

William Gilbert and Magnetism

- A.** 16th and 17th centuries saw two great pioneers of modern science: Galileo and Gilbert. The impact of their findings is eminent. Gilbert was the first modern scientist, also the accredited father of the science of electricity and magnetism, an Englishman of learning and a physician at the court of Elizabeth. Prior to him, all that was known of electricity and magnetism was what the ancients knew, nothing more than that the lodestone possessed magnetic properties and that amber and jet, when rubbed, would attract bits of paper or other substances of small specific gravity. However, he is less well-known than he deserves.
- B.** Gilbert's birth predated Galileo. Born in an eminent local family in Colchester county in the UK, on May 24, 1544, he went to grammar school, and then studied medicine at St. John's College, Cambridge, graduating in 1573. Later he traveled in the continent and eventually settled down in London.
- C.** He was a very successful and eminent doctor. All this culminated in his election to the president of the Royal Science Society. He was also appointed the personal physician to the Queen (Elizabeth I) and later knighted by the Queen. He faithfully served her until her death. However, he didn't outlive the Queen for long and died on December 10, 1603, only a few months after his appointment as personal physician to King James.
- D.** Gilbert was first interested in chemistry but later changed his focus due to the large portion of the mysticism of alchemy involved (such as the transmutation of metal). He gradually developed his interest in physics after the great minds of the ancient, particularly about the knowledge the ancient Greeks had about lodestones, strange minerals with the power to attract iron. In the meantime, Britain became a major seafaring nation in 1588 when

the Spanish Armada was defeated, opening the way to the British settlement of America. British ships depended on the magnetic compass, yet no one understood why it worked. Did the pole star attract it, as Columbus once speculated; or was there a magnetic mountain at the pole, as described in 'Odyssey' which ships would never approach because the sailors thought its pull would yank out all their iron nails and fittings? For nearly 20 years William Gilbert conducted ingenious experiments to understand magnetism. His works include *On the Magnet and Magnetic Bodies*, *Great Magnet of the Earth*.

E. Gilbert's discovery was so important to modern physics. He investigated the nature of magnetism and electricity. He even coined the word "electric". Though the early beliefs of magnetism were also largely entangled with superstitions such as that rubbing garlic on lodestone can neutralize its magnetism, one example being that sailors even believed the smell of garlic would even interfere with the action of the compass, which is why helmsmen were forbidden to eat it near a ship's compass. Gilbert also found that metals can be magnetized by rubbing materials such as fur, plastic or the like on them. He named the ends of a magnet "north pole" and "south pole". The magnetic poles can attract or repel, depending on polarity. In addition, however, ordinary iron is always attracted to a magnet. Though he started to study the relationship between magnetism and electricity, sadly he didn't complete it. His research of static electricity using amber and jet only demonstrated that objects with electrical charges can work like magnets attracting small pieces of paper and stuff. It is a French guy named du Fay that discovered that there are actually two electrical charges, positive and negative.

F. He also questioned the traditional of astronomical beliefs. Though a Copernican, he didn't express in his quintessential beliefs whether the earth is at the center of the universe or in orbit around the sun. However, he believed that stars are not equidistant from the earth, but have their own earth-like planets orbiting around them. The earth is itself like a giant magnet, which is also why compasses always point north. They spin on an axis that

is aligned with the earth's polarity. He even likened the polarity of the magnet to the polarity of the earth and built an entire magnetic philosophy on this analogy. In his explanation, magnetism was the soul of the earth. Thus a perfectly spherical lodestone, when aligned with the earth's poles, would wobble all by itself in 24 hours. Further, he also believed that suns and other stars wobble just like the earth does around a crystal core, and speculated that moon might also be a magnet caused to orbit by its magnetic attraction to the earth. This was perhaps the first proposal that a force might cause a heavenly orbit.

G. His research method was revolutionary in that he used experiments rather than pure logic and reasoning like the ancient Greek philosophers did. It was a new attitude toward the scientific investigation. Until then, scientific experiments were not in fashion. It was because of this scientific attitude, together with his contribution to our knowledge of magnetism, that a unit of magnetomotive force, also known as magnetic potential, was named Gilbert in his honor. His approach of careful observation and experimentation rather than the authoritative opinion or deductive philosophy of others had laid the very foundation for modern science.

Questions 1-7

The Reading passage has seven paragraphs A-G.

Choose the correct heading for each paragraph from the list of headings below.

Write the correct number, i-x.

List of Headings

- i Early years of Gilbert
- ii What was new about his scientific research method
- iii The development of chemistry

- iv Questioning traditional astronomy
- v Pioneers of the early science
- vi Professional and social recognition
- vii Becoming the president of the Royal Science Society
- viii The great works of Gilbert
- ix His discovery about magnetism
- x His change of focus

- 1. Paragraph A
- 2. Paragraph B
- 3. Paragraph C
- 4. Paragraph D
- 5. Paragraph E
- 6. Paragraph F
- 7. Paragraph G

Questions 8-10

Do the following statements agree with the information given in Reading Passage?

In boxes 8-10 on your answer sheet, write

- | | |
|------------------|--|
| TRUE | If the statement agrees with the information |
| FALSE | If the statement contradicts the information |
| NOT GIVEN | If there is no information on this |

8. He is less famous than he should be.
9. He was famous as a doctor before he was employed by the Queen.
10. He lost faith in the medical theories of his time.

Questions 11-13

Choose **THREE** correct letters, A-F.

Which **THREE** of the following are parts of Gilbert's discovery?

- A Metal can be transformed into another.
- B Garlic can remove magnetism.
- C Metals can be magnetized.
- D Stars are at different distances from the earth.
- E The earth wobbles on its axis.
- F There are two charges of electricity.

Twin Study: Two of a kind

A. THE scientific study of twins goes back to the late 19th century, when Francis Galton, an early geneticist, realized that they came in two varieties: identical twins born from one egg and non-identical twins that had come from two. That insight turned out to be key, although it was not until 1924 that it was used to formulate what is known as the twin rule of pathology, and twin studies really got going.

B. The twin rule of pathology states that any heritable disease will be more concordant (that is, more likely to be jointly present or absent) in identical twins than in non-identical twins – and, in turn, will be more concordant in non-identical twins than in non-siblings. Early work, for example, showed that the statistical correlation of skin-mole counts between identical twins was 0.4, while non-identical twins had a correlation of only 0.2. (A score of 1.0 implies a perfect correlation, while a score of zero implies no correlation.) This result suggests that moles are heritable, but it also implies that there is an environmental component to the development of moles, otherwise, the correlation in identical twins would be close to 1.0.

C. Twin research has shown that whether or not someone takes up smoking is determined mainly by environmental factors, but once he does so, how much he smokes is largely down to his genes. And while a person's religion is clearly a cultural attribute, there is a strong genetic component to religious fundamentalism. Twin studies are also unraveling the heritability of various aspects of human personality. Traits from neuroticism and anxiety to thrill – and novelty-seeking all have large genetic components. Parenting matters, but

it does not determine personality in the way that some had thought.

D. More importantly, perhaps, twin studies are helping the understanding of diseases such as cancer, asthma, osteoporosis, arthritis and immune disorders. And twins can be used, within ethical, for medical experiments. A study that administered vitamin C to one twin and a placebo to the other found that it had no effect on the common cold. The lesson from all of today's twin studies is that most human traits are at least partially influenced by genes. However, for the most part, the age-old dichotomy between nature and nurture is not very useful. Many genetic programs are open to input from the environment, and genes are frequently switched on or off by environmental signals. It is also possible that genes themselves influence their environment. Some humans have an innate preference for participation in sports. Others are drawn to novelty. Might people also be drawn to certain kinds of friends and types of experience? In this way, a person's genes might shape the environment they act in as much as the environment shapes the actions of the genes.

E. In the past, such research has been controversial. Josef Mengele, a Nazi doctor working at the Auschwitz extermination camp during the second world war, was fascinated by twins. He sought them out among arrivals at the camp and preserved them from the gas-chambers for a series of brutal experiments. After the war, Cyril Burt, a British psychologist who worked on the heredity of intelligence, tainted twin research with results that appear, in retrospect, to have been rather too good. Some of his data on identical twins who had been reared apart were probably faked. In any case, the prevailing ideology in the social sciences after the war was Marxist and disliked suggestions that differences in human potential might have underlying genetic causes. Twin studies were thus viewed with suspicion.

F. The ideological pendulum has swung back; however, as the human genome project and its aftermath have

turned genes for abstract concepts to real pieces of DNA. The role of genes in sensitive areas such as intelligence is acknowledged by all but a few die-hards. The interesting questions now concern how nature and nurture interact to produce particular bits of biology, rather than which of the two is more important. Twin studies, which are a good way to ask these questions, are back in fashion, and many twins are enthusiastic participants in this research.

G. Research at the Twinsburg festival began in a small way, with a single stand in 1979. Gradually, news spread and more scientists began turning up. This year, half a dozen groups of researchers were lodged in a specially pitched research tent. In one corner of this tent, Paul Breslin, who works at the Monell Institute in Philadelphia, watched over several tables where twins sat sipping clear liquids from cups and making notes. It was the team's third year at Twinsburg. Dr Breslin and his colleagues want to find out how genes influence human perception, particularly the senses of smell and taste and those (warmth, cold, pain, tingle, itch and so on) that result from stimulation of the skin. Perception is an example of something that is probably influenced by both genes and experience. Even before birth, people are exposed to flavours such as chocolate, garlic, mint and vanilla that pass intact into the bloodstream, and thus to the fetus. Though it is not yet clear whether such pre-natal exposure shapes taste-perception, there is evidence that it shapes preferences for foods encountered later in life.

H. However, there are clearly genetic influences at work, as well – for example in the ability to taste quinine. Some people experience this as intensely bitter, even when it is present at very low levels. Others, whose genetic endowment is different, are less bothered by it. Twin studies make this extremely clear. Within a pair of identical twins, either both, or neither, will find quinine hard to swallow. Non-identical twins will agree less frequently.

I. On the other side of the tent Dennis Drayna, from the National Institute on Deafness and Other

Communication Disorders, in Maryland, was studying hearing. He wants to know what happens to sounds after they reach the ear. It is not clear, he says, whether the sound is processed into sensation mostly in the ear or in the brain. Dr Drayna has already been involved in a twin study which revealed that the perception of musical pitch is highly heritable. At Twinsburg, he is playing different words, or parts of words, into the left and right ears of his twinned volunteers. The composite of the two sounds that an individual reports hearing depends on how he processes this diverse information and that, Dr Drayna believes, may well be influenced by genetics.

J. Elsewhere in the marquee, Peter Miraldi, of Kent State University in Ohio, was trying to find out whether genes affect an individual's motivation to communicate with others. A number of twin studies have shown that personality and sociability are heritable, so he thinks this is fertile ground. And next to Mr Miraldi was a team of dermatologists from Case Western Reserve University in Cleveland. They are looking at the development of skin disease and male-pattern baldness. The goal of the latter piece of research is to find the genes responsible for making men's hair fall out.

K. The busiest part of the tent, however, was the queue for forensic-science research into fingerprints. The origins of this study are shrouded in mystery. For many months, the festival's organisers have been convinced that the Secret Service – the American government agency responsible for, among other things, the safety of the president – is behind it. When The Economist contacted the Secret Service for more information, we were referred to Steve Nash, who is chairman of the International Association for Identification (IAI) and is also a detective in the scientific investigations section of the Marin County Sheriff's Office in California. The IAI, based in Minnesota, is an organisation of forensic scientists from around the world. Among other things, it publishes the Journal of Forensic Identification.

Questions 14-18

The Reading Passage has eleven paragraphs A-K.

Which paragraph contains the following information?

Write the correct letter, A-K.

NB You may use any letter more than once.

- 14. Mentioned research conducted in Ohio**
- 15. Medical contribution to the researches for twins.**
- 16. Research situation under life-threatening conditions**
- 17. Data of similarities of identical twins**
- 18. Reasons that make one study unconvincing**

Question 19 and 20

Complete the summary below.

Write NO MORE THAN TWO WORDS for each answer.

Write your answers in boxes 19-20 on your answer sheet.

The first one that conducted research on twins is called 19..... He separated twins into two categories: non-identical and identical twins. The twin research was used in a medical application in as early as the year of 20.....

Questions 21-23

Choose THREE correct letters, A-F.

Write **THREE** research fields that had been carried out in Ohio, Maryland and Twinburgh?

- A Sense
- B Cancer
- C Be allergic to Vitamin D
- D Mole heredity
- E Sound
- F Boldness of men

Questions 24-26

Choose **THREE** correct letters, A-F.

Write **THREE** results that had been verified in this passage.

- A Non-identical twins come from different eggs.
- B Genetic relation between identical twins is closer than non-identical ones.
- C Vitamin C has an evident effect on a cold.
- D Genetic influence on smoking is superior to the environment's
- E If a pregnant woman eats too much sweet would lead to skin disease.
- F Hair loss has been found to be connected with a skin problem.

Compliance or Noncompliance for Children

A. Many Scientists believe that socialization takes a long process, while compliance is the outset of it. Accordingly, compliance for the education of children is the priority. Motivationally distinct forms of child compliance, mutually positive affect, and maternal control, observed in 3 control contexts in 103 dyads of mothers and their 26-41-month-old children, were examined as correlates of internalization, assessed using observations of children while alone with prohibited temptations and maternal ratings. One form of compliance (committed compliance), when the child appeared committed wholeheartedly to the maternal agenda and eager to endorse and accept it, was emphasized. Mother-child mutually positive affect was both a predictor and a concomitant of committed compliance. Children who shared positive affect with their mothers showed a high level of committed compliance and were also more internalized. Differences and similarities between children's compliance with requests and prohibitions ("Do" vs. "Don't" demand contexts) were also explored. Maternal "Dos" appeared more challenging to toddlers than the "Don'ts." Some individual coherence of behavior was also found across both demand contexts. The implication of committed compliance for emerging internalized regulators of conduct is discussed.

B. A number of parents were not easy to be aware of the compliance, some even overlooked their children's noncompliance. Despite good education, these children did not follow the words from their parents on several occasion, especially boys in certain ages. Fortunately, this rate was acceptable, some parents could be patient with the noncompliance. Someone held that noncompliance is probably not a wrong thing. In order to determine the effects of different parental disciplinary techniques on young children's compliance and noncompliance, mothers were trained to observe emotional incidents involving their own toddler-aged children. Reports of disciplinary encounters were analyzed in terms of the types of discipline used (reasoning, verbal prohibition, physical coercion, love withdrawal, and combinations thereof) and children's responses to that discipline (compliance/ noncompliance

and avoidance). The relation between compliance/ noncompliance and type of misdeed (harm to persons, harm to property, and lapses of self-control) was also analyzed. Results indicated that love withdrawal combined with other techniques was most effective in securing children's compliance and that its effectiveness was not a function of the type of technique with which it was combined. Avoidant responses and affective reunification with the parent were more likely to follow love withdrawal than any other technique. Physical coercion was somewhat less effective than love withdrawal, while reasoning and verbal prohibition were not at all effective except when both were combined with physical coercion.

C. "Noncompliant Children sometimes prefer to say to directly as they were younger, they are easy to deal with the relationship with contemporaries. When they are growing up. During the period that children are getting elder, who may learn to use more advanced approaches for their noncompliance. They are more skillful to negotiate or give reasons for refusal rather than show their opposite idea to parents directly." Said Henry Porter, a scholar working in Psychology Institute of UK. He indicated that noncompliance means growth in some way, may have benefit for children. Many Experts held different viewpoints in recent years, they tried drilling compliance into children. His collaborator Wallace Friesen believed that Organizing a child's daily activities so that they occur in the same order each day as much as possible. This first strategy for defiant children is ultimately the most important. Developing a routine helps a child to know what to expect and increases the chances that he or she will comply with things such as chores, homework, and hygiene requests. When undesirable activities occur in the same order at optimal times during the day, they become habits that are not questioned but done without thought.

Chances are that you have developed some type of routine for yourself in terms of showering, cleaning your house, or doing other types of work. You have an idea in your mind when you will do these things on a regular basis and this helps you to know what to expect. In fact, you have probably already been using most of these compliance strategies for yourself without realizing it. For children, without setting these expectations on a daily basis by

making them part of a regular routine, they can become very upset. Just like adults, children think about what they plan to do that day and expect to be able to do what they want. So, when you come along and ask them to do something they weren't already planning to do that day, this can result in automatic refusals and other undesirable defiant behaviors. However, by using this compliance strategy with defiant children, these activities are done almost every day in the same general order and the child expects to already do them.

D. Doctor Steven Walson addressed that organizing fun activities to occur after frequently refused activities. This strategy also works as a positive reinforcer when the child complies with your requests. By arranging your day so that things often refused to occur right before highly preferred activities, you are able to eliminate defiant behavior and motivate your child's behavior of doing the undesirable activity. This is not to be presented in a way that the preferred activity is only allowed if a defiant child does the non-preferred activity. However, you can word your request in a way so that your child assumes that you have to do the non-preferred activity before moving on to the next preferred activity. For example, you do not want to say something such as, "If you clean your room we can play a game." Instead of the word your request like this, "As soon as you are done cleaning your room we will be able to play that really fun game you wanted to play."

E. Psychologist Paul Edith insisted praise is the best way to make children comply with. This is probably a common term you are used to hearing by now. If you praise your child's behavior, he or she will be more likely to do that behavior. So, it is essential to use praise when working with defiant children. It also provides your child with positive attention. However, it is important to know how to praise children in a way that encourages future automatic reinforcement for your child when doing a similar behavior.

Questions 27-31

Choose the correct letter, A, B, C or D.

27. The children, especially boys received good education may

- A always comply with their parents' words**
- B be good at math**
- C have a high score at school**
- D disobey their parents' order sometimes**

28. Face to their children's compliance and noncompliance, parents

- A must be aware of the compliance**
- B ask for help from their teachers**
- C some of them may ignore their noncompliance**
- D pretend not to see**

29. According to Henry Porter, noncompliance for children

- A are entirely harmful**
- B may have positive effects**
- C needs medicine assistance**
- D should be treated by an expert doctor**

30. When children are growing up, they

- A always try to directly say no**
- B are more skillful to negotiate**
- C learn to cheat instead of noncompliance**
- D tend to keep silent**

31. Which is the possible reaction the passage mentioned for elder children and younger ones if they don't want to comply with the order

- A elder children prefer to refuse directly**
- B elder ones refuse to answer**
- C younger children may reject directly**
- D younger ones may save any words**

Questions 32-35

Look at the following people and list of statements below.

Match each person with the correct statement.

Write the correct letter, A-G.

32 Henry Porter

33 Wallace Friesen

34 Steven Walson

35 Paul Edith

List of statements

- A children of all ages will indirectly show noncompliance**
- B elder children tend to negotiate rather than show noncompliance**
- C converse behavior means noncompliance**
- D organizing fun activities to occur after frequently refused activities**
- E organizing child's daily activities in the same order as much as possible.**

F use praise in order to make children compliant

G take the children to school at an early age

Questions 36-40

Do the following statements agree with the claims of the writer in Reading Passage 3?

In boxes 36-40 on your answer sheet, write

- | | |
|------------------|--|
| YES | If the statement is true |
| NO | If the statement is false |
| NOT GIVEN | If the information is not given in the passage |

36. Socialization takes a long process, while compliance is the beginning of it.

37. Many parents were difficult to be aware of compliance or noncompliance.

38. Noncompliant Children are simple to deal with the relationship with the people at the same age when they are growing up.

39. Experts never tried drilling compliance into children.

40. Psychologist Paul Edith negated the importance that knowing how to praise children in an encouraging way.