京都大学

平成27年度入学試験問題

外国語

英語

150点満点

≪配点は，学生募集要項に記載のとおり。≫

（注　意）

1. 問題冊子および解答冊子は係員の指示があるまで開かないこと。
2. 問題冊子は表紙のほかに7ページ，解答冊子は表紙のほかに12ページある。
3. 問題は全部で3題ある（1～7ページ）。
4. 試験開始後，解答冊子の表紙所定欄に学部名・受験番号・氏名をはっきり記入すること。表紙には，これら以外のことを書いてはならない。
5. 解答は，すべて解答冊子の指定された箇所に記入すること。
6. 解答に関係のないことを書いた答案は無効にすることがある。
7. 解答冊子は，どのページも切り離してはならない。
8. 問題冊子は持ち帰ってもよいが，解答冊子は持ち帰ってはならない。

I 次の文章を読み，下の設問(1)~(3)に答えなさい。 (50 点)

The properties of a piece of matter are defined not by the basic building blocks themselves but by the way they are organised into hierarchies. This paradigm — where structure defines function — is one of the overarching principles of biological systems, and the key to their innate ability to grow, self-repair, and morph into new functions. Spider silk is one of the most remarkable examples of nature's materials, created from a simple protein spun into fibres stronger than steel.

As we begin to appreciate the universal importance of hierarchies, engineers are applying this understanding to the design of synthetic materials and devices. They can gain inspiration from a surprising source: music.

In the world of music, a limited set of tones is the starting point for melodies, which in turn are arranged into complex structures to create symphonies. Think of an orchestra, where each instrument plays a relatively simple series of tones. (1) Only when combined do these tones become the complex sound we call classical music. Essentially, music is just one example of a hierarchical system, where patterns are nested within larger patterns — similar to the way words form sentences, then chapters and eventually a novel.

Composers have exploited the concept of hierarchies for thousands of years, perhaps unknowingly, but only recently have these systems been understood mathematically. This maths shows that the principles of musical composition are shared by many seemingly diverse hierarchical systems, suggesting many exciting avenues to explore. From the basic physics of string theory* to complex biological materials, different functions arise from a small number of universal building blocks. I call this the universality-diversity-paradigm.

Nature uses (2) this paradigm to design its materials, creating new functions via novel structures, built using existing building blocks rather than fresh ones. Yet through the ages humans have relied on a totally different approach to construct our world, introducing a new building block, or material, when a new function is required.

It is not the building block itself that is limiting our ability to create better, more durable or stronger materials, but rather our inability to control the way these building blocks are arranged. To overcome this limitation, I am trying to design new materials in a similar way to nature. In my lab we are using the hidden structures of music to create artificial materials such as designer silks and other materials for medical and engineering applications. We want to find out if we can reformulate the design of a material using the concept of tones, melodies and rhythms.

Our brains have a natural capacity for dealing with the hierarchical structure of music, a talent that may unlock a greater creative potential for understanding and designing artificial materials. For example, in recent work we designed different sequences of amino acids based on naturally occurring ones, introducing variations to create our own materials with better properties. However, the way in which the different sequences of amino acids interact to form fibres is largely a mystery and is difficult to observe in an experiment. To gain more understanding, we translated the process by which sequences of amino acids are spun into silk fibres into musical compositions.

In this translation from silk to music, we replaced the protein's building blocks (sequences of amino acids) with corresponding musical building blocks (tones and melody). As the music was played, we could "listen" to the amino acid sequences we had designed, and deduce how certain qualities of the material, such as its mechanical strength, appear in the musical space. (3) Listening to the music improved our understanding of the mechanism by which the chains of amino acids interact to form a material during the silk-spinning process. The chains of amino acids that formed silk fibres of poor quality, for example, translated into music that was aggressive and harsh, while the ones that formed better fibres sounded softer and more fluid, as they were derived from a more interwoven network. In future work we hope to improve the design of the silk by enhancing those musical qualities that reflect better properties — that is, to emphasise softer, more fluid and interwoven melodies.

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*string theory　ひも理論

(1)　下線部(1)を和訳しなさい。

(2)　下線部(2)が指している内容を，本文の主旨に照らして日本語 30～50 字で述べなさい(句読点を含む)。

(3)　下線部(3)を和訳しなさい。

白　紙

Ⅱ 次の文章を読み，下の設問(1)～(3)に答えなさい。 (50点)

Considering its history, you'd have thought that by now problems with *nothing* were a thing of the past, sorted out well before the end of the seventeenth century, and that thereafter *nothing* was nothing to talk about and certainly nothing to worry about.

Apparently not. Far from it, in fact. Not only does *nothing* remain a mystery, but (and possibly because of it)—*nothing* also keeps on making an appearance in virtually every walk of life, even when we don't notice. (1)

But then how could we notice *nothing*? That, surely, is the point of *nothing*: it is . . . nothing. Yet there it is, alive and well, and still, obstinately, as far away as ever from being understood, despite our advances in science, technology, and most spectacularly our ability to gather information and knowledge. In some way, in fact, it is even more of a mystery, precisely because we know so much about everything else. Since it follows that the more we know, the less we don't know, we are left with one of those strange paradoxes that the more we know about everything, the less we know about *nothing*. (2)

And let's face it: *nothing* just doesn't make sense, and because of that it's more than annoying—an affront to those who are endeavoring to understand the world.

If in the past the powers-that-be discouraged people to even think about it, today *nothing* is well out of the closet. (ア) out from the recesses of forbidden thought to an honored place within the hallowed halls of philosophy and religion, and finally into the wide world, *nothing* has been widely taken on board by the arts, almost to the point of obsession. Whether in film, television, music, literature, theatre or visual art, the search for *nothing* (and so to understand it) is there, sometimes on the surface, at other times below, as if *nothing* is the holy grail through which everything will be better understood.

For the arts, *nothing* seems to be the last frontier, the one windmill that blocks the way to depicting everything, the ultimate mystery that needs to be solved. With everyone trying to disprove King Lear's dark prediction that "nothing will come of nothing," *nothing* is thought about, laughed about, written about, (イ) about, painted and fashioned.

(1) 下線部(1)を，Far from it の it が指す内容が具体的に分かるように和訳しなさい。

(2) 下線部(2)を和訳しなさい。

(3) 空欄(　ア　)及び(　イ　)に入れるのに最も適切な語を以下の中から選び，必要であれば正しい形に変えて記入しなさい。ただし，同じ語は一度しか使用してはならない。

sing　　annoy　　bring　　hide

Ⅲ 次の文章(1), (2)を英訳しなさい。 (50 点)

(1) 花子：昨日の夕刊見た？ 絶滅の危機に瀕していたトキの雛が孵(かえ)ったと書いてあったわ。

太郎：飼育係の人はさぞかし大変だったろうね。

花子：でも，この雛は自然に戻されたトキから生まれたのよ。

太郎：トキが住みやすい環境，つまり，きれいな水や空気があり，珍しい鳥だからと追いかけ回されたりしない場所というのは，僕たち人間にとっても居心地のよいものなのかもしれないね。

*トキ＝Toki (or Japanese crested ibis)

(2) 世界には文字を持たない言語がたくさんあるらしい。毎日文字に囲まれて暮らしている私たちからすれば，さぞ不便なことだろうと思ってしまいがちだ。しかし，文字があろうがなかろうが，ことばの基本的な働きに変わりはない。文字のある言語のほうがない言語より優れているなどと考えるのは，とんでもない思い上がりだろう。

問題は，このページで終わりである。