平成 16 年度（2004 年度）

東北大学大学院理学研究科　地学専攻

博士課程前期２年の課程　入試問題

英語

平成 15 年 9 月 4 日　9：00～12：00　実施

注 意 事 項

1. 机の上には受験票、筆記用具、時計以外は置いてはいけません。
2. 合図があるまで問題冊子を開いてはいけません。
   試験時間は 9:00 から 12:00 までです。
3. 問題はⅠ、Ⅱ、Ⅲの3問で、受験者全員に共通の問題です。
4. 解答はすべて解答用紙に記入します。解答は大問1題毎に解答用紙を別にします。解答用紙の所定の欄に受験番号・氏名・志望分野および問題番号を明記します。

問題Ｉ 以下の英文を全訳せよ.

Like any other field of scientific exploration, climate science moves forward by an interactive combination of observations and theory. Most climate scientists spend much of their time gathering and analyzing data drawn from the kinds of climatic archives and using a variety of techniques. The results of this research are published, in part for the practical reason of demonstrating the progress necessary to help scientists obtain additional funding for further research. At a more basic level, progress in science depends on the free exchange of ideas, and climate researchers publish to tell the scientific community what they have discovered.

Scientists invariably need to explain and interpret their research results, and occasionally they devise a new idea called a hypothesis. Hypotheses are informal ideas that have not been widely tested by the larger community of scientists doing similar research. Most hypotheses are discarded, either because they are found to disagree with some basic scientific principle or because they make predictions that other observations contradict.

A hypothesis may occasionally reach a higher status because it is capable of explaining a wide array of observations. It then becomes a theory. Scientists further test successful theories by making additional observations, by developing new techniques to analyze data in new ways, and by devising models to simulate the workings of the climate system.

Models are useful because they give climate scientists an independent way to test whether a particular theory can explain the data they have collected. Experiments run on climate models are often based directly on geologic data that define various configurations of Earth's surface at key times in the past. The results that emerge from modeling experiments based on these configurations are compared and tested against climates that actually existed in the past and can be determined from climatic data.

This ongoing work may eventually disprove the predictions of a current theory. Science moves forward in part by disproving and discarding the less worthy among the existing hypotheses and theories. In some cases, new work may not only support an existing theory but refine and improve it, giving it even greater power to explain an even wider range of basic scientific observations. Only a few theories survive years and decades of repeated testing by energetic and imaginative scientists. Those that do are sometimes called unifying theories and are generally regarded as close approximations to the truth, although it is impossible to prove that a theory is true, only that it is untrue.

単語補助：devise（考案する), discard（廃棄する）

問題　II　次の英文を読み，下記の設問に答えよ．

The great challenge to theories of the natural evolution of biological species has always been to explain the development of order and complexity in organisms without resorting to the concepts of（　①　）and design. The difficulty with（　①　）and design is, of course, the implication of the existence of a Designer who would have the（　①　）and designs, namely God. Since philosophy, theology, and popular religion had always relied on the order and complexity of nature as evidence for the existence of God, producing some other kind of theory still seems to many contrary to the obvious.

Now, one might ask, why should anyone want to avoid anything that would introduce God into a scientific theory; and the answer is that God makes a poor addition to any scientific theory precisely because God explains too much. Being omnipotent, God can do anything. Thus, if we ask "Why is the sky blue?" we could simply say, "Because God makes it blue." (1) Since this doesn't really explain anything, it must be a firm principle of science to exhaust all other forms of explanation before resorting to something that will simply end inquiry. This must be true about life on earth just as much as about the color of the sky.

Early forms of evolutionary theory, like that of Jean Baptiste Lamarck (1744-1 829), simply substituted one form of intention for（　②　）, namely that the evolutionary changes could occur entirely because of the needs and desires of organisms, so that as the giraffe wished to stretch its neck, the neck actually would stretch, and that characteristic then was inherited. Since all kinds of acquired characteristics obviously are not inherited, Lamarck's theory had serious problems even if individual giraffe's were able to stretch their necks, which of course they are not.

The theory of evolution by natural selection as developed independently by Charles Darwin (1809-1882) and then Alfred Wallace (1823-1913) replaced any kind of intention, plan, or desire with an entirety blind mechanism: the increased competitive edge and so the greater survival of those organisms whose genetic mutations resulted in the most successful adaptations. Darwin and Wallace did not know how genetic mutations occurred, but (2) that didn't matter. The later general adoption of Gregor Mendel's (1822-1884) genetic theory and ultimately the discovery of（　③　）revealed the physical mechanisms by which mutations would occur.

What evolution by natural selection produces by its blind mechanism may be called a "spontaneous natural（　④　）". The view is that events in Nature are not really random, but that many kinds of（　④　）and complexity emerge naturally and spontaneously from often apparently very disordered and chaotic kinds of conditions. For evolution by natural selection is not by any means the only example of a spontaneous natural order.(3)Even in human affairs, where people might think that everything that happens is planned and intended by someone, there are many examples of spontaneous order emerging without either plan, intention, or purpose. One excellent case is the economic system of capitalism and the free market.

(出典 http://www.fresian.com/creation.htm)

（単語補助）theology：神学，omnipotent：全能，giraffe：キリン，genetic：遺伝子の，　mutation：突然変異，chaotic：混沌とした

問１　本文中の①から④のカッコ内に入る適語を下記の語句より選び，解答せよ．

God，　order，　protein，　origin，　destination，　need，　another，　evolution　material，　purpose，DNA

問２　下線（１）を和訳せよ．

問３　下線（２）の意味を説明せよ．

問４　文中の説明に基づいて Lamarck と Darwin および Wallace の理論について述べよ．

問５　下線（3）を和訳せよ．

問題　Ⅲ

以下の全文章を英訳せよ。いくつかの言葉については下線とアステリスクで示し文章の後ろに単語補助として例示してある。例は必ずしも使わなくて良い。

地球に近づく小さな惑星*は、人類にとってたいへんな脅威である。このような小天体についてもっとよく知るために、特別な Spacewatch 望遠鏡が Arizona の Kitt Peak に設置された。1991 年には、この望遠鏡によって 5 から 10 メートルくらいの小さな天体が、地球から 17 万キロメートルのところを通過したのが観測されたが、それは月と地球の距離の半分のところであった。万が一、これが地球に衝突*していたら、その爆発力は 400 キロトン（kilotons）の TNT 火薬に匹敵していたであろうし、それは広島型原爆*の約 3 倍のエネルギーをもっていたであろう。1993 年 6 月まで Spacewatch 望遠鏡で、地球に接近してきている小天体がさらに 40 個以上も発見された。もっとも衝撃的だったのは、1992 年 12 月に発見された直径 5 キロメートルの小惑星であった。この小惑星は地球から 400 万キロメートルのところを通過したが、4 年毎に回帰しており、例えば次回は 2004 年に接近してくる。もしこれが地球と衝突したら、白亜紀／第三紀の境界*で起こったと考えられているのと同様の天災が、生物圏*に起こり、おそらく人類の文明は跡形もなくなってしまうであろう。

（単語補助）

小さな惑星/小天体	asteroid
衝突する	collide
広島型原爆	Hiroshima atomic bomb
白亜紀／第三紀の境界	K/T－boundary
生物圏	biosphere