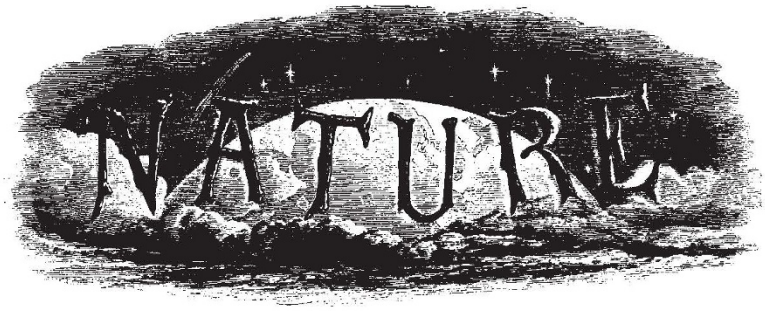
Earth. The australopithecine ancestry of modern human beings is reasonably well charted. But the techniques of molecular genetics may yet make it possible to make inferences about the parallel evolution of people and of the great apes, and even about the genetic basis of the emergence of outstanding human characteristics, that will be of great cultural importance. An equally great prize will be the linking of anthropological and cultural evolution, especially the use of language.

Biology, the booming branch of contemporary science, has questions of a different kind to answer. The most conspicuous of the outstanding problems is that of how the brain works. There is every reason to believe that the outstanding difficulties are to a large extent conceptual. It is not simply that nobody has yet answered the grand old question, "What is consciousness?", but that even simpler questions such as "What is a memory?" are loosely answered. There are also formidable technical problems, all of them related to the great complexity of the brain, a function of the number of neurons it contains and the number of the connections that each of them makes with others. In this field as in others, biology will have a huge data-retrieval problem on its hands in the years ahead.

None of that implies that the ethical questions already closely linked with biology are unimportant, or that they will melt away of their own accord. The use of genetic diagnosis is already contentious. Luckily, professional biologists seem as fully aware of the difficulties as anybody else. □



A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE

"To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH

THURSDAY, NOVEMBER 4, 1869

NATURE: APHORISMS BY GOETHE

NATURE! We are surrounded and embraced by her: powerless to separate ourselves from her, and powerless to penetrate beyond her.

Without asking, or warning, she snatches us up into her circling dance, and whirls us on until we are tired, and drop from her arms.

She is ever shaping new forms: what is, has never yet been; what has been, comes not again. Everything is new, and yet nought but the old.

We live in her midst and know her not. She is incessantly speaking to us, but betrays not her secret. We constantly act upon her, and yet have no power over her.

The one thing she seems to aim at is Individuality; yet she cares nothing for individuals. She is always building up and destroying; but her workshop is inaccessible.

Her life is in her children; but where is the mother? She is the only artist; working-up the most uniform material into utter opposites; arriving, without a trace of effort, at perfection, at the most exact precision, though always veiled under a certain softness.

Each of her works has an essence of its own; each of her phenomena a special characterisation: and yet their diversity is in unity.

She performs a play; we know not whether she sees it herself, and yet she acts for us, the lookers-on.

Incessant life, development, and movement are in her, but she advances not. She changes for ever and ever, and rests not a moment. Quietude is inconceivable to her, and she has laid her curse upon rest. She is firm. Her steps are measured, her exceptions rare, her laws unchangeable.

She has always thought and always thinks; though not as a man, but as Nature. She broods over an all-comprehending idea, which no searching can find out.

Mankind dwell in her and she in them. With all men she plays a game for love, and rejoices the more they win. With many, her moves are so hidden, that the game is over before they know it.

That which is most unnatural is still Nature; the stupidest philistinism has a touch of her genius. Whoso cannot see her everywhere, sees her nowhere rightly.

She loves herself, and her innumerable eyes and affections are fixed upon herself. She has divided herself that she may be her own delight. She causes an endless succession of new capacities for enjoyment to spring up, that her insatiable sympathy may be assuaged.

She rejoices in illusion. Whoso destroys it in himself and others, him she punishes with the sternest tyranny. Whoso follows her in faith, him she takes as a child to her bosom.

Her children are numberless. To none is she altogether miserly; but she has her favourites, on whom she squanders much, and for whom she makes great sacrifices. Over greatness she spreads her shield.

She tosses her creatures out of nothingness, and tells them not whence they came, nor whither they go. It is their business to run, she knows the road.

Her mechanism has few springs—but they never wear out, are always active and manifold.

The spectacle of Nature is always new, for she is always renewing the spectators. Life is her most exquisite invention; and death is her expert contrivance to get plenty of life.

She wraps man in darkness, and makes him for ever long for light. She creates him dependent upon the earth, dull and heavy; and yet is always shaking him until he attempts to soar above it.

B

Small issues yet to be decided

The big questions, that stick most easily in the mind, are dealt with elsewhere. The list that follows consists of apparently less important matters, none of which is likely to be decided quickly.

Will the Universe expand indefinitely, or stop?

Will galaxies become more or less numerous?

How long before the radius of the Sun encompasses the Earth?

Is there life elsewhere?

How best to find it?

How big was the australopithecine population?

When did human ancestors learn to speak?

How was the New World first colonized?

Why are human beings predominantly right-handed?

How can external forces make cells divide?

How energy-efficient are living things?

Can human evolution be reconstructed from the genes?

Can a realistic model of a cell be built?