to do good for others or for a cause that is greater than simply satisfying one's need for pleasure, possession or ego gratification.** Happiness 3 is found in the action of doing good not for the sake of self, but for the sake of others. A wise man once said it this way; "Happiness 3 is when you are happier to do the good for someone else than you are for yourself."

Another word for Happiness 3 is **love**; not the feeling of love but the action of love. This kind of love calls us out of ourselves and makes us want to give our time and talents to another person or to some good cause.