

平成 20 年度入学者選抜個別(第 2 次)学力検査問題

外国語

注意事項

1. 監督者の指示があるまで、この冊子を開いてはいけません。
2. 解答用紙は、問題冊子と別に印刷されているから、誤らないように注意しなさい。
3. 解答は、必ず解答用紙の指定された欄内に横書きで記入しなさい。
4. 各解答用紙には、受験番号欄が 2 または 4 カ所あります。それぞれ記入を忘れないこと。
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6. 問題冊子は、全部で 8 ページであり、第 1 ～ 3 ページは下書用紙です。下書用紙は切り離してはいけません。
7. 問題は、第 4 ページと第 5 ページの間に、はさみこんであります。
8. 落丁または印刷の不鮮明な箇所があれば申し出なさい。

外 国 語

次の英文は *Science* 誌(2007年6月15日)に掲載された, Ann Gibbons 氏の記事 “Food for Thought” を一部改変したものです。この文章をよく読んで, 問題 **1** から **6** に答えなさい。解答は解答用紙の指定された欄に記入すること。

*印のついている語句の注は本文のあとに示されています。

Richard Wrangham was lying beside a fire at home on a cold winter night 10 years ago when his mind *wandered* to the first hominids* to cook food. As a Harvard University primatologist* who studies wild chimpanzees in Africa, Wrangham knew that cooking is one of the few *uniquely* human abilities. He also knew that our habit of preparing our food by heating it allows us to spend less energy on digestion. And he suddenly realized that cooking is not merely the basis of *culinary* culture. It ⁽¹⁾ would have given our ancestors a big evolutionary advantage. He argues that cooking *paved the way* for the dramatic expansion of the human brain and eventually *fueled* intellectual accomplishments such as cave painting, writing symphonies, and inventing the Internet. In fact, Wrangham presents cooking as one of the answers to a long-standing riddle in human evolution: Where did humans get the extra energy to support their large brains?

Expanding the brain demands a new supply of energy, because human brains are *voracious*. The brain consumes 60% of the energy expended by a resting newborn baby. And a resting adult's brain uses 25% of its energy, as opposed to 8% used on average by ape brains. But humans consume about the same amount of calories as smaller-brained mammals of similar body size.

One classic explanation is that humans saved energy by shrinking their digestive organs, effectively trading brains for *guts* as they ⁽²⁾ shifted to a higher quality diet of more meat. That theory is now gathering additional support.

Wrangham thinks that in addition, our ancestors got cooking, giving them the same number of calories for less effort.

Other researchers are enthusiastic about the new results. But many aren't convinced by Wrangham's arguments that the first cooked meal was prepared 1.9 million to 1.6 million years ago, when the brain began to expand dramatically in *Homo erectus* (*H. erectus**). They think that although saving energy by shrinking the gut may have been important, the culinary explosion came later, perhaps during the evolution of our own species less than half a million years ago.

Even those unsure about the role of cooking in human evolution agree that something crucial must have happened to our ancestors' energy budget. Line up the skulls of early hominids and you'll see why: From 1.9 million to 200,000 years ago, our ancestors tripled their brain size.

The earliest members of the human family, including the Australopithecines* that lived from 4 million to 1.2 million years ago, had brains about the size of chimpanzees. The brain didn't expand significantly until just after *H. erectus* appeared in Africa about 1.9 million years ago, with a brain that eventually averaged 1000 cc, or about twice the size of a chimpanzee's. The next increase in brain capacity came 500,000 to 200,000 years ago with the evolution of our own species, whose brains average 1300 cc, and of Neanderthals (1500 cc).

What *spurred* this dramatic growth in the *H. erectus* skull? Meat, according to a longstanding body of evidence. The first stone tools appear about 2.7 million years ago, along with evidence that hominids were using them⁽³⁾ to cut up animals they had killed. But big changes don't appear in human anatomy until more than 1 million years later, when a 1.6-million-year-old skull of *H. erectus* shows it was twice the size of an Australopithecine's skull, says anthropologist Alan Walker. At about that time, archaeological sites show that *H. erectus* was moving animal bodies to campsites for further preparation and sharing; its teeth, jaws, and guts all got smaller. The traditional explanation is that *H. erectus* was a better hunter and ate more raw meat than its small-brained ancestors.

⁽⁷⁾ But a diet high in raw meat alone isn't enough to account for these dramatic changes, says Wrangham. He notes that *H. erectus* had small teeth — smaller than those of its ancestors — unlike other *carnivores* that adapted to eating raw meat by increasing tooth size. He argues that whereas earlier ancestors ate raw meat, *H. erectus* must have been cooking it. “Cooking produces soft, energy-rich foods,” he says.

To support his ideas, Wrangham went to the lab to measure the nutritional impact of cooking. He found almost nothing in food science literature and began to work with physiologist* Stephen Secor, who studies digestive physiology in animals. Secor's team fed 24 snakes one of four diets consisting of the same number of calories of beef: cooked ground beef, cooked intact beef, raw ground beef, or raw intact beef. Then they estimated the energy the snakes consumed before, during, and after they digested the meat. Snakes fed cooked beef spent 12.7% less energy digesting it and 23.4% less energy if the meat was both cooked and ground. “By eating cooked meat, less energy is expended on digestion; therefore, more energy can be used for other activities and growth,” says Secor.

Secor also helped Wrangham design a study in which they found that mice raised on cooked meat gained 29% more weight than mice fed raw meat over 5 weeks. The mice eating cooked food were also 4% longer on average, according to early results. Mice that ate raw *chow* weighed less even though they consumed more calories than those fed cooked food.

⁽⁴⁾ The heat from cooking makes the food easier to chew, and the calories in the food easier to absorb. This translates into less time spent chewing: Chimpanzees spend 5 hours on average chewing their food whereas hunter-gatherers who cook spend 1 hour chewing per day.

The immediate changes in body sizes in the mice also suggest that our ancestors would have been able to get rapid benefits out of cooking, says Wrangham. That's why he thinks there would be little time between learning to cook and seeing anatomical changes in humans — and why he thinks early

H. erectus must have been cooking. Less chewing would lead to smaller jaws and teeth, as well as to a reduction in gut size — changes seen in *H. erectus*. Those changes would be favored by selection.

Wrangham's analysis of nutritional, archaeological, and primatological data adds up to a hypothesis that hot cuisine fueled the brain. "It's such a nice explanation," says anthropologist Leslie Aiello. She says the smaller teeth in *H. erectus* indicate to her that it wasn't chewing much tough raw food: "Something ⁽⁵⁾ must be going on. If only there were evidence for fire."

And that's the stumbling block to Wrangham's theories: Cooking requires fire. Clear evidence of habitual cooking requires stone hearths or even clay cooking pots. Solid evidence for hearths, with stones or bones circling patches of dark ground or ash, has been found no earlier than 250,000 years ago in several sites in southern Europe. Burned bones, stones, ash, and charcoal 300,000 to 500,000 years ago have also been assigned to hearths. And burned flints*, seeds, and wood found in a hearth-like pattern have been cited as signs of controlled fire 790,000 years ago. But even the earliest of those dates are long after the dramatic anatomical changes seen in *H. erectus*, says Wrangham. He notes that evidence for fire is often ambiguous and argues that humans were roasting meat and roots around the campfire as early as 1.9 million years ago.

Indeed, there are a dozen claims for campfires almost that ancient. Anthropologist Jack Harris has presented evidence of burned stone tools 1.5 million years ago, along with burned clay at two sites. *H. erectus* has been found at both sites. Claims by other researchers include animal bones burned at high temperatures 1.5 million years ago, and clay burnt at high temperatures 1.4 million years ago. But where there is smoke there isn't necessarily cooking fire: None of these teams can rule out beyond a doubt that the burns came from natural fires, although Harris argues that cooking fires burn hot at 600 °C to 800 °C and leave a trail different from that of bush fires, which often burn as low as 100 °C.

All the same, those most familiar with *H. erectus* aren't convinced they were chefs. Walker says that if the species was cooking with fire, he and others should have found campfires associated with its bones and stone tools. Others agree: Loring Brace notes that less than 200,000 years ago is about the time evidence appears for earth-oven cookery: "While fire has been under control back near 800,000 years, its use in the systematic preparation of food has only been over the last 100,000-plus years."

Others think that cooking may have played an important role early on, along with other adaptations to expand human brainpower. As Aiello observes, the big brain was apparently the lucky accident of several converging factors that accentuate each other. Critical sources of energy to fuel the brain came from several sources — more meat, reduced guts, cooking, and perhaps more efficient upright walking and running. The order in which our ancestors adopted these energy-saving adaptations is under hot debate, with the timing for cooking hardest to test.

注

hominids	ヒト
primatologist	霊長類学者
<i>H. erectus</i>	ホモ・エレクトス
Australopithecines	アウストラロピテクス属
physiologist	生理学者
flints	火打石

問題

1 The following words appear in italics in the text. On the answer sheet, circle the letter indicating the best definition for each italicized word (based on how the word is used in the text).

wander

- | | | |
|-----------|------------|----------|
| a) admire | b) defect | c) drift |
| d) plunge | e) suspect | |

uniquely

- | | | |
|----------------|---------------|--------------|
| a) exclusively | b) frequently | c) onerously |
| d) properly | e) unlikely | |

culinary

- | | | |
|-----------------|------------|-------------|
| a) advanced | b) ancient | c) communal |
| d) contemporary | e) cooking | |

pave the way

- | | | |
|-------------|------------|---------|
| a) advocate | b) delay | c) halt |
| d) prepare | e) prevent | |

fuel

- | | | |
|------------|--------------|------------|
| a) achieve | b) exploit | c) inhibit |
| d) praise | e) stimulate | |

voracious

- | | | |
|--------------|---------------|--------------|
| a) fragile | b) hungry | c) ponderous |
| d) sensitive | e) vulnerable | |

gut

- | | | |
|-----------|----------|----------|
| a) bowel | b) brain | c) heart |
| d) kidney | e) lung | |

spur

- | | | |
|-----------|------------|------------|
| a) arrest | b) cause | c) control |
| d) slow | e) suggest | |

carnivore

- a) animal b) clown c) dinosaur
d) meat-eater e) vegetarian

chow

- a) chalk b) fish c) food
d) oatmeal e) vitamins

2 *What do the following words, which are underlined in the text, refer to? Answer using one or two English words.*

- (1) It
(2) they
(3) them
(4) they
(5) it

3 *According to the text, decide whether the following statements are true (T) or false (F). For each statement circle the correct answer on the answer sheet.*

- (1) One example of a skill only humans have developed is cooking.
(2) Cooking meat gave *H. erectus* a better chance of survival.
(3) A resting newborn baby's brain uses three-fifths of its energy.
(4) Wrangham's theory opposes the accepted fact that the hominid brain was an energy-consuming organ.
(5) Human calorie intake is more than that of a smaller-brained mammal of similar body size.

- (6) Cooking can be regarded as a process for predigesting food for the human body.
- (7) Nobody knows with certainty where early humans got the extra energy to support their large brains.
- (8) Almost all scientists agree with Wrangham's hypothesis regarding heated food and the growth in *H. erectus*' brain.
- (9) The brain size of human ancestors had a remarkable growth in size from 1.9 million to 1.6 million years ago.
- (10) The brain of Neanderthals averaged about triple the size of a chimpanzee's.
- (11) According to the traditional explanation, the reason why *H. erectus* had smaller teeth, jaws, and guts than its small-brained ancestors is that it started eating cooked meat.
- (12) Wrangham found a lot of support for his ideas in food science literature.
- (13) In the study of energy consumption during digestion, Secor's team used four different types of snake, each of which preferred cooked ground, cooked intact, raw ground, and raw intact beef respectively.
- (14) Studies of snakes and mice suggest that eating cooked food may lead to more weight gain than eating raw food.
- (15) Wrangham believes it's difficult for us to be certain whether or not cooking occurred at the sites of early fires.
- (16) Cooking fires usually burn at about 700 °C, whereas wild fires often only reach about 100 °C.
- (17) Aiello believes, along with Wrangham, that eating cooked meat was the main reason for the increase in size of the early human brain.
- (18) The dates for solid evidence for cooking closely match the dates when the dramatic anatomical changes in the human brain occurred.
- (19) As cooked meat entered *H. erectus*' diet, the early human brain and stomach increased in size.
- (20) Wrangham's hypothesis is backed up primarily by archaeological finds.

4 **BRIEFLY** (5 to 20 words) answer the following questions in your own words, using complete English sentences.

- (1) Why does Wrangham think it is important to note that *H. erectus* had small teeth?
- (2) Summarize Aiello's thoughts on how human ancestors were able to develop large brains.
- (3) What is the main reason some specialists on *H. erectus* argue against Wrangham's hypothesis?

5 下線部(ア)と(イ)を日本語に訳しなさい。

6 この文章で説明されている, Wrangham (ランガム)の仮説およびそれに対する異論を 300 字以内で要約しなさい。