

平成14年度（2002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13年9月6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。
3. 試験時間は9:00から12:00までです。
4. 問題はⅠ、Ⅱ、Ⅲの3問です。  
問題Ⅰは受験者全員に共通の問題です。  
問題Ⅱおよび問題Ⅲは、それぞれA、B、C、から1問\*を選択して解答します。  
Aは地圏進化学・環境動態論分野、Bは環境地理学・環境動態論分野、Cは地球物質科学・比較固体惑星学分野からの出題ですが、希望分野にかかわらず自由に選択して構いません。（\*地球物質科学・比較固体惑星学分野の受験生はさらに2問、問題Ⅰを含めて合計5問まで解答することができます。）
5. 解答はすべて解答用紙に記入します。  
解答用紙の所定の欄に受験番号・氏名・希望分野および設問番号を（ⅡおよびⅢはABCも）明記します。また問題によって解答用紙を別にします。

## 問題 1-1

(共通問題) (3枚あります)

下記の一文は、人間が関与した地球の変貌に警鐘を鳴らすために、The Royal Society of Canada が同国の専門家を動員して著した「Planet Under Stress」の最初の1節である。執筆はある地球科学者による。下線部分①、②、③、④、⑤を和訳せよ。

### Population



①Homo sapiens is one among over ten million species living on the planet Earth. When Christ was born there were 200 million of us. This number had doubled to 400 million 1,500 years later. The last doubling (1950-87) happened in thirty-seven years, bringing our population to its present number of over five billion.

Population growth in the 'rich' countries is almost level, or is declining. Some countries, like China and Indonesia, have declared that the current rate of growth cannot be sustained, and have instituted successful population-control measures. However, in many countries families are still large. For example, in Kenya 8 children is the average; in Egypt, 5; Nigeria, 6; India, 4.3. In Kenya the population grows at 3.9 percent per year, in Nigeria 2.8 per cent per year, in India 2.3 percent per year. Nations that have high birth-rates seem also to be the most poverty-stricken. But the picture is

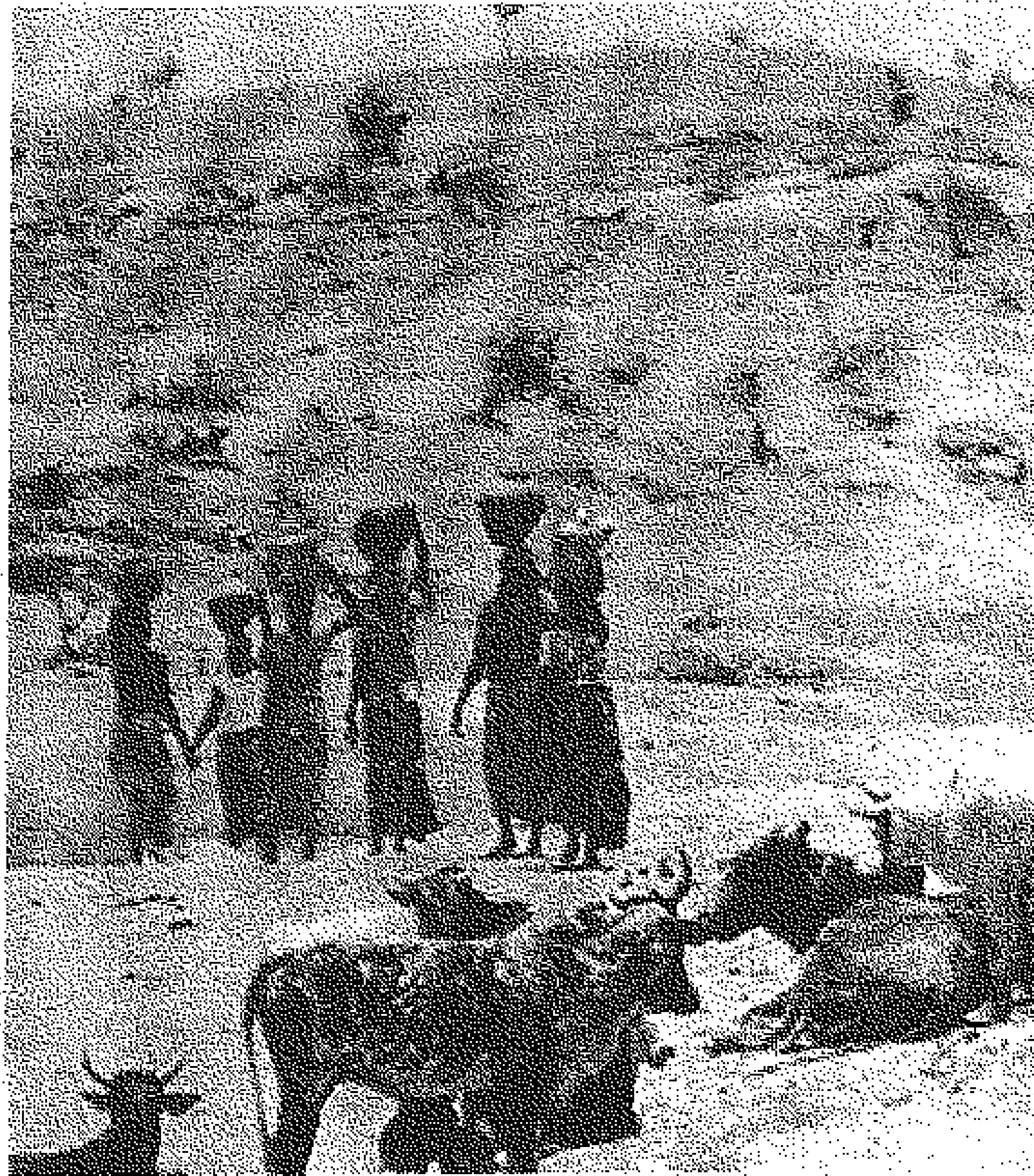
## 問題 1-2

not quite so straightforward: Saudi Arabia, for instance, with an average of 6.9 children per family, is not poor.

② Today we add 90 million people per year, the equivalent of the population of Canada each four months, of the USA each two and a half years. At this rate the global population of Homo sapiens will reach ten billion before the year 2050. It is doubtful that the planet will support such growth without ever-increasing distress. Ultimately population is controlled by the basic resources of food and water. An indication of the growing strains in the system is the increasing numbers of environmental refugees—ten million people at the present estimate—who must move because their systems for support are collapsing.

③ Population growth is a very complex issue, influenced by social-religious-educational-political structures, and particularly by diverse views of the world, the place of all people in it—and perhaps by the status of women. There is little doubt that the present flood of environmental problems is related to population growth. We are recognizing the difference between growth and sustainable growth.

### Soil 1



The nutrient supply for more than five billion human beings comes almost exclusively from plants and animals that live on the surface, on and in the stuff we call soil.

## 問題 1-3

(Globally, we depend very little on food from the sea.) Soil forms when organisms, water, air, and surface materials interact. It provides the physical support for the plant, and the nutrient and water bank from which the plant draws its sustenance. ④ It carries a load of minute micro-organisms--bacteria, fungi, viruses, insect, worms--that play a vital role in supplying nutrients to plants--and without a certain soil thickness, growth of most of our food crops would be impossible. It takes a few thousand years to produce a useful amount from rock; but in dry regions that have little rainfall, like the Canadian prairie, inches of soil can be lost in a single rain or wind storm. Soil that is washed away collects in waterways and affects navigation, irrigation, and even the generation of electricity as the reservoirs behind dams fill with silt. Eventually most of the lost soil forms sediment in the oceans.

Across the world, as agriculture becomes more intensive, as more and more herbicides, pesticides, and fertilizers are used, and as the plants in a field become less diverse, land becomes more vulnerable to erosion. ⑤ Desertification--the making of more desert--occurs when vegetation growth is reduced in semi-arid regions owing to droughts or less-than-usual rainfall; or as a result of overuse (too much cultivation and grazing). The deserts of North Africa have been spreading across the continent for decades. Drought has forced local people to cut all the trees to provide cooking fuel and to feed animals. The photograph opposite exemplifies the barren state such areas are reduced to. In another part of the world, sand from the great Gobi Desert is constantly blowing away, much of it into the city of Beijing 150 miles away. Areas threatened by desertification represent thirty-five per cent of the world's land area, affecting nineteen per cent of the world's population.

### 単語補助

fungi: 菌類 (fungus) の複数、nutrient: 食物、栄養物、crop: 作物、収穫、arid: 乾燥した、drought: 旱魃 (かんばつ)、graze: 放牧する

問題 II A 以下の英文を和訳せよ。

Primary production depends mainly on the availability of sunlight and nutrients. In about half of the ocean, nutrients have been virtually exhausted from the euphotic zone by incorporation into phytoplankton via photosynthesis. The phytoplankton are consumed by marine animals, the excreta and dead bodies of which tend to move downwards, transporting nutrient elements below the mixed layer. Nutrients are bacterially regenerated at depth from this particulate matter. A deep, permanent thermocline in the low fertility areas forms a barrier between the nutrient-rich waters at depth and the illuminated surface waters, thus preventing the replenishment of the euphotic zone with nutrients. Consequently, productivity is believed to be less than  $100 \text{ mg C cm}^{-2} \text{ day}^{-1}$  over 35% of the World Ocean. Recent study has stressed the importance of the contribution to production of a chlorophyll-rich layer below the "euphotic zone" which extends down to the 1% light level. Thus, the value of  $100 \text{ mg C cm}^{-2} \text{ day}^{-1}$  may be low. Areas in which the thermocline is shallow or indistinct, at least during part of the year, tend to be rich in nutrients. These are the regions of divergence or intense mixing (e.g. equatorial areas, west-wind drift and polar front regions), and the boundary regions between land and sea (e.g. neritic areas, coastal upwelling zones, and the waters immediately surrounding oceanic islands). Thus, high fertility zones form a ring around an ocean basin (more intensely developed and wider in extent in eastern than in western boundary areas) with transverse latitudinal strips along the oceanic divergences. It is now appreciated that the limiting role of illumination becomes very important in high latitudes.

註： euphotic zone : 真光層, excreta : 排泄物, replenishment : 満たす

問題 II B. 下記の文章はある本の一部である。これを読んで次の問いに答えなさい。

- 問1. Vulnerability とは何か、下記の文章の説明に従って 5 行程度で簡単に説明しなさい。(40 点)
- 問2. \*より後の部分を全訳しなさい。(50 点)
- 問3. この本の著者らは、hazard と disaster を明瞭に使い分けている。下記の文章から判断して、どのように使い分けていると考えられるか 3 行程度で簡単に説明しなさい。(10 点)

### WHAT IS VULNERABILITY?

We have already used this word a number of times. It has a commonplace meaning: being prone to or susceptible to damage or injury. The book is an attempt to refine the definition of 'vulnerability'. To begin with we offer a simple working definition. By 'vulnerability' we mean the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood is put at risk by a discrete and identifiable event in nature or in society.

Some groups in society are more prone than others to damage, loss, and suffering in the context of differing hazards. Key characteristics of these variations of impact include class, caste, ethnicity, gender, disability, age, or seniority. While the concept of vulnerability clearly involves varying magnitude, from high to low levels of vulnerability, for different people, we use the term to mean those who are more vulnerable. When used in this sense, the implied opposite of vulnerable is sometimes indicated by our use of the term *secure*. Other authors have contrasted vulnerability with 'capability' – the ability to protect one's community, home and family, and to re-establish one's livelihood (Anderson and Woodrow 1989).

It should also be clear that our definition of vulnerability has a time dimension built into it. Since it is damage to livelihood and not just life and property that is at issue, the more vulnerable groups are those that also find it hardest to reconstruct their livelihoods following disaster. They are therefore also more vulnerable to the effects of subsequent hazard events.

The word 'livelihood' is important in the definition. We mean by this the command an individual, family, or other social group has over an income and/or bundles of resources that can be used or exchanged to satisfy its needs. This may involve information, cultural knowledge, social networks, legal rights as well as tools, land, or other physical resources. In Chapter 3 we will develop this livelihood aspect of vulnerability in a model of *access* to opportunities which defines the ability of people to deal with the impact of the hazards to which they are exposed.<sup>5</sup>

Our focus on vulnerable people leads us to give secondary consideration to natural events as determinants of disasters. Normally, vulnerability is closely correlated with socio-economic position (assuming that this incorporates race, gender, age, etc.). Although we make a number of distinctions that show it to be too simplistic to explain all disasters, as a rule the poor suffer more from hazards than the rich, although poverty and vulnerability are not uniformly or invariably correlated in all cases. The key point is the significance we attach to social forms of disaster explanation.

\* For example, heavy rainfall may wash away the homes in wealthy hillside residential areas such as Topanga Canyon (near Los Angeles) or the Oakland-Berkeley hills (near San Francisco) as well as those of the poor in Rio de Janeiro or Belo Horizonte.<sup>6</sup> There are three important differences, however. Firstly, few rich people are affected if we compare the number of victims of landslides in various cities around the world. Money buys design and engineering that minimizes (but of course does not eliminate) the frequency of such events for the rich. Telecommunications and transport infrastructure facilitate warning and rescue.

Secondly, living in the hazardous canyon environment is voluntary for the rich in California, but not for the poor Brazilian or Filipino job-seeker who lives in a hillside slum. Without entering the psychological or philosophical definitions of 'voluntary' versus 'involuntary' risk-taking (Sjöberg 1987), it should be clear that slum dwellers' occupancy of hillsides is less voluntary than that, say, of the corporate executive who lives in Topanga Canyon 'for the view'.<sup>7</sup> The urban poor use their location as the base around which they organize livelihood activities (casual labour, street-trading, crafts, crime, prostitution). If the structure of urban landownership and rent means that the closest they can get to economic opportunities is a hillside slum, people will locate there regardless of the landslide risk (Hardoy and Satterthwaite 1989). This, we will argue, is a situation in which neither 'voluntary choice' models nor the notion of 'bounded rationality' is applicable (see Chapter 8).

Thirdly, the consequences of a mudslide for the rich are far less than for the surviving poor. Homes and possessions of the rich are usually insured (at least partly), while those of the poor tend not to be. The rich are more easily able to find alternative shelter and to continue with their income-earning activities after the disaster. They have reserves and credit available, and insurance.<sup>8</sup> The poor, by contrast, often have their entire stock of capital (home, clothing, tools for artisanal production, etc.) assembled at the site of the disaster. They have few if any cash reserves and are generally not considered creditworthy. Moreover, as emphasized above, location itself is a livelihood resource for the urban poor. In places where workers have to commute to work over distances similar to those habitually covered by the middle class, transport can absorb as much as 40 per cent of household budgets. The poor self-employed or casually-employed underclass finds such transport expenses insupportable. It is therefore not surprising that large numbers of working-class Mexicans affected by the 1985 earthquake refused to be relocated to the outskirts of Mexico City (Robinson *et al.* 1986).

Blakie, P. *et al.* (1994) *At Risk: natural hazards, people's vulnerability, and disasters.*

Rutledge, pp. 9-10. による

## 問題 110

以下の全文を和訳しなさい。

What we know about the earth today has been general knowledge for only a relative short period of time. When people first pondered the size and shape of the earth and its place in the solar system, the "world" with which they were familiar amounted to only a small portion of the earth's surface. Adequate clocks were not to be had, and even the simplest surveying instruments were unheard of. To most people, in fact, the earth appeared flat. Indeed it was believed that the sun and stars revolving around the earth, and this belief was maintained in most religions. Yet some observers noticed that the shadow the earth cast on the moon during an eclipse appeared round; that when ships approached port the sails always come first into view; and that when one traveled relatively long distances north or south the stars in the night skies changed in position. The Greek astronomer Eratosthenes not only concluded that the earth was round, but on the basis of a very simple experiment determined its circumference\* to be 38,400 km. Modern-day estimates do not differ greatly from that figure.

\*circumference: the boundary line of a circle.



問題 IIIA 次の文章を英訳せよ。なお、英訳に際しては、下線部を括弧内の単語を用いて表現してもよい。

(1) 淡水は摂氏 0 度で凍るが、標準的な海水は摂氏-1.9 度まで凍らない。海水が形成されるときには、その中には海水中の塩分はほとんど含まれない。海水は海水よりも密度が低いので、大洋の表面に浮かぶ。

(2) 熱帯域に生息するサンゴは気候を研究する科学者に、熱帯気候の長期にわたる変動傾向 (trend) のみならず、過去に発生したエルニーニョ (El Niño events) とその強さを計測する機会を提供してくれる。

(3) 前期古生代には大気中の二酸化炭素濃度が有意に高かったであろうということを示すいくつかの証拠がある。

(4) 海洋地殻は地球表層の 50% 以上を占めるが、下部海洋地殻の組成や海洋のモホ (Moho) の岩石学的性質は大部分が未知である。

(5) 1980 年に Alvares et al. (1980) は K-T 境界における絶滅の少なくとも一部は 10 km の小惑星 (a 10-km asteroid) の衝突によって引き起こされたとする有名な論文を発表した。そのもともとの証拠は、K-T 境界粘土層中に地球外起源の物質によるものとしか考えられないほど高濃度のイリジウム (Iridium) が見出されることに基づいていた。

問題ⅢB. 次の文章を英訳せよ.

アジア・モンスーンは、ユーラシア大陸とその南および東の海洋との間で行われる、季節によって変化する大気循環系である。それは、同時に巨大な水循環系でもあり、明瞭な雨季・乾季をともなっている。雨季の大量の降水は、ヒマラヤ、チベットおよびその東方の諸山地から流れ出す大河川に豊富な流量をもたらす。起伏の大きな地帯での豊富な流水は、侵食を活発に行い、その結果、これらの河川が運搬する土砂の量も莫大になる。その莫大な土砂が堆積して、いくつもの山間盆地や巨大なデルタを作っている。それら盆地、谷底、デルタを中心に、水田耕作が広く行われているのが、モンスーン・アジアの土地利用の特色である。この水田稲作が、この地帯に地球の総人口の半数強を住まわせている一つの要因と考えられる。もちろん、モンスーン・アジアの住民がすべて水田稲作農業に従事しているわけではないが、この農業の高い生産性と、その成果の蓄積が、他のいろいろな産業の成立・維持に大きく関わっている。

## 問題 11C

Professor Globe 宛てに留学を希望する手紙を英語で書け。  
現在自分が大学の4年生で、2002年3月に学士(B. S. degree)を取る予定であること、  
大学院で勉強を続けたいのでアメリカの貴校の大学院(graduate school)に応募(apply)  
したいこと、外国人留学生(foreign student)のための研究助手またはその他の経済援助  
(research assistantship or any financial assistance)があるかどうか、大学4年間の自分の  
成績(grades)、専攻(major)について、どのようなことに興味をもっているか、返事を  
待つこと、等々について書けるところまで自由に書け。英文と文章構成力について  
評価する。

解答用紙に以下の様な書式で書くこと。

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September 6, 2001

Dear Professor Globe:

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Sincerely yours.

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