（平成 27 年度前期日程）

英　　語

90　分

注　意　事　項

1. 試験開始の合図までこの冊子を開かないこと。
2. 本問題冊子は 14 ページ，答案用紙は 2 ページである。
3. 各答案用紙の上の枠内には，受験番号を記入し，その右側の枠内には，受験番号の下 2 桁の数字を忘れずに記入すること。
4. 解答はすべて各答案用紙の所定の欄に記入すること。
5. 問題冊子および答案用紙は切りはなさないこと。
6. 答案用紙に記入する受験番号の数字の字体は，下記の例にならい，明瞭に記入すること。

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試験問題は、つぎのページより始まります。

I　次の英文を読んで，以下の設問に答えよ。(80点)

To villagers in medieval Europe, nightfall was so terrifying that we can scarcely imagine it today. At the first hints of sunset, farmers raced to get inside a city's walls before they were locked at night. Anyone not fast enough would have to survive the dark hours in the wilderness alone, fending off robbers, wolves, and the ghosts and devils they believed were lurking around every corner.

The cities weren't much safer. If you found yourself on the streets at night, it would be logical to assume that everyone you met wanted to rob or kill you. It was best to be on your guard.

After nightfall, "clashes of all sorts became likely when tempers were shortest, fears greatest, and eyesight weakest," says Roger Ekirch, a historian at Virginia Tech University. In his research on the history of nighttime, he found stories of servants stabbing each other in the armpit and merchants getting into sword fights with their neighbors on the streets of London — all a common part of life after dark.

The hours of the night were so different from the day that they had their own culture. Townspeople who proudly fended for themselves during the day obeyed curfews[*1] at night, literally locking themselves into their homes. Rural farmers who would never see an ocean in their lifetimes knew how to tell time and direction from the stars, just like sailors. Monarchs and bishops impressed audiences by putting on elaborate ceremonies and dances, lit by hundreds of torches. These shows dazzled the eyes of peasants who used stinky, smoky, and dim candles to light their own small houses.

Yet as Ekirch did his research during the 1980s and 1990s, leafing through old parchments to look for clues about the night, something puzzled him. He kept noticing strange references to sleep.

In *The Canterbury Tales*[*2], for instance, one of the characters in "The

Squire's Tale" wakes up in the early morning after her "first sleep" and then goes back to bed. A 15th-century medical book told readers to spend the "first sleep" on their right side, and after that to lie on their left. And a scholar in England wrote that the time between the "first sleep" and the "second sleep" was the best time for serious study.

Mentions of these two separate types of sleep kept coming up. Finally Ekirch could no longer ignore the clues. Sleep, he realized, wasn't always accomplished in one long block.

Ekirch had rediscovered a fact of life that was once as ordinary as eating breakfast. Every night, people fell asleep not long after the sun went down and slept until sometime after midnight. This was the "first sleep" that kept popping up in old tales. Once a person woke up, he or she would stay awake for an hour or two before going back to sleep until morning — the so-called second sleep.

Waking up between the two periods of sleep was a normal part of the night. Depending on your needs, you might spend this time on activities such as praying, reading, thinking about your dreams, or using the bathroom.

Ekirch was uncovering a pile of evidence that how we sleep today is nothing like how our ancestors slept. Meanwhile, about 300 miles away, a psychiatrist was noticing something odd in a research experiment.

A

Thomas Wehr, who worked for the National Institute of Mental Health in Maryland, wondered if the artificial light we see every day could be affecting our sleep habits. So he set up a simple experiment: he would keep people away from artificial light and see what happened. He hoped this would recreate the lighting conditions that were normal for earlier generations of humans.

B

Without lightbulbs, televisions, or street lamps, the subjects in his experiment at first did nothing at night but sleep. They spent the first few weeks of the experiment like kids in a candy store, making up for all of the sleep

they'd lost by staying out late at night or getting to work early in the morning. After a few weeks, they may have been better rested than at any other time in their lives.

C

It was the same sort of two-part sleep that Ekirch had found in the historical records. While they were kept away from artificial light, subjects were forgetting the one-long-block sleep habit they'd formed over a lifetime. Not long after Wehr published his findings, Ekirch got in touch and told him what his own research had revealed.

D

Wehr soon decided to investigate more. Once again, he blocked subjects from artificial light. This time, however, he took some of their blood during the night. Was there anything significant about the time between the first and second sleep, or was it just an opportunity for medieval peasants to get up and use the bathroom?

E

The results showed that the hour humans once spent awake in the middle of the night was probably the most relaxing block of time in their lives.

F

Chemically, the subjects' bodies looked like they had just spent a day resting at the spa. During the time between the two sleeps, their brains pumped out extra prolactin, a hormone that helps reduce stress. The subjects in Wehr's study said that the time between the two halves of sleep felt like a period of meditation.

Many other studies have shown that splitting sleep into two roughly equal halves is something that our bodies will do if we give them a chance. In parts of the world where there isn't any artificial light — or all the things that go with it, like computers, movies, and bad reality TV shows — people still sleep this way. In the mid-1960s, anthropologists studying the Tiv culture[*3] in central Nigeria found that group members not only slept in two periods, but also used roughly

the same names of "first sleep" and "second sleep."

You would think that learning our modern sleep habits are different from our natural wiring would be a pretty big deal. But almost two decades after Wehr's study was published in a medical journal, many sleep researchers — not to mention your average doctor — have never heard of it. People see waking up in the middle of the night as a sign that something is wrong.

Why do roughly six billion humans sleep in a way that's opposite to what worked for millions of years? (2) Because of a single product. Once revolutionary, it now costs less than two dollars: the lightbulb.

Like countless other items in modern life that we take for granted, the lightbulb started out in northern New Jersey, in a complex of worn brick buildings surrounded by a black metal fence. Here, an inventor named Thomas Alva Edison created the little glass orbs that changed how we sleep.

Some artificial lights were in use before Edison came around. In 1736 the city of London took a giant leap forward by installing 5,000 gaslights in its streets. This calmed the city's fear of the dark, and allowed shopkeepers to stay open past 10 o'clock at night for the first time.

Other cities followed. By the beginning of the Civil War*4, there were so many gas lamps on the streets of New York City that going out at night was just as common as going out during the day. Theaters, operas, and saloons lit by gaslights stayed open until the early morning. Well-lit streets promised a safe ride home. Homes, too, glowed from the light of flames.

Yet before Edison developed his lightbulb, all the world's artificial light was like the brightness of a match compared to the lights of Times Square*5.

Edison's career as an inventor began when, as a bored teenage telegraph operator in the 1860s, he tried to come up with ways to send more than one message at a time on the machine. A few years later he made a name for himself by inventing the phonograph. He didn't quite realize how popular his invention would be. (In fact, this became a pattern in Edison's life.)

Around this time, French inventors installed "arc light" — so called because it sent currents on an arc across a gap — on the streets of Lyon, France. The light wasn't anything you would want in your kitchen, unless you wanted to burn the house down. (3) Arc light was a barely controlled ball of current. It was closer to the intense, white light from a welder's torch*6 than the soft glow of the bulb in your refrigerator.

The contraption generated plenty of light, but it wasn't pretty. In Indiana, four arc lights installed on top of a city's courthouse were said to be bright enough to light up cows five miles away. The town of San Jose, California, built a 20-story tower and put arc lights on it. Confused birds crashed into it and eventually ended up on the tables of the city's restaurants.

Armed with a little fame and money from inventing the phonograph, Edison set out to invent a better kind of artificial light than the arc lamp. His goal was to make a light simple enough that a child could operate it and safe enough that accidentally leaving it on all night wouldn't start a fire. He designed a lightbulb that glowed from electric currents passing through a U-shaped wire set in a vacuum, which essentially kept it from melting or catching on fire.

Edison's light became the standard of the world because it was cheap, safe, and just powerful enough to be comfortable. The lightbulb wasn't so bright that it could reach cows a few miles away. But it had an even, steady glow that could illuminate a living room full of guests. A few years after its invention, a parade of men walked down the streets of New York wearing lightbulbs on their heads to show that light no longer had to come from flames.

Thanks to Edison, sunset no longer meant the end of your social life; now it marked the beginning of it. Night stopped being scary and became the time when all the good stuff happens. Life could function just as well at 11 o'clock at night as at 11 in the morning.

The world responded to these extra hours of possibility like college students respond to spending their first month in a dorm. Sleep became less important than socializing and working — and it has never regained its former place.

Factories realized that they could now produce twice as much. All they had to do was employ a second group of workers overnight and keep the lights on. Twenty years after Edison invented lightbulbs, they were hanging from the ceilings of assembly lines where some of the first "graveyard-shift[*7]" workers tried to stay awake on the job. We no longer needed to stop working just because the sun went down.

Edison saw no problem as he watched the natural rhythms of sleep change for good. For a reason that was never quite clear, he thought sleep was bad for you.

Extra sleep — that is, anything more than three or four hours a night, which is how much Edison claimed to sleep himself — made a person "unhealthy and inefficient," he said. Edison saw his lightbulb as healthful. He believed that all one had to do was "put an undeveloped human being into an environment where there is artificial light and he will improve."

Life, in Edison's eyes, was like an assembly line. Stopping to rest was just wasting time. Not that Edison needed any less sleep than the rest of us do. He napped throughout the day and night, sometimes falling asleep on a workbench in his laboratory (and then claiming the next day that he had worked through the night). Visitors to his lab in Menlo Park can still see his small cot and pillow tucked away in a corner.

Now, about a hundred years later, we have so much artificial light that we can't escape it. After a 1994 earthquake knocked out the power in Los Angeles, some residents called the police to report a strange "giant, silvery cloud" in the sky above them. It was the Milky Way. They had never seen it before.

In fact, two-thirds of the population of the United States — and half the population of Europe — live in areas where it's too bright at night to see the Milky Way with the naked eye. In the United States, 99 out of every 100 people live in an area with light pollution. That's what astronomers call it when 人工的な明かりが、夜空を自然のままならばそうであるだろうより10倍以上明るくしている[4].

If all lights did was make it easier to find things at night, there wouldn't be much to complain about. But when we introduced bright lights into the hours when it's supposed to be dark, we threw a wrench into ecosystems around the world. (5)

As many as 10,000 confused birds — which, like moths, are attracted to bright lights — die each year after slamming into glowing skyscrapers in Manhattan. More than 100 million birds crash into brightly lit buildings across North America every year. Biologists now believe artificial light is a threat to many kinds of life, from sea turtles to frogs to trees.

Just like every other living being, you too are affected by the glow of streetlamps and skyscrapers.

Electric light at night messes with your "circadian clock." This is what scientists call the natural rhythms that living things have developed over time. When you see enough bright light at night, your brain interprets it as sunlight, because it doesn't know any better. Your body reacts the same way it does to sunshine, sending out signals to try to keep itself awake. This delays the nightly maintenance work your body does, cleaning up and rebuilding cells while you're asleep. And too much artificial light can stop your body from releasing melatonin, a hormone that helps control sleep.

Sleeping badly is just one symptom of a broken body clock. Circadian rhythms may control as many as 15 percent of our genes. When those genes don't work correctly, thanks to artificial lights, all kinds of health problems can result. Studies have found possible connections between seeing too much light at night and depression, heart disease, diabetes, obesity, and even cancer.

Scientists are working to find out more about how artificial light affects our health and how we can keep our circadian clocks ticking along properly. In the meantime, people will keep waking and sleeping in time with the new patterns created by Edison's invention. Wehr, the sleep researcher, says, "We are living in an experiment."

*1 curfews　夜間外出禁止命令

*2 *The Canterbury Tales*　『カンタベリー物語』。14 世紀末のイングランドで書かれた物語集。"The Squire's Tale" は収録された物語の一つ。

*3 the Tiv culture　(ナイジェリアに住む)ティブ族の文化

*4 the Civil War　(米国の)南北戦争(1861–1865)

*5 Times Square　ニューヨーク市中心部にある繁華街

*6 a welder's torch　溶接トーチ

*7 graveyard-shift　深夜勤務の

[Adapted from David K. Randall, "A Tale of Two Sleeps," *Muse*, May/June 2013, 6–12.]

I –1. 下線部(1)を日本語に訳せ。

I –2. 下線部(2)は何を指すか。日本語で説明せよ。

I –3. 下線部(3)を日本語に訳せ。

I –4. 下線部(4)を英語に訳せ。

I –5. 下線部(5)は何を意味しているか。本文中の例を使って，日本語で説明せよ。

I-6. 次のパラグラフを入れるのにもっとも適切な場所を文中の [A] から [F] の中から選び，記号で答えよ。

That was when the experiment took a strange turn. Soon, the subjects began to stir a little after midnight. They'd lie awake in bed for an hour or so, then fall back asleep again.

I-7. 次の1から15の文から，本文の内容に一致するもの4つを選び，番号で答えよ。

1. In medieval Europe, even villagers living far from the sea were skilled in telling their fortunes from the stars.
2. Peasants in the Middle Ages must have been amazed by the brightly lit ceremonies when they were put on by the rulers.
3. A medical book written in the 15th century advised readers to change the location of the bed after they woke up from their "first sleep."
4. Roger Ekirch noticed that it was not really common in medieval Europe to have the two halves of one's sleep in a single block of flats.
5. Though splitting up sleep is thought to be quite natural for our body, it has not been practiced outside Europe.
6. Before Edison invented the lightbulb it was almost impossible for shopkeepers in London to keep their doors open after ten o'clock at night.
7. Edison was so bored while working as a telegraph operator in the 1860s that he set out to invent a new kind of artificial light.
8. Some people said that arc lights installed on top of a building in an American town were so bright that the light could reach things five miles away.
9. The glowing wire in Edison's lightbulb did not melt or catch fire because it was formed like the letter "U".

10. The light invented by Edison was inexpensive, safe, and bright enough to illuminate a room, so it became the world standard.

11. It can be inferred from the article that new college students tend to sleep longer for a month after they have settled into a dormitory.

12. The normal work hours of factory laborers became twice as long when electric lighting was introduced.

13. Bright electric lights, except for arc lights, are so confusing that they attract wild birds which crash into buildings at night.

14. If you were shut up in a brightly lit room for several days, you would know with accuracy when the day begins and ends because the circadian clock is controlled by genes.

15. Too much exposure to artificial light at night may be a cause of mental as well as physical problems.

II　次の英文を読んで，以下の設問に答えよ。(70 点)

We are being flooded every day with computational findings, conclusions, and statistics. In op-eds[*1], policy debates, and public discussions, numbers are presented with the finality of a door slammed shut. In fact we need to know how these findings were reached, so we can evaluate their relevance, their credibility, resolve conflicts when they differ, and make better decisions. (1) Even figuring out where a number came from is a challenge, let alone trying to understand how it was determined.

This is important because of how we reason. In the thousands of decisions we make each day, seldom do we engage in a deliberately rational process anything like gathering relevant information, distilling it into useful knowledge, and comparing options. In most situations, standing around weighing pros against cons is a pretty good way to ensure defeat, either metaphorical or real, and miss out on pleasures in life. So of course we don't very often do it; instead, we make quick decisions based on instinct, intuition, heuristics, and shortcuts honed over millions of years.

Computers, however, are very good at components of the decision-making process that we're not: They can store vast amounts of data accurately, organize and filter it, carry out blindingly fast computations, and beautifully display the results. Computers can't (yet?) direct problem solving or contextualize findings, but for certain important sets of questions they are invaluable in enabling us to make much more informed decisions. They operate at scales our brains can't, and they make it possible to tackle problems at ever greater levels of complexity.

The goal of better decision making is behind the current excitement surrounding big data, the emergence of "evidence-based" everything — policy, medicine, practice, management, and issues such as climate change, fiscal predictions, health assessment, even what information you are exposed to online. (2) The field of statistics has been addressing the reliability of results derived from data for a long time, with many successful contributions.

The scientific method suggests skepticism[*2] when interpreting conclusions and a responsibility to communicate scientific findings transparently so others may evaluate and understand the result. We need to bring these notions into our everyday expectations when presented with new computational results. We should be able to dig in and find out where the statistics came from, how they were computed, and why we should believe them. [(3)]結果が公表されるとき，そうした考え方はほとんど考慮されない。

I'm not saying we should independently verify every fact that enters our daily life — there just isn't enough time, even if we wanted to — but the ability should exist where possible, especially for knowledge generated with the help of computers. Even if no one actually tries to follow the chain of reasoning and calculations, more care will be taken when generating the findings when the potential for inspection exists. If only a small number of people look into the reasoning behind results, they might find issues, provide needed context, or be able to confirm their acceptance of the finding as is. In most cases, the technology exists to make this possible.

Here's an example. When news articles started appearing on the World Wide Web in the 1990s, I remember eagerly anticipating hot-linked statistics — being able to click on any number in the text to see where it came from. More than a decade later, [(4)]this still isn't routine, and facts are asserted without the possibility of verification. For any conclusions that enter the public sphere, it should be expected that all the steps that generated the knowledge are disclosed, including making the data they're based on available for inspection whenever possible and making available the computer programs that carried out the data analysis — open data, open source, scientific reproducibility.

Without the ability to question findings, we risk fooling ourselves into thinking we are capitalizing on the Information Age when we're really just making decisions based on evidence that no one, except perhaps the people who generated it, can actually understand. That's the door closing.

*1 op-ed: a newspaper page opposite the editorial page, devoted to personal opinions

*2 skepticism: an attitude that questions or doubts accepted opinions

[Adapted from Victoria Stodden, "Where Did You Get That Fact?" *What Should We Be Worried About? Real Scenarios That Keep Scientists Up at Night.* Ed. John Brockman. New York: Harper-Perennial, 2014, 340－42.]

II-1. 下線部(1)を日本語に訳せ。

II-2. 下線部(2)を日本語に訳せ。

II-3. 下線部(3)を英語に訳せ。

II-4. 下線部(4) this の指す内容を日本語で簡潔に説明せよ。

II-5. 以下の(1)から(4)の答えとしてもっとも適切なものをAからEの中から選び、記号で答えよ。

(1) In paragraph 1, what does "a door slammed shut" refer to?

A. lack of sufficient time to research how facts were derived

B. narrow-minded refusal to consider any numerical data

C. our embarrassment about our grasp of complex data

D. our inability to enjoy life if we are constantly analyzing data

E. overconfidence in popular discourse when it comes to numerical data

(2) In paragraph 4, why is the phrase "evidence-based" in quotation marks?

A. The author is critical of the term "evidence-based."

B. The author is emphasizing the importance of evidence.

C. The author is indicating that the term "evidence-based" is of foreign origin.

D. The author is repeating what a famous person said.

E. The author is uncertain of the meaning of "evidence-based."

(3) Which statement is **NOT** mentioned in the text regarding the implications of applying the scientific method to the use of data?

A. We would be suspicious of data that lacked transparency regarding its origins.

B. We would discuss the trustworthiness of the data as a matter of course.

C. We would expect others to be able to find the same results using the same raw data, calculations, and analytical methods.

D. We would rely on evaluations of the accuracy, validity, and reliability of data.

E. We would sue those who concealed their data collection and analysis procedures.

(4) Which of the following worries the author most?

A. Artificial intelligence may result in statisticians losing their jobs.

B. Humans rely on mental shortcuts to make quick decisions.

C. It is often difficult to check how data has been produced.

D. Many people do not consult the World Wide Web when making decisions.

E. The capacity of the human brain to process large amounts of data is limited.