

# On the Teaching of Physiography

Pëtr Kropotkin

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When Professor Huxley introduced, twenty-three years ago, the name and the subject of Physiography, his intentions were certainly excellent. Natural sciences were almost entirely excluded at that time from the schools. The teaching of geography stood very low: political geography, so-called, was a mere collection of names, and an entirely subordinate subject; and physical geography was a collection of information, too abstract, too incoherent, too wide, and too superficial at the same time, to be of any use in education. Under the name of Physiography natural sciences were, so to say, smuggled into the schools. And by showing how the study of Nature may be approached, and methods of scientific observation may be rendered familiar by examining things close at hand, Professor Huxley has undoubtedly rendered an immense service to this country. He has brought about a far-reaching reform.

However, the very form which Physiography assumed in his well-known textbook, and especially later on in schools, shows that the reform was not thorough enough. I need not speak here of Professor Huxley's "Physiography"; everyone knows its invaluable merits and its obvious disadvantages, its wonderfully clear explanations of natural phenomena, its beautiful anatomy of the spring, or of the volcano, and its want of a general constructive conception of the phenomena of the globe. I need not speak either of the merits of this or that other text-book, because the time is coming when another further reform in the same direction will become absolutely necessary. What is required now in school is, not to give *some* notions of Nature in connection with the physical features of a given locality, but to convey a thorough knowledge of the Earth, as a part of the Universe – not a mere introduction to the study of Nature, but that study itself. And the question is, How to carry on this study?

*Heimatskunde* [Local History] is now in great vogue; but the more one thinks of it, the more one grows convinced that if it might have answered its purpose fifty years ago, especially in some remote village, lost in the Black Forest mountains, it answers its purpose no more in our own times of railway civilization and world traffic.

We cannot prevent our children from getting some general knowledge of the Earth, even at a very early age. They eat oranges and bananas, which do not grow in our latitudes; and many of them see those growing in the hot-houses of Kew, amid quite unwonted surroundings. At the age of six they already know "the ship of the desert," the ugly crocodile of the Nile, the dog which drags sledges in the far north, and the dog which used to find Italian boys, lost in the snows of the St. Bernard Pass. The books, the illustrated papers, the tales which pass through our children's

hands, tell them stories of distant lands, peopled – not with fairies, but with black men, whom Livingstone loved and Stanley drilled; they speak to them of countries glaring under a tropical vegetation, or buried in snow, and of distant men, strangely dressed and strangely featured. At the age when we used to live by imagination in fairylands, they live by imagination as midshipmites on journeys to Australia, as travelers in the dark continent, as settlers on distant islands. And if there is still in our slums a considerable mass of children who, on being taken to a suburb, and on seeing a blooming apple-tree, wonder at "the daisies on the tree" – still some sort of knowledge of the wide world begins to penetrate, and will penetrate more and more, even into the slums.

In short, there is no period in the life of our present children during which their knowledge of the Earth might be limited to the study of their own locality. The *Erdkunde* [Geography] – i.e., the knowledge of the Earth as a whole – flows from all sides into their minds, and we are bound to accept the fact, and to speak to them of the Earth as a whole, from their earliest age – in the primary school and in the secondary school, as well as in the University, and after the University.

The study of one's own locality has undoubtedly an immense importance in education; but this importance seems to me to lie elsewhere. The study of one's own corner can *not* be used for the study of Nature altogether. It must be used simply as a means for giving a more concrete form to the acquired knowledge, and as a means of acquiring knowledge through personal work and personal observation. Every boy and girl, as soon as they know enough of elementary geometry for measuring angles and distances, ought to be able to trace angles on the ground, and to make the map of a pond or of a brook, with the aid of the compass and their own paces. Not in order to become geographers, but to help them to understand concretely what a map means; to give a better comprehension of geometry itself, and to immensely facilitate the comprehension of all further developments of mathematics and physics. Every girl and boy ought to know the chief plants of their meadows, their kinship to other plants of the same family, or allied groups, and the distinctive features of each order. They ought to know many of the animals as well, and especially the insects, and learn to observe their habits. All this would contribute to give them a more concrete conception of what they hear and learn about distant lands.

This is the proper part of the *Heimatskunde* in education; but if you trust to it more than that, you fall short of your aim. To speak to a pupil of the distribution of rainfall in the British Isles, *à propos* of the water which flows under London Bridge, is as artificial and irrational as to develop the laws of friction of liquids, or those of the elasticity of solids, in connection with the same bridge. These laws, as well as the distribution of climates on the Earth, must be studied for themselves, not *à propos* of some feature of a local landscape.

In short, under the present state of our civilization, the conception of the Earth as a whole, and of the variety of its climates, scenery, and inhabitants, unavoidably penetrates into the minds of our children, and we must give them notions of the Earth and the universe from the earliest stages, up to the highest ones, in accordance with the gradual development of their intelligence; and we must utilize our neighborhood, not for conveying knowledge of the Earth – this would be an utterly artificial method – but for giving a *concrete* conception of the facts learned by the pupil, and especially for promoting spontaneous study. In this sense, *Heimatskunde* ought to be carried on, parallel to *Erdkunde*, through all three stages of education.

Turning to the present state of education in physiography in the schools, it is most pleasant to ascertain that in the elementary schools the study of Nature stands, as a rule, on a tolerably good

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<sup>1</sup> J. S. Keltie's 'Geographical Education'; Report to the Council of the Royal Geographical Society. London (John

basis. The same remark has already been made by the Geographical Society's Commissioner<sup>1</sup> as regards the teaching of geography; and opinions seem to be pretty well agreed upon this subject. There are, among those who have undertaken the great mission of conveying to our children the first notions of the universe, many women and men who undertook the task in full earnest. Although poorly supported in their endeavors by a mass of indifferent parents, and although finding but insufficient sympathy in a society which values the services rendered to it by the salaries it pays, they do their best; and very many of them succeed in conveying to our children, both in the Kindergarten and the elementary school, a good deal of sound knowledge and good scientific methods of observation.

It is evident that there is still room for improvement. More knowledge of natural sciences among elementary teachers is one of the great desiderata of the moment. However, when we see the eagerness with which the teachers seize every opportunity for acquiring more of that knowledge, it seems that what is most wanted now is to give them more opportunities for widening their knowledge in science, more evening lectures, more free courses delivered throughout the country, beyond the great centers, by volunteers in biology, geology, geography, and so on; and also more summer excursions wherever a naturalist or a geographer happens to spend his holidays. All these could be easily realized, especially if the Teachers' Guild and other similar bodies took the initiative in the matter.

At the same time a great deal ought to be done by the parents themselves. They must be thankful to the teacher who gives to their children the first notions of science, and systematizes the knowledge they acquire. But it would be foolish on their behalf to rely upon the teacher alone. No amount of organized teaching can supplant the first impulse towards love of nature which must come from the parents themselves. The German school is often spoken of in this country with great praise. But the school in Germany is only a part of the system of education. The amount of excellent and cheap books and periodicals for home education, and the numbers of societies which have recently been started in Germany for developing the taste for natural history collections, for freshwater and marine aquaria and terraria in private houses, for topographical studies and the like, among amateurs, must also be taken into account. Such societies – not for furthering the development of science but for rendering its results and methods accessible to a wide public – could easily be founded, and the teacher would find them of great help in his task.

In short, what is wanted to improve elementary education is not so much a change in the system as a further perfection in carrying out the existing system. A great deal of such improvements can be achieved through a general development of taste in natural sciences. As to the remainder, they entirely depend upon improvements in the secondary schools and the university.

Things stand quite differently with secondary education in the middle schools. Here, the naturalists are unanimous in recognizing it; everything is to reform.

In very many schools of this country physiography is the only means for conveying to the learner some knowledge of Nature. No physics, no chemistry, no botany, no zoology are taught in those schools, and instruction in all these is thrown upon the shoulders of the teacher of physiography. His pupils have no idea of heat and its mechanical laws, of its propagation and conversion, and the physiography teacher is supposed to instruct them in all that, while he speaks of the west or east wind which blows over the school-room, or treats of the circulation of the atmosphere. His pupils do not know what a chemical compound is, and he must speak of the

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Murray), 1885.

composition of the rocks and sea-water, and explain the atomic theory, while he tells to his pupils where kitchen salt is taken from. Their knowledge in the physiology of plants is *nil*, and he must explain how plants feed, what they absorb from the soil, and reject in the atmosphere, and how their protoplasm works. They know not one law of mechanics, and they are invited to understand the mechanism of earthquakes, of glacier motion, of sea and air currents!

If the teacher follows Professor Huxley's text-book, he is supposed to address pupils who do not know that the source of a river lies higher than its mouth, and who hesitate in finding out where is north and south; but, after a few explanatory remarks about these utterly elementary matters, he is already supposed to show them a hyetographical map of the British Isles, to explain to them how "air is drained of moisture," and how "a table-land, or high plain surrounded by mountains" will influence the distribution of rainfall over a country. All knowledge of Nature, the one which is good for a child, and the one which can be understood much later only, is thus supposed to be conveyed incidentally in an unsystematic haphazard way.

In the hands of a well-educated teacher, excellent results may be, and are obtained from such *causeries* in the elementary schools. Like conversations about Nature, being intended to stimulate the desire of knowing something, and to test the various aptitudes of the children, the method answers to the purpose; but in the secondary school, education in science can *not* be left to the hazards of taste and impulse. It must be systematized. To give systematic knowledge is, in fact, the chief duty of this division of the school.

An attempt at conveying such a systematical knowledge has been made in that remarkable work, the 'Realm of Nature,' by Dr. H. R. Mill. I find no adequate terms to express the pleasure I have myself derived from the philosophical and yet plainly worded definitions of the author, and from reading paragraph after paragraph of this well-planned little book. But the teacher who would take this book for his own guidance, and who, as always, ought to know much more than what he intends teaching – very much more – ought to be possessed with as wide an encyclopedic and thorough knowledge of several great branches of science as, the author himself should be, and this would mean to require the impossible from a secondary-school teacher.

The fact is, that we cannot eschew the necessity imposed upon us by the development of science, industry, and civilization as a whole, of educating our children in natural sciences in the proper way. The knowledge of the movements of masses – the foundation of all natural sciences – must be conveyed in its proper shape, that of mechanics, with the aid of geometrical figures and simple algebraic formulas, not only as it is given in the introduction to physics in all Continental schools, and especially in France, but with a deeper insight into the subject, otherwise it will be superficial knowledge of very little value. The study of the moods, laws and transformations of molecular energy must again be conveyed in its proper shape of physics, also with a thorough knowledge of the mathematical expressions of the laws, and with laboratory work. And the study of atomic energy must be conveyed in the form of chemistry, again with laboratory work, and with a thorough study of the laws of chemical transformations. What sort of a generation are we preparing for the future struggles, and the further development of industry and science, if we deny to our children the very elements, the very basis of every education? A general review of the realm of Nature, of the Cosmos, including: organic life, man, and man's ideals and institutions, will certainly be required. But its proper place will be at a much later stage, when a general review of knowledge already acquired in various separate branches, will have to be made. By the end of secondary education, and during university studies, such a review would be invaluable. Then,

and then only, would it be properly understood, but not before the elements of each separate science have been mastered.

I know, however, and by no means will minimize, the chief obstacle to this necessary reform. It lies in the pseudo-classical education, which is now considered as the proper foundation of secondary education, and which leaves no time for the study of the world we live in; no time for familiarizing the pupil with the methods of scientific research. A discussion upon the relative merits of the two rival systems of education would be out of place here; but there are two or three points, at least, which I am bound to mention as having a direct bearing upon my subject.

First of all, the present system of classical education was born at a time when the knowledge of Nature could be borrowed from the study of antiquity only. It was a sound and necessary reaction against monastic scholasticism. It was a return to our mother Nature. To return to the Greek spirit meant a return to Nature – to Natural Science; to scientific methods instead of verbal discussions: to natural art instead of conventional art; to the freedom of municipal life instead of the slavery of eastern despotical states. This made the force, the historical meaning, and the Inestimable merits of the medieval return to the study of antiquity. In reality, this movement meant the beginning – the dawn of modern Natural Science. But now the parts are reversed. Science can be studied in Aristotle no more; it must be studied in Newton and Mayer. And those who neglect Newton for Aristotle stand now in the same position as the adversaries of classical education stood five hundred years ago. They are for Words against Science.

Another fact which strikes everyone who thinks about education is, the immense difference between the amount of knowledge which was required in olden times, and the amount required now. He who knew geometry five hundred years ago was a learned man; now, every carpenter must know geometry. He who knew then what lay beyond the Black Sea was a man of extraordinary learning; now, we go for a sea-air cure to New Zealand, for a bicycle trip to Hami, and for a holiday to Spitzbergen. The limits of the known world have been widened; so also those of knowledge. Our generation was considered as educated enough when we knew elementary geometry and elementary algebra; but the coming generation will find its education very imperfect if the boy and girl of eighteen are not able to understand at least the methods of differential and integral analysis, if not to use these instruments of analysis as we now use the rules of arithmetic.

Such a knowledge can be acquired only on the condition that spontaneous work becomes the basis of education in all branches of the school curriculum; and if fifty years ago it could be said that natural sciences afforded no discipline to the young mind, that they did not open a sufficiently large field for the pupil's own work, such a reproach can be maintained no longer. Not even as regards biological sciences, which not long ago were merely descriptive, but now have also elaborated the methods for promoting research and discovery as educational exercises.

And finally, a third reproach to natural sciences must be mentioned, the more so as it brings me back directly to my subject. Natural sciences, it is said, do *not* give to education the human character which they ought to give. This is true; and the objection remains in full force until now. However, it depends entirely upon ourselves to make of these a most powerful instrument for conveying human education as well. The ancient Greeks did not separate Man from Nature. And the divorce between human sciences – history, economy, politics, morals – and natural sciences has been accomplished entirely by ourselves, especially during our century, and by that school which kept the students of Man in gross ignorance of Nature, and the students of Nature in ignorance of Man.

This artificial separation is, however, done away with every day. We return to Nature. We return to the Greek spirit which conceived Man as a part of the Cosmos, living the life of the whole, and finding his greatest happiness in living that life. The universal revival of the love of Nature, which is a prominent feature of our own times; the application of the methods of natural sciences to sciences dealing with Man and his mind; and finally, the poetical conception of the grand infinite Universe, which more and more penetrates our poetry, our art, and our science, are proofs that the divorce is coming to an end. Geographers have especially contributed to destroy the screens which separated the two branches of science, isolated from each other by the University. Humboldt's 'Cosmos' is the work of a geographer; and the geographical work which is most representative of our own times – the 'Géographie Universelle' [Universal Geography] of Elisée Reclus – gives a description of the Earth so thoroughly intermingled with that of Man, that if Man were taken out of it the entire work would lose its meaning-its very soul.

This growing tendency removes the last objection against natural sciences becoming the very foundation of education. Man, his institutions, his language, his knowledge, and his morals, are now taken as parts of the great Cosmos, and treated as such.

This digression was necessary in order to support my next proposition, namely, *I cannot conceive Physiography from which Man has been excluded*. A study of nature without man is the last tribute paid by modern scientists to their previous scholastic education.

But physiography, including Man, returns to its origin, the *Erdkunde*, the study of the Earth and all what is upon it. Shall we, therefore, return to the Physical Geography of old? The spring first; then the stalactites and the stalagmites; the volcanoes, the movements of the Earth's crust, the distribution of mono and di-cotyledons, and the distribution of human races? Certainly not, because we can do better.

The first thing which strikes the geographer as he looks upon the Earth as a whole is, not so much the diversity of the landscape and characters of its separate parts, as the well-defined types of certain definite kinds of landscape and scenery. Here is for instance the great plateau of East Asia, the backbone of the continent, a part of the oldest continent, Eurasia. We see its monotony: its want of salient topographical features: its lazy rivers and brackish lakes; its cold winter and its scorching hot summer; the migrations of its animals southwest and northeast; its populations driven at certain dates of history by the rapid desiccation, through the Dzungarian gate, towards the lowlands of Asia and Europe; their lazy life, their monotonous songs, their immense federations. We have in it a well defined feature, a living whole. And thought immediately evokes the idea of another grand plateau in the New World, with its salt lakes, and canõns, its herds of migrating buffaloes, its Indians retaining the clan organizations of old, and, amid them, the eruption of the pioneer's wagon, and the Pacific railway crossing the wilderness. And thus we see the plateau of Asia Minor, and those of Africa, their physical similarities, and the variety of their floras and faunas, of their historical destinies and their meaning in modern times. Here is thus one salient feature of the Earth's surface, making itself a wide subject full of meaning for separate study, in which study geology, climatology, biology and history complete each other, in order to impress upon the mind one distinct and dominant feature of the architecture and the life of the Earth.

Then, following the courses of the rivers, we have the plains, high and low, which surround the plateaus. I see there the plains of my mother-country, covered with cornfields as far as the eye can reach; the groves of graceful birches, and the meadows richly adorned with a flora not yet modified by man; the poor log-houses in the villages, and the village communities at work;

and on a map, guiding myself simply by the orography of country, I trace the extension of glacial drift and loess, and delineate the famine-stricken regions with almost as much security as the statistician. I read the history of the country written in its rivers in the proximity of the Dzungarian gate on the other side, and in those other plains which only wait for colonizers to be covered with corn crops. Then I compare these plains with those of Yorkshire and Lancashire, placed between the highlands and the Channel, having the densely-peopled parts of Europe at their side, and the tempting ocean in the west. Then I compare them with the plains of Germany, the *puzhters* ["putters", direct translation, no historical record of so-called "puzhters" – editors] of Hungary, the South Siberian steppes, the Pampas of South America. And again, out of these separate landscapes, diversified by their geographical positions and their surroundings, another great feature of the Earth's surface – the high plains and the low plains – fixes my attention, engraves itself in my memory.

The same with Alpine regions – such as those of Switzerland, the Altai, the Caucasus, and that other quite different type, represented by the central Pyrenees or Transcaucasia. The same with the Lake regions, which stretch through Canada, Northwestern England, Scandinavia, and Finland, and again represent a well-defined type of the Earth's scenery, originated from a certain well-defined group of agencies, and playing its definite part in the history of mankind. The waterless deserts of Africa, Arabia, and the Transcaspian territory; the great African and Siberian forest region; the tropical and the Arctic archipelagoes; the lowlands of the Ganges [the Ganga, "Ganges" is a Westernist-styled, power-based, racial demotion of the native language] and the Nile; the tundras of the far north, and so on, appear again as definite features of the Earth's surface.

In a word, there are *types* of landscape and scenery on the Earth's surface as there are types of animals and plants, each of them representing a definite group of physical causes which have acted to produce the result, and each of them playing a definite part in the distribution and destinies of organic life, as well as in the growth and development of separate civilizations. With these types we ought to familiarize our learners in order to convey to them a correct general impression of the world we live in. This review and analysis of the different types of scenery ought to be, in my opinion, the leading feature in the teaching of geography in the secondary school. When this has been done, and when the learner's education in mechanics, physics, and biology has sufficiently progressed, then a general revision of the movements of the atmosphere, the ocean and the Earth's crust would come as a necessary conclusion; and the learner's mind being sufficiently nurtured by that time to take interest in economic and political topics, a review of the sub-divisions of mankind into economic regions and states, with an analysis of their institutions and mutual relations would find its proper place.

It is evident that throughout such teaching all that is possible should be done to convey a concrete idea of the different types described by the geographer. The excellent collections of colored landscape pictures, published in both a large and a small size by [Gustav] Hölzel in Vienna, and giving a really scientific representation of the various types, would be of great use; the collection only requires to be further completed. As to books, I should especially recommend the reading of original descriptions of travels. Our youths do not read enough of those charming and deeply impressive and highly instructive records of travel of which all literatures and especially the English literature – possess such a wealth, especially from the last century and the beginning of the present. They ought to be selected, reprinted, and widely circulated. So also such classical works as Humboldt's 'Ansichten der Natur,' [Views of Nature] Ritter's monographs upon the camel, the

tea tree, and his lectures on general *Erdkunde*, and the like. We are too much afraid to give to our youths such works as they are not yet prepared entirely to understand; while it is exactly from such works that they are most liable to draw the poetical love of Nature, the desire of knowing more about her mysteries, the very dim light with which some parts of the work are surrounded, awakening the thirst of further knowledge, and surrounding Nature with the poetry which led our best naturalists to their researches.

I hardly need to insist upon the necessity of promoting practical work and experiment by all possible means, and need only mention how much is achieved even now by some modest physiography teachers in this direction. In some schools actual experiment on a modest scale is performed in order to explain various features of the Earth's surface, and immense interest is awakened in the classes when the origin of mountains is shown by means of strata of clay, or when the origin of valleys is illustrated by heaps of sand; or weather charts are compiled from data given in the daily papers; or records of meteorological instruments are kept by the pupils; or, again, the routes of Arctic expeditions are traced on maps from the data given in the traveler's record; while in other schools rough orographical models are made out of clay. The importance of such work, and its stimulating and educational effects are so evident, that I need not further insist upon this subject.

And, finally, a good deal could be done in the way of traveling, even with all the obstacles which are put in the way by railroad and hotel expenses. Young people are not extravagant in their requirements, and can travel with little outlay. Moreover, a good deal in the way of reducing expense could be done by a sort of federation of schools for this special purpose. In fact I do not see why, during the Easter holidays, the boys of a London school wishing to visit the Lake district, could not go and hang their hammocks in some school building in Cumberland for the holiday week. A great deal in this direction is already done in Norway and in Caucasasia. Schoolboys' travels are a regular feature of education in both countries, and the amount of valuable materials gathered by the boys of the upper classes of the secondary schools, and especially by the pupils of the teachers' seminaria of Caucasasia, as well as by such schoolmasters as have the chance of staying in remote and unexplored mountain districts, can be seen from the excellent year-books recently published by the School Administration of Caucasasia.

It is also evident that similar excursions, and even more distant journeys, ought to be a regular part of university education. Summer excursions like those which are made at the summer meetings of the Scotts, Patrick Geddes and Arthur Thomson, at Edinburgh, cannot be too warmly recommended. They certainly will contribute to develop a taste for geography in the schools, and they will widen the knowledge of those who may later on become teachers. But this brings me to university education.

In relation to this, I cannot too much insist upon the fact that the best and the surest means for raising the standard of secondary education in any subject is to raise the standard of university education in the same subject. In thousands of ways, direct and indirect, it is the university which affixes its stamp upon the education of a country. It is the high standard of university education in Germany, and the considerable numbers of young men receiving university education, which have so immensely improved the secondary education in Germany, not only by providing the *real schulen* [real training] and gymnasia with good teachers, many of whom love their own subject, but also by creating a whole literature of excellent text-books, or reviews of science in all its branches, accessible to the most modest purse; of popular reviews and popular books, of reviews for promoting lecture and laboratory experiments in the middle-class schools; of cheap atlases,



which other countries have to reprint as they are unable themselves to produce anything as good or as cheap, and so on. All the luxury of appliances for geographical education which we have admired at the Geographical Society's Exhibition, and can now study at our leisure at the rooms of the Teachers' Guild in London; so also the flood of thoroughly scientific popular literature and the flow of science into industry which we now see in Germany, are the direct outcome of her university education. Austria is another instance in point. The presence of Professor Penck at Vienna has given that wonderful impulse, both for exploration and in education, which we now admire in Austria; and the generation of students working under Dr. Penck's guidance will undoubtedly mark a new departure in the development of geography in the country. If Oxford had had fifty years ago a Ritter occupying one of its chairs, and gathering round him students from all the world (Elisée Reclus went on foot to Berlin to follow his lectures), it would be this country, not Germany, which would keep now the lead in geographical education.

Each science must be taught in concentric, ever-widening circles. So it must be done with geography. The student who has learned the fundamental facts in the middle school, and has been accustomed there to scientific methods of reasoning, will have a wide series of new questions developed before him in the University. He will have to study, and partly aid in the discovery of, the *laws* which determine the different features of the Earth's surface – for there are such laws; the laws of the plateaus, the plains, the continents; the laws of distribution of land and sea; the laws of spreading and inter-penetration of floras and faunas; the laws of the circulation of the hydrosphere and the atmosphere; the laws of the growth and migrations of civilizations.

It is evident that independent research must lie at the very foundation of all studies. No matter how restricted the domain explored by a student, no matter which branch of science he has chosen, personal exploration and personal work, *in contact with free Nature*, develop the young man's or woman's intelligence incomparably more than years of study from books, or even in the laboratory. All men of mark whom I know, or knew, among geographers, have had the opportunity of doing such independent exploration in their early years; while it is to distant voyages that this country owes Darwin, Wallace, Hooker, and so many others of her glories. It seems astonishing, therefore, that so little is being done in this direction especially in this country which possesses such an immense commercial fleet and so many pleasure-yachts. When one remembers the epoch-making explorations of simple Norwegian whalers who opened the Kara Sea and the North Siberian route some twenty years ago, or when one thinks of Scoresby, one cannot but ascribe to indolence the fact that scores of young explorers are not taken every year on board of the ships of this country cruising in all latitudes and longitudes. But there is much work to be done at home as well. And when I see the amount of useful information collected every year by the student explorers of Dr. Penck in Austria, or by Russian students in Russia, I cannot but think that the young naturalists of this country are extremely stinted in opportunities for research. The little that has already been done for furthering the study of geography in the universities is already bearing its fruits. But let university education develop freely in this branch, and you will soon see its effects reflected upon the whole of the secondary education given in this country.

I conclude as I began. My task was to express the desiderata of a geographer who sees in his science a powerful educational instrument, and treats it, in its higher stages, as a philosophical review of knowledge acquired by different branches of science. It now remains with the teacher to see which of these requirements is realizable at once, with the slender means at his disposal, and within his own range of action, and which must be left to the slow change of public opinion.

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