For Teachers: Please have the students read the sentences one at a time and correct their pronunciation of each sentence then have them repeat after you. Wait until after they read the sentence (use the number in place of the missing word) to have the students choose the correct answer to fill in the blank. When the students finish the article, move on to the further questions.

日本語訳なしタイプ B もございます。スクロールダウンするとございますのでお好きな方をご利用下さい。

3[B] – The Natural Way

AP1E 10-2

1. At the 2000 Summer Olympics in Sydney, 83 percent of the medal-winning (メダルを獲得（かくとく）した) swimmers (競泳選手（きょうえいせんしゅ）) wore (着（き）た) the Speedo Fastskin (競泳水着（きょうえいみずぎ）) swimsuit. This revolutionary (画期的（かっきてき）な) swimsuit (水着（みずぎ）) allows wearers (着用者（ちゃくようしゃ）) to glide through (滑（すべ）り抜（ぬ）ける) the water with much less
2. resistance, thanks to (～のおかげで) a material (素材（そざい）) designed to mimic (再現（さいげん）する) the skin of one nature's fastest (最（もっと）も早（はや）い) swimmers, the shark (鮫（さめ）). The Fastskin is an example (例（れい）) of "biomimetics (バイオミメティックス（生体模倣技術）)," the field of research in which product designs are
3. based on (～に基（もと）づいて) phenomena (現象（げんしょう）) found in nature (自然（しぜん）).

Further Questions&A

*Ask student to answer the question on their own at first. If the student can't answer correctly, have him look at the last page and read the "example answer" for the question. Have the student try to memorize the answer, if it's too long or difficult, you should divide the sentence into 2 or 3 parts to make it easier to remember. Once they have memorized the answer, the teacher should ask the question one last time so that the student can practice answering. Also if you find any mistakes, please mark the page and let me know ASAP.

4. 1) What did 83 percent of the medal-winning swimmers wear during the 2000 Summer Olympics? 2000年夏のオリンピックでメダルを獲得（かくとく）したスイマーの83%が着用（ちゃくよう）していた水着（みずぎ）は何（なん）ですか。
5. *They wore Speedo Fastskin swimsuits.*
6. 2) What is "biomimetics"? バイオミメティックス（生体模倣技術（せいたいもほうぎじゅつ））とは何（なに）ですか。
7. *Biomimetics is the field of research in which product designs are based on phenomena found in nature.*

8. This is not a new idea—Leonardo da Vinci designed (設計（せっけい）した) aircraft (航空機（こうくうき）) in the same way (方法（ほうほう）) —but biomimetics has taken off (活気（かっき）づく) only in the last (最近（さいきん）の) 10 to 15 years as more scientists from a variety (多様性（たようせい）) of disciplines (規律（きりつ）) turn to nature for inspiration (名案（めいあん）). In Japan, for example (例（たと）えば), researchers are carrying out (遂行（すいこう）する) trials (試（こころ）み) of a
9. nearly painless (痛（いた）みのない) hypodermic (皮下注射（ひかちゅうしゃ）の) needle (針（はり）) with a design based on the mosquito (蚊（か）の)'s proboscis (口先（くちさき）) (the thin (薄（うす）い) tube that forms part of its mouth).
10. Researchers (研究者（けんきゅうしゃ）) in the United States are studying the humpback whale's (ザトウクジラの) flippers in the hope of developing wind (風力（ふうりょく）) turbines (タービン、原動機（げんどうき）) that can turn even at low wind speeds.

Further Questions&A

11. 3) What are biomimetic researchers in Japan doing?
12. 日本（にほん）のバイオミメテックス（生体模倣技術（せいたいもほうぎじゅつ））の研究者（けんきゅうしゃ）は何（なに）をしていますか。

12. *Researchers are carrying out trials of a nearly painless hypodermic needle with a design based on the mosquito's proboscis.*

13. 4) Why have researchers in the United States been studying the humpback whale?

14. アメリカの研究者(けんきゅうしゃ)はなぜザトウクジラを研究(けんきゅう)しているのですか。

15. *They hope to develop wind turbines that can turn even at low wind speeds.*

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16. Given that natural organisms(有機体(ゆうきたい)) have evolved(進化(しんか)した) over millions(百万(ひゃくまん)) of years, researchers(研究者(けんきゅうしゃ)) in the field of biomimetics can be confident(自信(じしん)がある) that they are imitating(模倣(もほう)している) extremely(極(きわ)めて) efficient(効果(こうか)のある) systems. Nevertheless(にも関(かか)わらず), they face great difficulty(困難(こんなん)) in copying(模倣(もほう)すること) all aspects(外観(がいかん)) of nature's complex(複雑(ふくざつ)な) designs.

17. The makers(製造者(せいぞうしゃ)) of the Stickybot, a robot designed to copy the gecko lizard's(ヤモリの) ability(能力(のうりょく)) to climb(登(のぼ)る) smooth(つるつるの) glass surfaces(表面(ひょうめん)), envisioned(構想(こうそう)する) it being used in search-and-rescue operations. Unfortunately(不運(ふうん)にも), the technological limitations(規制(きせい)) mean the robot can only climb at the expense of speed— unlike(と違(ちが)って) the gecko,

18. which can climb incredibly(信(しん)じられないほど) quickly. Mark Cutkosky, one of the Stickybot's developers(開発者(かいはつしゃ)), admits(認(みと)める) that in order to(～する為(ため)に) build the robot at all, "there are a lot of things about the gecko that we simply(全(まった)く) had to ignore(無視(むし)する)."

Further Questions&A

19. 5) Why are researchers in the field of biomimetics confident about imitating animals?

バイオミメティックス(生体模倣技術(せいたいもほうぎじゅつ))の分野(ぶんや)の研究者(けんきゅうしゃ)はなぜ動物(どうぶつ)の模倣(もほう)について自信(じしん)があるのですか。

20. *Given that natural organisms have evolved over millions of years, researchers in the field of biomimetics can be confident that they are imitating extremely efficient systems.*

21. 6) Why couldn't the Stickybot be used in search and rescue operations?

22. Stickybot はなぜ捜索(そうさく)救助(きゅうじょ)活動(かつどう)に使(つか)われないのですか。

23. *The technological limitations mean that the robot can only climb at the expense of speed—unlike the gecko.*

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24. So far(今(いま)のところ), the number of commercially(商業的(しょうぎょうてき)に) successful(成功(せいこう)した) biomimetic products(製品(せいひん)) has been limited(限定(げんてい)されている). As technology(科学技術(かがくぎじゅつ)) continues to advance(進歩(しんぽ)する), however(しかしながら), biomimetic research may find it easier to catch up with(～に追(お)いつく) nature. Nevertheless(それにも関(かか)わらず), history suggests(暗示(あんじ)する) that they need not only technical skill but also

25. a great deal of(沢山(たくさん)の) persistence(持続性(じぞくせい)). Biomimetic projects(計画(けいかく)) tend(傾向(けいこう)がある) to scare off(おじけづかせる) investors(投資家(とうしか)) because such projects lack clear practical(実用的(じつようてき)な) applications(利用法(りようほう)) and do not guarantee(保証(ほしょう)する) immediate(即時(そくじ)の) gains. One of the earliest biomimetic products, the

adhesive（粘着性（ねんちゃくせい）の） material Velcro, was first developed（開発（かいはつ）された） by George de Mestral in the 1940s. It took years for de Mestral to perfect（完全（かんぜん）にする） the design and decades for a practical application to be found. It was not until the 1970s that Velcro became widely（広（ひろ）く） used.

Further Questions&A

7) Why do biomimetic projects tend to scare off investors?

バイオミメティックス（生体模倣技術（せいたいもほうぎじゅつ））の計画（けいかく）はなぜ投資家（とうしか）をおじけづかせたのですか。

Biomimetic projects tend to scare off investors because such projects lack clear practical applications and do not guarantee immediate gains.

8) What is one example of a successful biomimetic product?

成功（せいこう）したバイオミメティックス（生体模倣技術（せいたいもほうぎじゅつ））製品（せいひん）の一例（いちれい）は何（なに）ですか。

The adhesive material Velcro was one of the earliest biomimetic products.

*Choose the correct answer from these choices.

(35) What has led to the increased interest in biomimetics in recent years?

ここ数年（すうねん）バイオミメティックス（生体模倣技術（せいたいもほうぎじゅつ））についての興味（きょうみ）を増加（ぞうか）させているのは何（なに）ですか。

1. Products based on mosquitoes and humpback whales have experienced commercial（商業的（しょうぎょうてき）な） success（成功）.

2. Scientifically（科学的（かがくてき）に） advanced countries like Japan and the United States are working together to develop biometric products.

3. Investigations（投資家（とうしか）） over the last two decades（１０年間（ねんかん）） have shown that many of Leonardo da Vinci's designs were biometric.

4. Scientists（科学者（かがくしゃ）） from many fields（分野（ぶんや）） are realizing that designs from nature can provide（与（あた）える） them with new products.

(36)The creation of the Stickybot has shown that? Stickybot の創作（そうさく）は以下（いか）のことを示（しめ）している。

1. researchers（研究者（けんきゅうしゃ）） should remember evolution（進化（しんか）） is not perfect（完璧（かんぺき）） and may not always produce designs worth copying.

2. researchers need not include（含（ふく）む） all aspects of natural designs to develop（発展（はってん）させる） products whose overall（全体（ぜんたい）の） performance matches nature.

3. current（現在（げんざい）の） levels of technology can prevent researchers from producing designs as effective（有効（ゆうこう）な） as those found in nature.

4. Geckos are actually（実際（じっさい）に） faster but have worse climbing ability than researchers at first believed.

(37) What challenge do researchers in biomimetics face when attempting to market their products? バイオミメティックス（生体模倣技術（せいたいもほうぎじゅつ））の研究者（けんきゅうしゃ）が彼（かれ）らの発明（はつめい）した製品（せいひん）を市場（しじょう）に広（ひろ）げようと試（こころ）みた時（とき）、どのような試練（しれん）に直面（ちょくめん）しますか。

1. Investors（投資家（とうしか）） are usually only interested in（興味（きょうみ）がある） opportunities（機会（きかい）） that promise profits in the short term.

46. 2. The public（世間（せけん）） reluctant（気（き）の進（すす）まない） to buy biomimetic products as（なので） it is suspicious（疑（うたが）わしい） of new developments（発展（はってん）） in the field（分野（ぶんや）） .

47. 3. Biomimetics has yet to be recognized（認識（にんしき）された） by the wider scientific community as a respectable（尊敬（そんけい）すべき） field of research.

48. 4. Product development（開発（かいはつ）） takes so long that conventional（慣習的（かんしゅうてき）な） products for the same purpose（目的（もくてき）） are usually released first.

Review Questions

49. 1) What did 83 percent of the medal-winning swimmers wear during the 2000Summer Olympics?
They wore Speedo Fastskin swimsuits.

50. 2) What is “biomimetics”?
Biomimetics is the field of research in which product designs are based on phenomena found in nature.

51. 3) What are biomimetic researchers in Japan doing?
Researchers are carrying out trials of a nearly painless hypodermic needle with a design based on the mosquito’s proboscis.

52. 4) Why have researchers in the United States been studying the humpback whale?
They hope to develop wind turbines that can turn even at low wind speeds.

53. 5) Why are researchers in the field of biomimetics confident about imitating animals?
Given that natural organisms have evolved over millions of years, researchers in the field of biomimetics can be confident that they are imitating extremely efficient systems.

54. 6) Why couldn’t the Stickybot be used in search and rescue operations?
The technological limitations mean that the robot can only climb at the expense of speed—unlike the gecko.

55. 7) Why do biomimetic projects tend to scare off investors?
Biomimetic projects tend to scare off investors because such projects lack clear practical applications and do not guarantee immediate gains.

56. 8) What is one example of a successful biomimetic product?
The adhesive material Velcro was one of the earliest biomimetic products.

解答: (35) 4 (36) 3 (37) 1

Type B 日本語訳なし

3[B] – The Natural Way

Version3 GP1 10-2

At the 2000 Summer Olympics in Sydney, 83 percent of the medal-winning swimmers wore the Speedo Fastskin swimsuit. This revolutionary swimsuit allows wearers to glide through the water with much less resistance, thanks to a material designed to mimic the skin of one nature's fastest swimmers, the shark. The Fastskin is an example of "biomimetrics," the field of research in which product designs are based on phenomena found in nature.

Further Questions *Ask student to answer the question on their own at first. If the student can't answer correctly, have him look at the last page and read the "example answer" for the question. Have the student try to memorize the answer, if it's too long or difficult, you should divide the sentence into 2 or 3 parts to make it easier to remember. Once they have memorized the answer, the teacher should ask the question one last time so that the student can practice answering. Also if you find any mistakes, please mark the page and let me know ASAP.

1) What did 83 percent of the medal-winning swimmers wear during the 2000 Summer Olympics?

They wore Speedo Fastskin swimsuits.

2) What is "biomimetrics"?

Biomimetrics is the field of research in which product designs are based on phenomena found in nature.

This is not a new idea—Leonardo da Vinci designed aircraft in the same way—but biomimetrics has taken off only in the last 10 to 15 years as more scientists from a variety of disciplines turn to nature for inspiration. In Japan, for example, researchers are carrying out trials of a nearly painless hypodermic needle with a design based on the mosquito's proboscis (the thin tube that forms part of its mouth). Researchers in the United States are studying the humpback whale's flippers in the hope of developing wind turbines that can turn even at low wind speeds.

Further Questions

3) What are biomimetric researchers in Japan doing?

Researchers are carrying out trials of a nearly painless hypodermic needle with a design based on the mosquito's proboscis.

4) Why have researchers in the United States been studying the humpback whale?

They hope to develop wind turbines that can turn even at low wind speeds.

Given that natural organisms have evolved over millions of years, researchers in the field of biomimetrics can be confident that they are imitating extremely efficient systems. Nevertheless, they face great difficulty in copying all aspects of nature's complex designs. The makers of the Stickybot, a robot designed to copy the gecko lizard's ability to climb smooth glass surfaces, envisioned it being used in search-and-rescue operations. Unfortunately, the technological limitations mean the robot can only climb at the expense of speed—unlike the gecko, which can climb incredibly quickly. Mark Cutkosky, one of the Stickybot's developers,

admits that in order to build the robot at all, “there are a lot of things about the gecko that we simply had to ignore.”

Further Questions

5) Why are researchers in the field of biomimetrics confident about imitating animals?

Given that natural organisms have evolved over millions of years, researchers in the field of biomimetrics can be confident that they are imitating extremely efficient systems.

6) Why couldn’t the Stickybot be used in search and rescue operations?

The technological limitations mean that the robot can only climb at the expense of speed—unlike the gecko.

So far, the number of commercially successful biomimetric products has been limited. As technology continues to advance, however, biomimetric research may find it easier to catch up with nature. Nevertheless, history suggests that they need not only technical skill but also a great deal of persistence. Biomimetric projects tend to scare off investors because such projects lack clear practical applications and do not guarantee immediate gains. One of the earliest biomimetric products, the adhesive material Velcro, was first developed by George de Mestral in the 1940s. It took years for de Mestral to perfect the design and decades for a practical application to be found. It was not until the 1970s that Velcro became widely used.

Further Questions

7) Why do biomimetric projects tend to scare off investors?

Biomimetric projects tend to scare off investors because such projects lack clear practical applications and do not guarantee immediate gains.

8) What is one example of a successful biomimetric product?

The adhesive material Velcro was one of the earliest biomimetric products.

***Choose the correct answer from these choices.**

(35) What has led to the increased interest in biomimetrics in recent years?

1. Products based on mosquitoes and humpback whales have experienced commercial success.
2. Scientifically advanced countries like Japan and the United States are working together to develop biometric products.
3. Investigations over the last two decades have shown that many of Leonardo da Vinci’s designs were biometric.
4. Scientists from many fields are realizing that designs from nature can provide them with new products.

(36) The creation of the Stickybot has shown that?

1. researchers should remember evolution is not perfect and may not always produce designs worth copying.
2. researchers need not include all aspects of natural designs to develop products whose overall performance matches nature.
3. current levels of technology can prevent researchers from producing designs as effective as those found in nature.
4. Geckos are actually faster but have worse climbing ability than researchers at first believed.

(37) What challenge do researchers in biomimetrics face when attempting to market their products?

1. Investors are usually only interested in opportunities that promise profits in the short term.
2. The public reluctant to buy biomimetric products as it is suspicious of new developments in the field.
3. Biomimetrics has yet to be recognized by the wider scientifit community as a respectable field of research.
4. Product development takes so long that conventional products for the same purpose are usually released first.

Answers for "Further Questions"

1) What did 83 percent of the medal-winning swimmers wear during the 2000 Summer Olympics?
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2) What is "biomimetrics"?
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3) What are biomimetric researchers in Japan doing?
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The adhesive material Velcro was one of the earliest biomimetric products.

解答: (35) 4 (36) 3 (37) 1