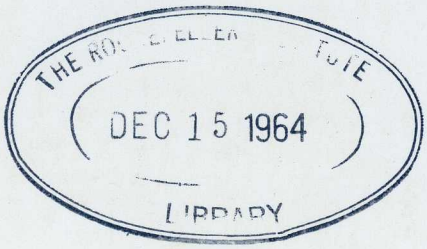
Spring 1964

The Rockefeller Institute Review 1964, vol. 2, no. 2

The Rockefeller University

THE ROCKEFELLER INSTITUTE REVIEW

MARCH • APRIL 1964



THE ROCKEFELLER INSTITUTE REVIEW, March-April 1964. The Review is issued bi-monthly. This is volume 2 number 2. Published by The Rockefeller Institute, Sixty-sixth Street and York Avenue, New York 10021. Second class postage paid at New York, New York.

THE ILLUSION OF THE TWO CULTURES

BY LOREN EISELEY

The substance of the truth lies in the great images behind the phenomenal world. Man constantly deals in symbols, whether in science or in art.

NOT LONG AGO an English scientist, Sir Eric Ashby, remarked that "To train young people in the dialectic between orthodoxy and dissent is the unique contribution which universities make to society." I am sure that Sir Eric meant by this remark that nowhere but in universities are the young given the opportunity to absorb past tradition and at the same time to experience the impact of new ideas — in the sense of a constant dialogue between past and present — lived in every hour of the students' existence. This dialogue, ideally, should lead to a great winnowing and sifting of experience and to a heightened consciousness of self which, in turn, should lead on to greater sensitivity and perception on the part of the individual.

Our lives are the creation of memory and the accompanying power to extend ourselves outward into ideas and relive them. The finest intellect is that which employs an invisible web of gossamer running into the past as well as across the minds of living men, and which constantly responds to the vibrations transmitted through these tenuous lines of sympathy. It would be contrary to fact, however, to assume that our universities always perform this unique function of which Sir Eric speaks, with either grace or perfection; in fact our investment in man, it has been justly remarked, is deteriorating even as the financial investment in science grows.

Over thirty years ago, George Santayana had already sensed this trend. He commented, in a now forgotten essay, that one of the strangest consequences of modern science was that as the visible wealth of nature was more and more transferred and abstracted, the mind seemed to lose courage and to become ashamed of its own fertility. "The hard-pressed natural man will not indulge his imagination," continued Santayana, "unless it poses for truth; and being half-aware of this imposition, he is more troubled at the thought of being deceived than at the fact of being mechanized or being bored; and he would wish to escape imagination altogether."

"Man would wish to escape imagination altogether." I repeat that last phrase, for it defines a peculiar aberration of the human mind found on both sides of that bipolar division between the humanities and the sciences, which C. P. Snow has popularized under the title of the two cultures. The idea is not solely a product of this age. It was already emerging with the science of the seventeenth century; one finds it in Bacon. One finds the fear of it faintly foreshadowed in Thoreau. Thomas Huxley lent it weight when he referred contemptuously to the "caterwauling of poets."

Ironically, professional scientists berated the early evolutionists such as Lamarck and Chambers for overindulgence in the imagination. Almost eighty years ago John Burroughs observed that some of the animus once directed by science toward dogmatic theology seemed in his day increasingly to be vented upon the literary naturalist. In the early 1900's a quarrel over "nature faking" raised a confused din in America and aroused W. H. Hudson to some dry and pungent comment upon the failure to distinguish the purposes of science from those of literature. I know of at least one scholar who, venturing to de-

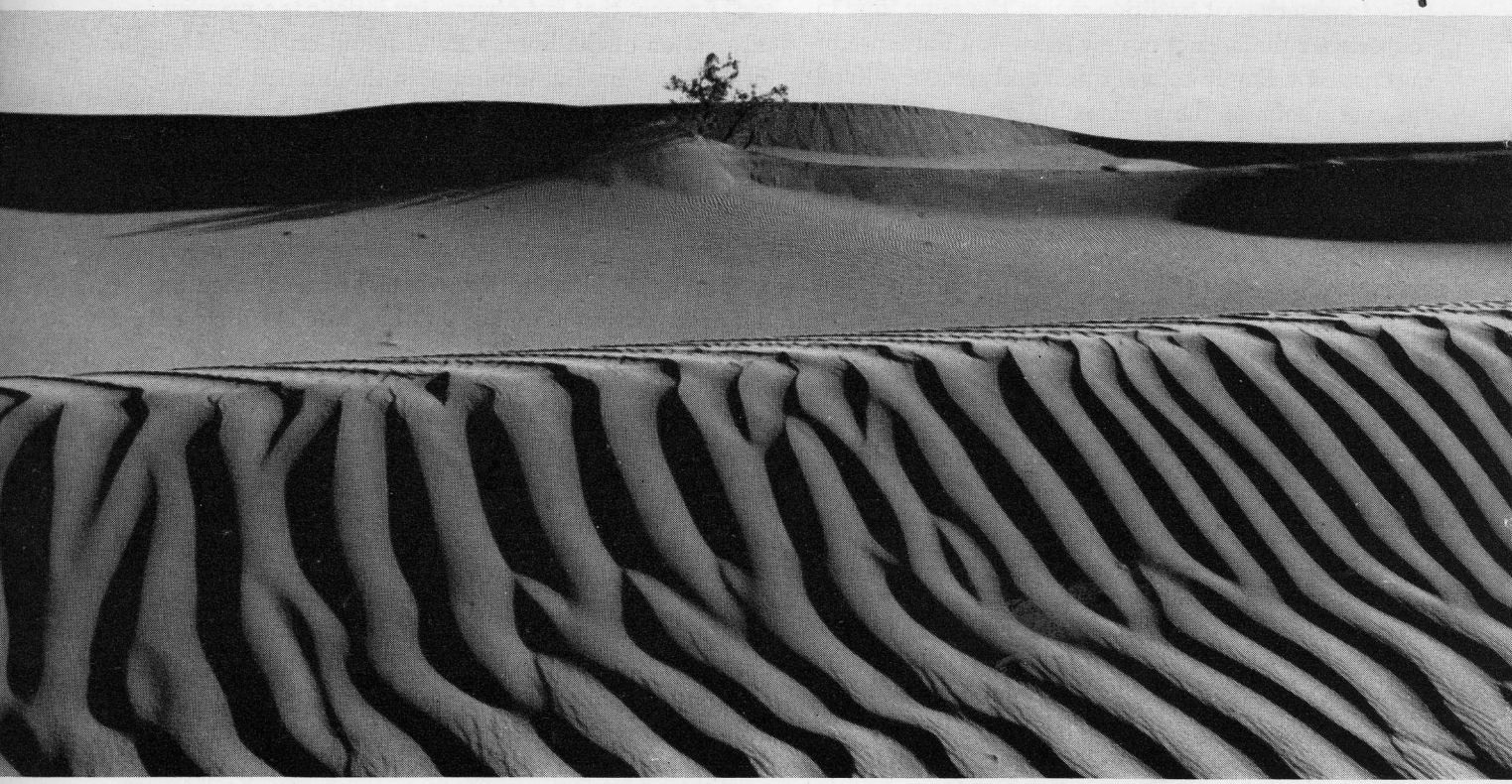
velop some personal ideas in an essay for the layman, was characterized by a reviewer in a leading professional journal as a worthless writer, although, as it chanced, the work under discussion had received several awards in literature, one of them international in scope. More recently, some scholars not indifferent to humanistic values have exhorted poets to leave their personal songs in order to portray the beauty and symmetry of molecular structures.

Now some very fine verse has been written on scientific subjects, but, I fear, very little under the dictate of scientists as such. Rather there is evident here, precisely that restriction of imagination against which Santayana inveighed; namely, an attempt to constrain literature itself to the delineation of objective or empiric truth, and to dismiss the whole domain of value, which after all constitutes the very nature of man, as without significance and beneath contempt.

Unconsciously, the human realm is denied in favor of the world of pure technics. Man, the tool user, grows convinced that he is himself only useful as a tool, that fertility except in the use of the scientific imagination is wasteful and without purpose, even, in some indefinable way, sinful. I was reading J. R. R. Tolkien's great symbolic trilogy, *The Fellowship of the Ring,* a few months ago, when a young scientist of my acquaintance paused and looked over my shoulder. After a little casual interchange the man departed leaving an accusing remark hovering in the air between us. "I wouldn't waste my time with a man who writes fairy stories." He might as well have added, "or with a man who reads them."

As I went back to my book I wondered vaguely in what leafless landscape one grew up without Hans Christian Andersen, or Dunsany, or even Jules Verne. There lingered about the young man's words a puritanism which seemed the more remarkable because, as nearly as I could discover, it was unmotivated by any sectarian religiosity unless a total dedication to science brings to some minds a similar authoritarian desire to shackle the human imagination. After all, it is this impossible, fertile world of our imagination which gave birth to liberty in the midst of oppres-

". . . the Desert — a power — just as the sea is."



sion, and which persists in seeking until what is sought is seen. Against such invisible and fearful powers, there can be found in all ages and in all institutions – even the institutions of professional learning – the humorless man with the sneer, or if the sneer does not suffice, then the torch, for the bright unperishing letters of the human dream.

One can contrast this recalcitrant attitude with an 1890 reminiscence from that great Egyptologist, Sir Flinders Petrie, which steals over into the realm of pure literature. It was written, in unconscious symbolism, from a tomb:

> I here live, and do not scramble to fit myself to the requirements of others. In a narrow tomb, with the figure of Néfermaat standing on each side of me – as he has stood through all that we know as human history – I have just room for my bed, and a row of good reading in which I can take pleasure after dinner. Behind me is that Great Peace, the Desert. It is an entity – a power – just as much as the sea is. No wonder men fled to it from the turmoil of the ancient world.

It may now reasonably be asked why one who has similarly, if less dramatically, spent his life among the stones and broken shards of the remote past should be writing here about matters involving literature and science. It was while considering this with humility and trepidation that my eye fell upon a stone in my office. I am sure that professional journalists must recall times when an approaching deadline has keyed all their senses and led them to glance wildly around in the hope that something might leap out at them from the most prosaic surroundings. At all events my eyes fell upon this stone.

Now the stone antedated anything that the historians would call art; it had been shaped many hundreds of thousands of years ago by men whose faces would frighten us if they sat among us today. Out of old habit, since I like the feel of worked flint, I picked it up and hefted it as I groped for words over this difficult matter of the growing rift between science and art. Certainly the stone was of no help to me; it was a utilitarian thing which had cracked marrow bones, if not heads, in the remote dim morning of the human species. It was nothing if not practical. It was, in fact, an extremely early example of the empirical tradition which has led on to modern science.

The mind which had shaped this artifact knew its precise purpose. It had found out by experimental observation, that the stone was tougher, sharper, more enduring than the hand which wielded it. The creature's mind had solved the question of the best form of the implement and how it could be manipulated most effectively. In its day and time this hand ax was as grand an intellectual achievement as a rocket.

As a scientist my admiration went out to that unidentified workman. How he must have labored to understand the forces involved in the fracturing of flint, and all that involved practical survival in his world. My uncalloused twentieth-century hand caressed the yellow stone lovingly. It was then that I made a remarkable discovery.

Art in Stone

In the mind of this gross-featured, early exponent of the practical approach to nature – the technician, the no-nonsense practitioner of survival – two forces had met and merged. There had not been room in his short and desperate life for the delicate and supercilious separation of the arts from the sciences. There did not exist then the refined distinctions set up between the scholarly percipience of reality and what has sometimes been called the vaporings of the artistic imagination.

As I clasped and unclasped the stone, running my fingers down its edges, I began to perceive the ghostly emanations from a long-vanished mind, the kind of mind which, once having shaped an object of any sort, leaves an individual trace behind it which speaks to others across the barriers of time and language. It was not the practical experimental aspect of this mind that startled me, but rather that the fellow had wasted time.

In an incalculably brutish and dangerous world he had both shaped an instrument of practical application and then, with a virtuoso's elegance, proceeded to embellish his product. He had not been content to produce a plain, utilitarian implement. In some wistful, inarticulate way, in the grip of the dim aesthetic feelings which are one of the marks of man – or perhaps I should say, some men – this archaic creature had lingered over his handiwork.

One could still feel him crouching among the stones on a long-vanished river bar, turning the thing over in his hands, feeling its polished surface, strik-

ing, here and there, just one more blow that no longer had usefulness as its criterion. He had, like myself, enjoyed the texture of the stone. With skills lost to me, he had gone on flaking the implement with an eye to beauty until it had become a kind of rough jewel, equivalent in its day, to the carved and gold inlaid pommel of the iron dagger placed in Tutankhamen's tomb.

All the later history of man contains these impractical exertions expended upon a great diversity of objects, and, with literacy, breaking even into printed dreams. Today's secular disruption between the creative aspect of art and that of science is a barbarism that would have brought lifted eyebrows in a Cro-Magnon cave. It is a product of high technical specialization, the deliberate blunting of wonder, and the equally deliberate suppression of a phase of our humanity in the name of an authoritarian institution: science, which has taken on, in our time, curious puritanical overtones. Many scientists seem unaware of the historical reasons for this development, or the fact that the creative aspect of art is not so remote from that of science as may seem, at first glance, to be the case.

I am not so foolish as to categorize individual scholars or scientists. I am, however, about to remark on the nature of science as an institution. Like all such structures it is apt to reveal certain behavioral rigidities and conformities which increase with age. It is no longer the domain of the amateur, though some of its greatest discoverers could be so defined. It is now a professional body, and with professionalism there tends to emerge a greater emphasis upon a coherent system of regulations. The deviant is more sharply treated, and the young tend to imitate their successful elders. In short, an "Establishment"—a trade union—has appeared.

Similar tendencies can be observed among those of the humanities concerned with the professional analysis and interpretation of the works of the creative artist. Here too, a similar rigidity and exclusiveness make their appearance. It is not that in the case of both the sciences and the humanities standards are out of place. What I am briefly cautioning against is that too frequently they afford an excuse for stifling original thought, or constricting much latent creativity within traditional molds.

Such molds are always useful to the mediocre conformist who instinctively castigates and rejects what he cannot imitate. Tradition, the continuity of learning, are, it is true, enormously important to the learned disciplines. What we must realize as scientists is that the particular institution we inhabit has its own irrational accretions and authoritarian dogmas which can be as unpleasant as some of those encountered in sectarian circles—particularly so since they are frequently unconsciously held and surrounded by an impenetrable wall of self-righteousness brought about because science is regarded as totally empiric and open-minded by tradition.

A hand ax perhaps 250,000 years old, ". . . as grand an intellectual achievement as a rocket."

Professionalism

This type of professionalism, as I shall label it, in order to distinguish it from what is best in both the sciences and humanities, is characterized by two assumptions: that the accretions of fact are cumulative and lead to progress, whereas the insights of art are, at best, singular, and lead nowhere, or, when introduced into the realm of science, produce obscurity and confusion. The convenient label "mystic" is, in our day, readily applied to men who pause for simple wonder, or who encounter along the borders of the known, that "awful power" which Wordsworth

characterized as the human imagination. It can, he says, rise suddenly from the mind's abyss and enwrap the solitary traveler like a mist.

We do not like mists in this era, and the word *imagination* is less and less used. We like, instead, a clear road, and we abhor solitary traveling. Indeed one of our great scientific historians remarked not long ago that the literary naturalist was obsolescent if not completely outmoded. I suppose he meant that with our penetration into the biophysical realm, life, like matter, would become increasingly represented by abstract symbols. To many it must appear that the more we can dissect life into its elements, the closer we are getting to its ultimate resolution. While I have some reservations on this score, they are not important. Rather, I should like to look at the symbols which in the one case, denote science and, in the other constitute those vaporings and cloud wraiths that are the abomination, so it is said, of the true scientist, but are the delight of the poet and literary artist.

Creation in Science

Creation in science demands a high level of imaginative insight and intuitive perception. I believe no one would deny this, even though it exists in varying degrees, just as it does, similarly, among writers, musicians, or artists. The scientist's achievement, however, is quantitatively transmissible. From a single point his discovery is verifiable by other men who may then, on the basis of corresponding data, accept the innovation and elaborate upon it in the cumulative fashion which is one of the great triumphs of science.

Artistic creation, on the other hand, is unique. It cannot be twice discovered as, say, natural selection was discovered. It may be imitated stylistically, in a genre, a school, but, save for a few items of technique, it is not cumulative. A successful work of art may set up reverberations and is, in this, just as transmissible as science, but there is a qualitative character about it. Each reverberation in another mind is unique. As the French novelist François Mauriac has remarked, each great novel is a separate and distinct world operating under its own laws with a flora and fauna totally its own. There is communication, or the work is a failure, but the communication releases our own visions, touches some highly personal chord in our own experience.

The symbols used by the great artist are a key releasing our humanity from the solitary tower of the self. "Man," says Lewis Mumford, "is first and foremost the self-fabricating animal." I will merely add that the artist plays an enormous role in this act of self-creation. It is he who touches the hidden strings of pity, who searches our hearts, who makes us sensitive to beauty, who asks questions about fate and destiny. Such questions, though they lurk always around the corners of the external universe which is the peculiar province of science, the rigors of the scientific method do not enable us to pursue directly.

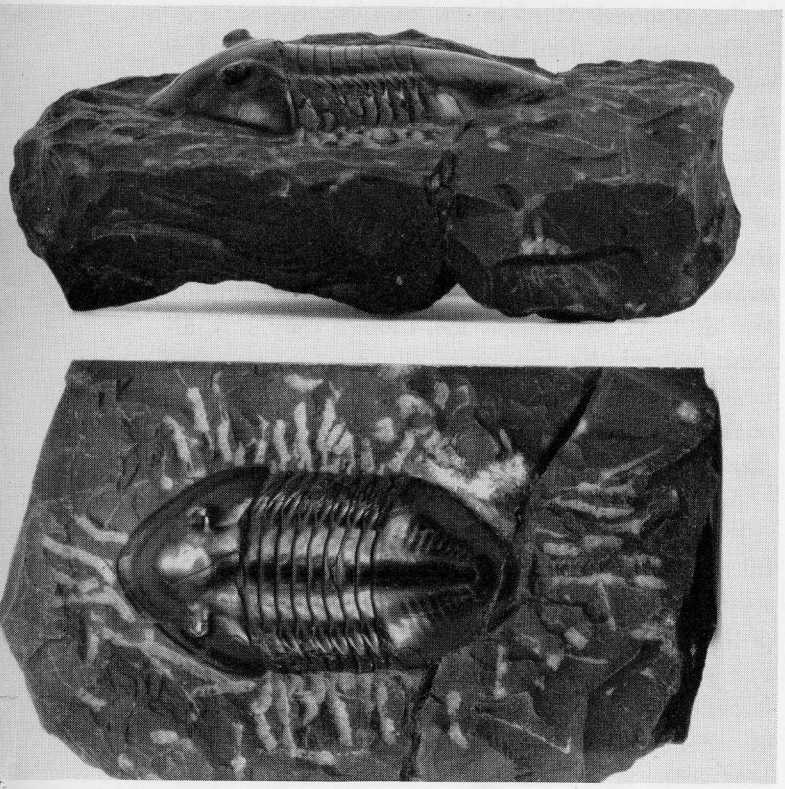
And yet I wonder.

It is surely possible to observe that it is the successful analogy or symbol which frequently allows the scientist to leap from a generalization in one field of thought to a triumphant achievement in another. For example, Progressionism in a spiritual sense later became the model contributing to the discovery of organic evolution. Such analogies genuinely resemble the figures and enchantments of great literature, whose meanings similarly can never be totally grasped because of their endless power to ramify in the individual mind.

John Donne, in the seventeenth century, gave powerful expression to a feeling applicable as much to science as to literature when he said devoutly of certain Biblical passages: "The literall sense is alwayes to be preserved; but the literall sense is not alwayes to be discerned; for the literall sense is not alwayes that which the very letter and grammar of the place presents."—A figurative sense, he argues cogently, can sometimes be the most "literall intention of the Holy Ghost."

It is here that the scientist and artist sometimes meet in uneasy opposition, or at least along lines of tension. The scientist's attitude is sometimes, I suspect, that embodied in Samuel Johnson's remark that, wherever there is mystery, roguery is not far off.

Yet surely it was not roguery when Sir Charles Lyell glimpsed in a few fossil prints of raindrops the persistence of the world's natural forces through the incredible, mysterious aeons of geologic time. The fossils were a symbol of a vast hitherto unglimpsed order. They are, in Donne's sense, both literal and symbolic. As fossils they merely denote



Fossil raindrops, even the eyes of extinct trilobites, become symbols of a vast natural order extending millions of years into the unknown past.

evidence of rain in a past era. Figuratively they are more. To the perceptive intelligence they afford the hint of lengthened natural order, just as the eyes of ancient trilobites tell us similarly of the unchanging laws of light. Equally, the educated mind may discern in a scratched pebble the retreating shadow of vast ages of ice and gloom. In Donne's archaic phraseology these objects would bespeak the principal intention of the Divine Being, that is, of order beyond our power to grasp.

Such images drawn from the world of science are every bit as powerful as great literary symbolism and equally as demanding upon the individual imagination of the scientist who would fully grasp the extension of meaning which is involved. It is, in fact, one and the same creative act in both domains.

Indeed evolution itself has become such a figurative symbol, as has also the hypothesis of the expanding universe. The laboratory worker may think of these concepts in a totally empirical fashion as subject to proof or disproof by the experimental method. Like Freud's doctrine of the subconscious, however, such ideas frequently escape from the professional scientist into the public domain. There they may undergo further individual transformation and embellishment. Whether the scholar approves or not, such hypotheses are now as free to evolve as the creations of art in the mind of the individual. All the resulting enrichment and confusion will bear about it something suggestive of the world of artistic endeavor.

Figurative Insights

As figurative insights into the nature of things, such embracing conceptions may become grotesquely distorted or glow with added philosophical wisdom. As in the case of the trilobite eye or the fossil raindrop, there lurks behind the visible evidence vast shadows no longer quite of that world which we term natural. Like the words in Donne's Bible enormous implications have transcended the literal expression of the thought. Reality itself has been superseded by a greater reality. As Donne himself asserted, "The substance of the truth is in the great images which lie behind."

It is because these two types of creation – the artistic and the scientific – have sprung from the same being and have their points of contact even in division, that I have the temerity to assert that, in a sense, the two cultures are an illusion, that they are a product of unreasoning fear, professionalism, and misunderstanding. Because of the emphasis upon science in our society, much has been said about the necessity of educating the layman and even the professional student of the humanities upon the ways and the achievements of science. I admit that a barrier exists, but I am also concerned to express the view that there persists in the domain of science itself, an occasional marked intolerance of those of its own membership who venture to pursue the way of letters. As I have previously remarked, this intolerance can the more successfully clothe itself in seeming objectivity because of the supposed open nature of the scientific society. It is not remarkable that this trait is sometimes more manifest in the younger and less secure disciplines.

There was a time, not too many centuries ago, when to be active in scientific investigation was to invite suspicion. Thus it may be that there now lingers among us, even in the triumph of the experi-

mental method, a kind of vague fear of that other artistic world of deep emotion, of strange symbols, lest it seize upon us or distort the hard-won objectivity of our thinking – lest it corrupt, in other words, that crystalline and icy objectivity which, in our scientific guise, we erect as a model of conduct. This model, incidentally, if pursued to its absurd conclusion, would lead to a world in which the computer would determine all aspects of our existence; one in which the bomb would be as welcome as the discoveries of the physician.

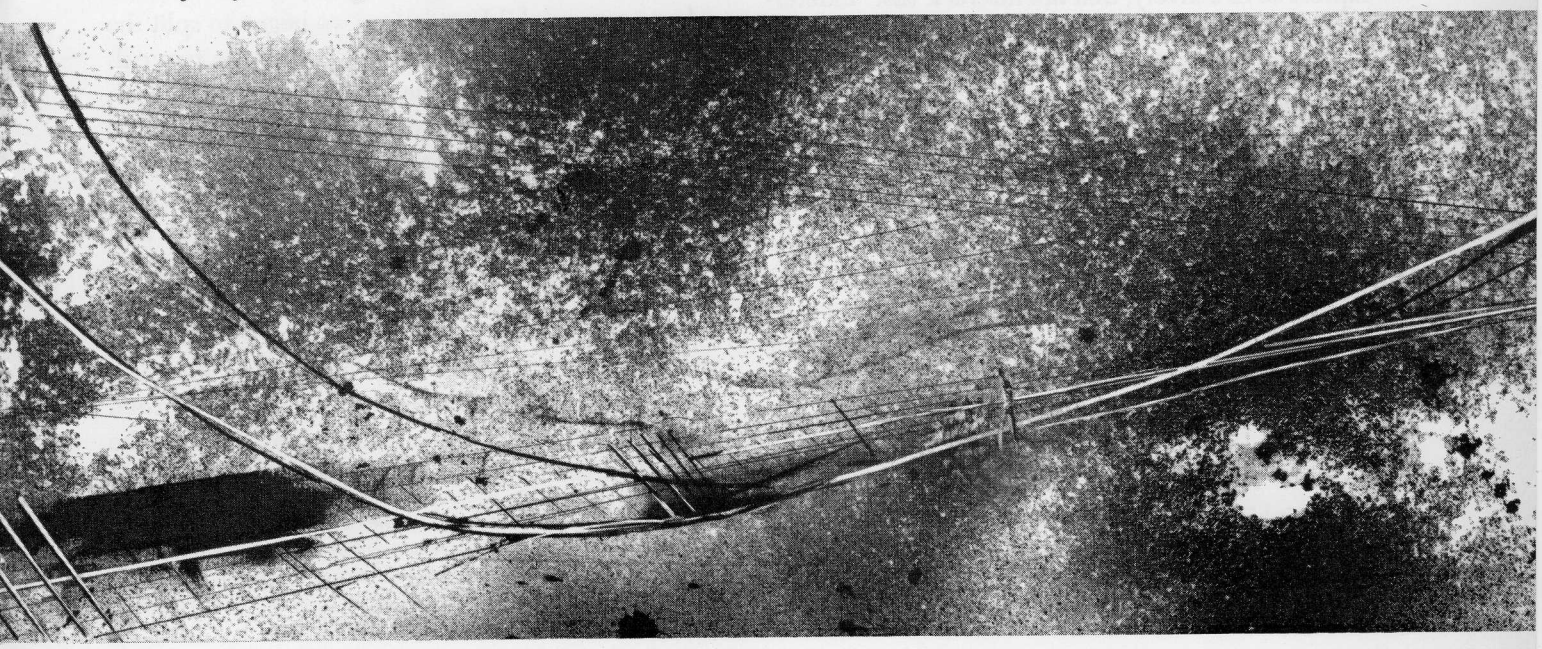
Happily, the very great in science, or even those unique scientist-artists such as Leonardo, who foreran the emergence of science as an institution, have been singularly free from this folly. Darwin decried it even as he recognized that he had paid a certain price in concentrated specialization for his achievement. Einstein, it is well known, retained a simple sense of wonder; Newton felt like a child playing with pretty shells on a beach. All show a deep humility and an emotional hunger which is the prerogative of the artist. It is with the lesser men, with the institutionalization of method, with the appearance of dogma and mapped-out territories that an unpleasant suggestion of fenced preserves begins to dominate the university atmosphere.

As a scientist, I can say that I have observed it in my own and others' specialties. I have had occasion, also, to observe its effects in the humanities. It is not science *per se;* it is, instead, in both regions of thought, the narrow professionalism which is also plainly evident in the trade union. There can be small men in science just as there are small men in government, or business. In fact it is one of the disadvantages of big science, just as it is of big government, that the availability of huge sums attracts a swarm of elbowing and contentious men to whom great dreams are less than protected hunting preserves.

The sociology of science deserves at least equal consideration with the biographies of the great scientists, for powerful and changing forces are at work upon science, the institution, as contrasted with science as a dream and an ideal of the individual. Like other aspects of society, it is a construct of men, and is subject, like other social structures, to human pressures and inescapable distortions.

Let me give you an illustration. Even in learned journals, clashes occasionally occur between those who would regard biology as a separate and distinct domain of inquiry and the reductionists who, by contrast, perceive in the living organism only a vaster and more random chemistry. Understandably, the

Mystery and beauty are the common substrate of science and art. (Pen and ink drawing by Charles Schucker.)



concern of the reductionists is with the immediate. Thomas Hobbes was expressing a similar point of view when he castigated poets as "working on mean minds with words and distinctions that of themselves signifie nothing, but betray (by their obscurity) that there walketh . . . another kingdome, as it were a kingdome of fayries in the dark." I myself have been similarly criticized for speaking of a nature "beyond the nature that we know."

Semantic Confusion

Yet consider for a moment this dark, impossible realm of Fayrie. Man is not totally compounded of the nature we profess to understand. He contains, instead, a lurking unknown future, just as the man-apes of the Pliocene contained in embryo the future that surrounds us now. The world of human culture itself was an unpredictable fairy world until, in some Pre-Ice-Age meadow, the first meaningful sounds in all the world broke through the jungle babble of the past, the nature, until that moment, "known."

It is fascinating to observe that, in the very dawn of science, Bacon, the spokesman for the empirical approach to nature, shared with Shakespeare, the poet, a recognition of the creativeness which adds to nature, and which emerges from nature as "an art which nature makes." Neither the great scholar nor the great poet had renounced the kingdome of Fayrie. They had realized what Bergson was later to express so effectively, that life inserts a vast "indetermination into matter." It is, in a sense, an intrusion from a realm which can never be completely subject to prophetic analysis by science. The novelties of evolution emerge; they cannot be predicted. They haunt, until their arrival, a world of unimaginable possibilities behind the living screen of events, as these last exist to the observer confined to a single point on the time scale.

Oddly enough, much of the confusion that surrounded my phrase, "a nature beyond the nature that we know," resolves itself into pure semantics. I might have pointed out what must be obvious even to the most dedicated scientific mind that the nature which we know has been many times reinterpreted in human thinking, and that the hard, substantial matter of the nineteenth century has already vanished into a dark, bodiless void, a web of "events" in space-time. This is a realm, I venture to assert, as weird as any we have tried, in the past, to exorcise by the brave use of seeming solid words. Yet some minds exhibit an almost instinctive hostility toward the mere attempt to wonder, or to ask what lies below that microcosmic world out of which emerge the particles which compose our bodies, and which now take on this wraithlike quality.

Is there something here we fear to face, except when clothed in safely sterilized professional speech? Have we grown reluctant in this age of power to admit mystery and beauty into our thoughts, or to learn where power ceases? I referred a few moments ago to one of our own forebears on a gravel bar, thumbing a pebble. If, after the ages of building and destroying, if after the measuring of light-years, and the powers probed at the atom's heart, if after the last iron is rust-eaten and the last glass lies shattered in the streets, a man, some savage, some remnant of what once we were, pauses on his way to the tribal drinking place and feels rising from within his soul the inexplicable mist of terror and beauty that is evoked from old ruins – even the ruins of the greatest city in the world – then, I say, all will still be well with man.

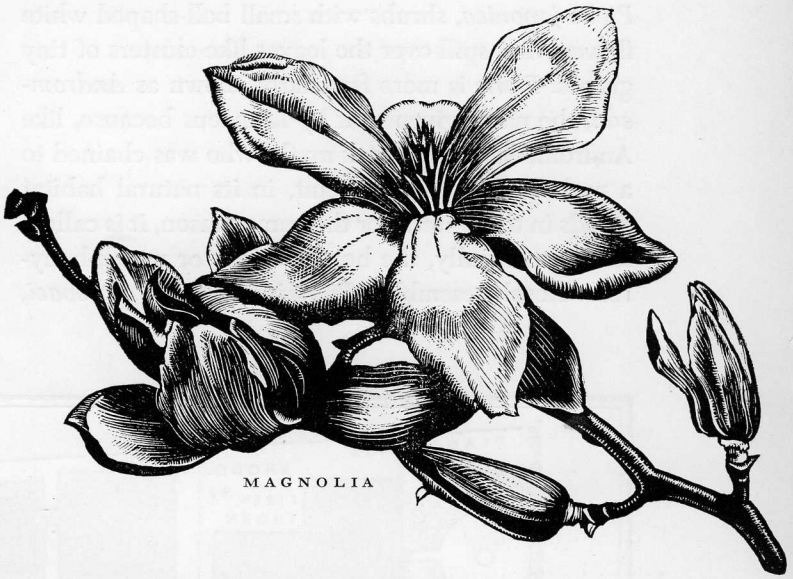
The Stone of Power

And if that savage can pluck a stone from the gravel because it shone like crystal when the water rushed over it, and hold it against the sunset, he will be as we were in the beginning, whole – as we were when we were children, before we began to split the knowledge from the dream. All talk of the two cultures is an illusion; it is the pebble which tells man's story. Upon it is written man's two faces, the artistic and the practical. They are expressed upon one stone over which a hand once closed, no less firm because the mind behind it was submerged in light and shadow and deep wonder.

Today we hold a stone, the heavy stone of power. We must perceive beyond it, however, by the aid of the artistic imagination, those humane insights and understandings which alone can lighten our burden and enable us to shape ourselves, rather than the stone, into the forms which great art has anticipated.

This address was delivered October 29, 1963 in The Rockefeller Institute at a symposium inaugurating The Richard Prentice Ettinger Program for Creative Writing, of which Doctor Eiseley is Director.

INSTITUTE FLORA


MAGNOLIA

When the development of The Rockefeller Institute as a graduate university was being planned, the question was asked: Should the Institute move into an uncrowded, rural area of natural beauty. To have done so would have removed the Institute from an environment of man-made beauty and the rich fruits of human creativity. As plans for a score of new buildings progressed, architect Wallace Harrison recommended Dan Kiley of Charlotte, Vermont, as a sensitive landscape architect. On a morning in 1956, Mr. Kiley and President Bronk met on the Institute campus. "If you wish me to participate in the development of the new Institute, I should tell you at once that I cannot assume any further commitments because of large undertakings to which I am obligated," said Mr. Kiley. But he agreed to listen for fifteen minutes. Dr. Bronk described the trustees' plans for fifteen acres of natural beauty as the setting for a great university in a frenetic, crowded city. Fifteen minutes lengthened into five and a half hours of discussion. Finally, Mr. Kiley exclaimed: "If I cannot participate in this great undertaking, I shall be one of the most disappointed men in America." The fulfillment of the dream was made possible by a generous contribution from David Rockefeller, Chairman of the Institute's Board of Trustees and a perceptive lover of nature and art. Thus began the development of one of the most beautiful areas in New York.

SPRING STIRS in each of us a sense of wonder. Perhaps we are still linked to a not-so-distant past when spring was a truly magic event, to be evoked each year by sacred rites. Or it may be the sheer profligacy of the season, so astonishing to every city dweller who has spent months brooding over a single pallid begonia. Surely, for all who glimpse the complexity of events taking place in each awakening cell, spring is little short of a miracle.

One of the loveliest places in Manhattan to watch this miracle unfold is on the campus of The Rockefeller Institute where each change of color and form is brought into sharp focus against the city streets and buildings. Here, as in almost all lands to which spring comes, the first signs that winter is yielding are the crocuses, bright promissory notes gleaming through the last snowfall. They bloom first on the sunny northern bank of the main walk and spread along the east of Caspary and Abby Aldrich Rockefeller Halls.

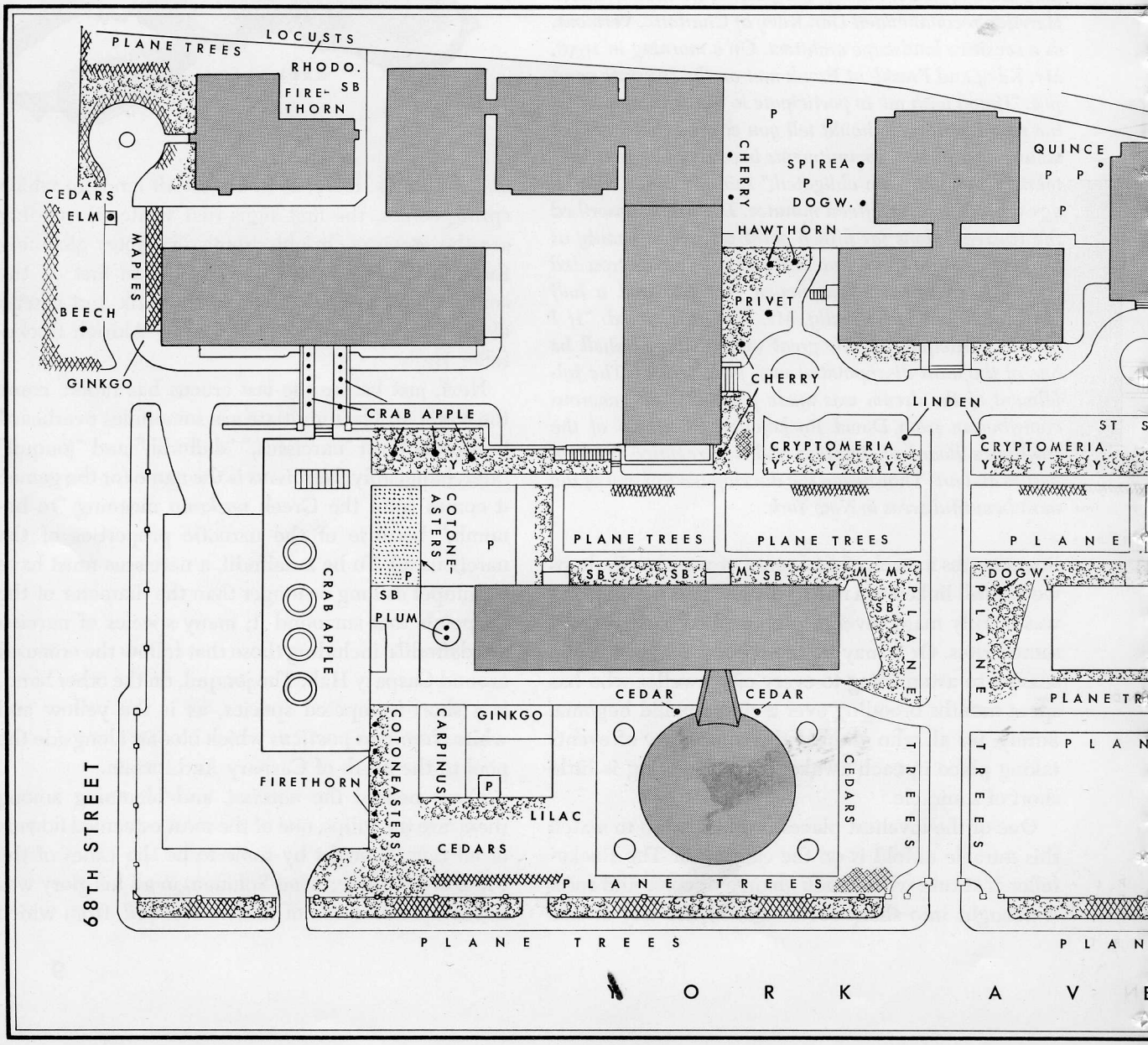
Next, just before the last crocus has faded, come the *Narcissi.* The uninitiate are sometimes overheard to use the term "narcissus," "daffodil," and "jonquil" interchangeably. *Narcissus* is the name for the genus; it comes from the Greek *narkoun* meaning "to benumb," because of the narcotic properties of the narcissus oil. To be a daffodil, a narcissus must have a trumpet as long or longer than the diameter of the six petals that surround it; many species of *narcissi* are daffodils, including those that follow the crocuses around Caspary Hall. The jonquil, on the other hand, is a short-trumpeted species, as is the yellow and white *Narcissus poeticus* which blooms alongside the pool to the north of Caspary Auditorium.

Close behind the *narcissi,* and blooming among them, are the tulips, one of the most esteemed flowers of all time, thought by some to be the Lilies of the Field of the Bible, "And Solomon in all his glory was not arrayed like one of these." *Tulbend,* from which

tulip is derived, means turban in Turkish; it is said that once tulips became popular, Turks wound their turbans in new ways to make them resemble tulips even more, proving the power of a metaphor.

Flowering with the narcissi and tulips are the *Pieris japonica,* shrubs with small bell-shaped white flowers that spill over the leaves like clusters of tiny grapes. *Pieris* is more familiarly known as *Andromeda,* the name given to it by Linnaeus because, like Andromeda of the Greek myths who was chained to a rock in the sea, the plant, in its natural habitat stands in the water. For this same reason, it is called, less romantically, the bog-rosemary or marsh-holly-rose. Closely resembling *Pieris* is *Leucothoe catesbaei,* a lovely evergreen found wild through Virginia, Georgia, and Tennessee. The flowers are similar, but the clusters are more erect than those of *Pieris japonica* and experts, such as Christopher Murray, the Institute's chief gardener, can detect a difference in the leaves. *Leucothoe* grows between the border of yew (*Taxus cuspidata*) and the flowering quince (*Cydonia oblongata*) along the west wall of Flexner Hall.

Other early flowers are the shadbushes (*Amelanchier canadensis*), tall, thinnish shrubs which have white flowers with narrow drooping petals that appear about the time the shad begin to run; later in the year they bear a maroon-purple fruit. Shadbushes

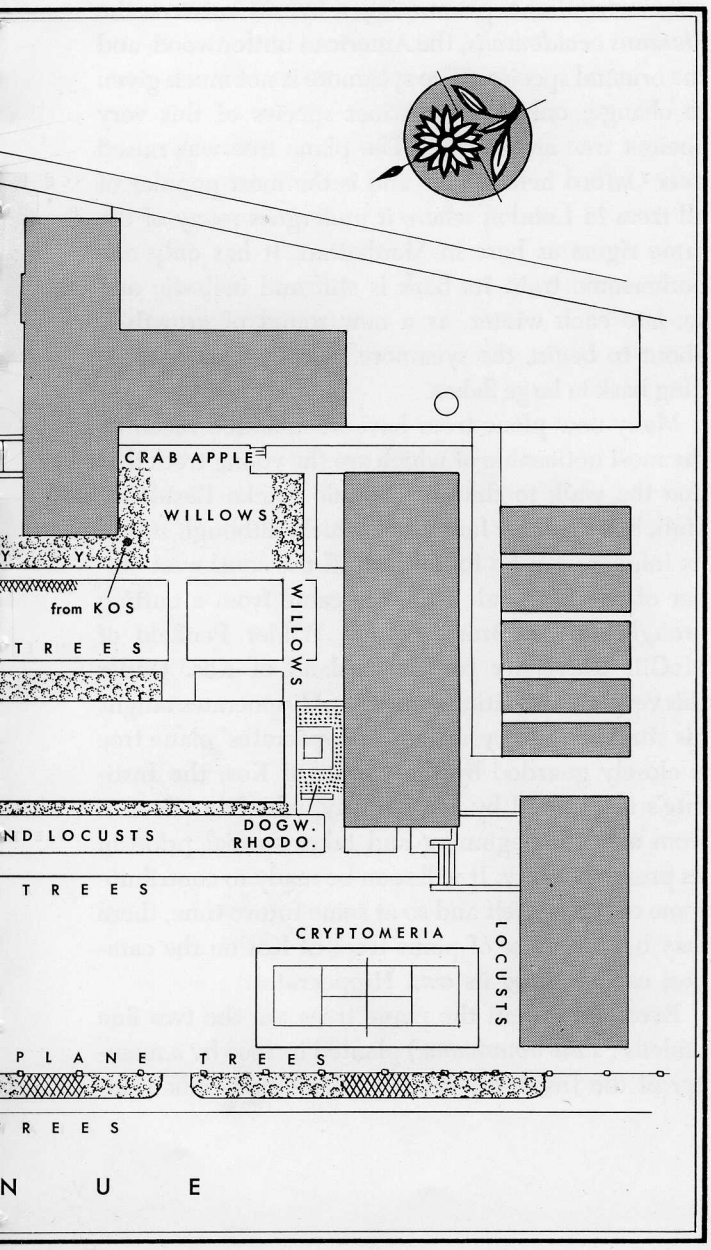


grow along the east and south of Caspary Hall, and the north and east of the Students Residence. Another plant that calls attention to itself in April, though in a modest way, is the ground myrtle, or *Vinca minor,* which bears a shy blue flower. *Vinca* is a useful ground cover, sharing this function with Pachysandra and English ivy. The deciduous vine that traces such a complex pattern across the face of Founder's Hall is the *Ampelopsis.*

Suddenly, once bulbs, Pieris, and Leucothoe have set the stage, the magnolias burst spectacularly into flower, spilling creamy cup-shaped blossoms on the banks south of Caspary Hall. Magnolias are traditionally associated with romantic evenings in our southern states but actually the first magnolias left their fossil records in the circumpolar forest some 300 miles north of the Arctic Circle. Driven south by the Ice Age, they took refuge in the Alleghanies and now have begun to creep back once more toward the north. According to folklore, the chewing of magnolia bark is said "to break the cigarette habit," a property not, however, recorded in the Report to the Surgeon General.

In May, a new wave of flowering sweeps across the campus. The spectacular white-flowering cherries burst into snowy bloom near the entrance to Flexner Hall and pink cherries flower behind Founder's where they can be seen from the north windows of the small dining hall. Also in the little garden is a dogwood, a crab apple, a Weigela, a *hibiscus* (the Rose-of-Sharon of the Bible) and several *Spirea* or Bridal Wreath. Across from Abby Aldrich Rockefeller, to the east, there are four more flowering crabs, each a slightly different shade of pink, and still more crab trees, later bloomers because of their less sunny location, can be found behind the Hospital. The crab trees are natives but the cherries are from Japan, where a national holiday is declared each year when the cherry trees bloom in Tokyo.

Most spectacular of all the Institute's horticultural treasures are the azaleas, of which there are many different kinds on the campus. Typical of the "old-



TREES	BUSHES AND COVER
beech	azalea and Pieris japonica
Carpinus (hornbeam)	barberry
cedars	cotoneasters
cherry	firethorn
crab apple	Ilex
Cryptomeria	lilac
dogwood	magnolia (M)
elm	pachysandra
Ginkgo	privet
linden	Rhododendron
locusts	shadbushes (SB)
maples	spirea
plane trees (also P)	Stewartia (St)
quince	yew (Y)
willows	

fashioned" azaleas are the large purple shrubs, such as those along the main walk and in front of Flexner Hall. The newer azaleas are smaller, with lighter wood and foliage and a great variety of colors ranging from white through pink and "apple blossom" to the deepest of reds. Taxonomically, the azaleas are grouped with *Rhododendron* (rose tree), one of the most aristocratic of shrubs of which several hundred species have been identified. "True" rhododendrons, broad-leafed evergreens, grow wild in the mountains and forests of the Appalachian chain and on the mountain slopes of the West Coast as well as in Western China and the Himalayas where many new kinds have recently been discovered. When explorations of the Far East first began, botanists were astonished at the close similarity of American and Oriental plant life. This is now attributed by the authorities to a common origin in the circumpolar forest when these continents were once joined in a single land mass. As they drifted apart, they carried their magnolias and rhododendrons and countless other genera with them. Last year, a few of these "true" rhododendrons were planted on campus and their blooms may be expected for future springs.

Another new acquisition is a group of small late-blooming dogwoods (*Cornus kousa*), several of which are planted just to the north of the Graduate Students Residence, close to the main driveway. The dogwood is useful as well as ornamental. As the name *Cornus* implies, the wood is very hard and has been used for a variety of objects, such as heads of golf clubs, pulleys, spindles and knitting needles. Some students of nomenclature believe that it is the hardness of the wood that led to the name dogwood – an epithet uttered by a tired axman – but Bailey, dean of taxonomists, offers the alternative suggestion that one species (*Cornus sanguinea*) was held to be good for the mange.

CHERRY BLOSSOMS

Trees

As the bright flashes of color burst and fade, the many shades of green shift slightly with the changing season. The dominant green is the long stretch of smooth lawn extending north and south in a serene unbróken vista. Shading the walks and the lawn are the sycamores or London plane trees; more than 120 of these were planted in 1913, not long after the Hospital was opened. The London plane tree (*Platanus acerifolia*) is presumably a hybrid between the *Platanus occidentalis,* the American buttonwood, and the oriental species. (The sycamore is not much given to change; only three distinct species of this very ancient tree are known.) The plane tree was raised near Oxford before 1700 and is the most popular of all trees in London where it undergoes many of the same rigors as here in Manhattan. It has only one bothersome trait. Its bark is stiff and inelastic and so, late each winter, as a new round of growth is about to begin, the sycamore literally bursts, shedding bark in large flakes.

Many new plane trees have been added recently, the most noticeable of which are the young trees that line the walk to the new Sophie Fricke Residence Hall, but the most famous of which, although still in its infancy, can be found just off the southwest corner of the Hospital. This tree came from a cutting brought to Dr. Bronk by Dr. Wilder Penfield of McGill University from the island of Kos. Under this very tree, tradition assures us, Hippocrates taught his students, 2400 years ago. Hippocrates' plane tree is closely guarded by the people of Kos; the Institute's is guarded by Mr. Murray, who has raised it from a sickly beginning and takes special pride in its present vitality. It will soon be ready to contribute some cuttings itself and so at some future time, there may be a number of plane trees of Kos on the campus, each waiting its own Hippocrates.

Even older than the plane trees are the two fine lindens (*Tilia americana*) planted in 1906 by a member of the Institute's Board of Directors. When lin-

SUNLIGHT AND GREEN LEAVES

The next time you see a tree in leaf or a plot of grass with the light shining on it, think of it for a moment. It is more than something green, a decorative part of the landscape. It is the world's greatest and most important factory, the products of which are essential for the life not only of the plant, but of almost all living things, including ourselves. In the last analysis, all the energy of the food we eat as well as that stored in fossil fuels was once captured by the green leaf of a plant from the light that fell upon it.

CROCUSES

The importance of plants has been known for a hundred years or more. Even so, some of us may forget that the oxygen we breathe and all the food we eat come from those plants which contain the green pigment, chlorophyll. The process by which this occurs, photosynthesis, can be described simply: in the presence of light, gaseous carbon dioxide and chlorophyll in the living plant combine with water to form gaseous oxygen and sugar. From this sugar are made all of the complex constituents of the plant body. The perfume of a lilac and the pigment that colors its blossoms, the opium of the poppy, the digitalis in the foxglove, the starch in a potato, the lignin of wood, the oil in a peanut, the protein in a wheat grain, even DNA and RNA, are all formed from sugar. Phosphorus, sulfur, nitrogen, and other elements may be added to the sugar molecule, but no matter how complex the ultimate product may be, the original material is that which the plant makes in photosynthesis.

William J. Robbins

dens are in bloom, it is said that their fragrance carries more than a mile and that bees forsake all other flowers, making a very white honey from the nectar of the tiny blossoms. Just to the south of the southernmost linden, along the drive leading to the entrance to the Hospital, is a sedate row of three lovely trees, the *Stewartia Pseudo-Camellia,* named by Linnaeus after John Stuart, Earl of Bute. If one looks closely, one can see minute camellia-like flowers nestled in the spring leaves. Another gentleman who went into botanical immortality with his name misspelled was Caspar Wistar, the physician and anatomist; a specimen of his namesake can be found at the entrance to the driveway of the President's House.

The lightest shade of green, a golden yellow, is contributed by the weeping willows, the *Salix babylonica,* near the entrance to the South Laboratory at the end of the long walk that bisects the campus from north to south. Lining the east of this long walk is a row of trees of a dark, dark green, the *Cryptomerias,* plume-like trees that look as if they had been drawn by a Japanese brush, as indeed they often have. These lovely trees are struggling to survive the cold and sulfurous air of the city; those near the pool north of the auditorium seem to be faring a little better in their more sheltered location. The *Cedrus atlanticus,* related to the majestic cedars of Lebanon, also seem to find Manhattan unfriendly; the most robust of these are found near the dome of Caspary Auditorium.

One of the sturdiest and most versatile of all the Institute's shrubs is the *Ilex crenata,* or Japanese holly. It forms the close-knit hedges on the western border of the long north-south walk, and a long hedge of *Ilex* stretches the length of the Institute along York Avenue. Mr. Bernard Lupinek, Superintendent of Buildings and Grounds, tells us that when the planting along the Avenue was completed, the First Avenue Association awarded a certificate to the Institute in appreciation for the beauty added to the

neighborhood. Allowed to grow taller, the *Ilex* makes a useful fence or a nice dark green clump to fill a corner where other plants refuse to grow. *Ilex crenata* is not like our American holly, with the serrated shiny leaves and red berries that we have come to associate with Christmas, but is more closely related to the *Ilex paraguayensis* used by the natives of South America to make maté. Some American holly trees are to be found on the campus but unlike their Japanese relatives, they find survival in the city difficult.

New this year are the honey locusts, *Gleditsia triacanthos*. A native American tree, the honey locust bears unassuming green flowers followed by highly characteristic scimitar-shaped pods filled with sweet sticky substance edible by children. There is a row of tall slender honey locusts along the west of the Students Residence Hall, behind the new plane trees, and a small forest in front of the Sophie Fricke Residence.

Garden

One of the most popular springtime retreats on the campus is the secluded area around the pool to the north of Caspary Auditorium. The south and west are sheltered by a high-growing *Ilex*. Behind the *Ilex,* toward the dome is, surprisingly, a small thicket of blueberries, the fruits of which are seen by few of the staff but are well-known to neighborhood birds. On the west, between *Ilex* and pool, are snowy white azaleas, punctuated in the early spring by the yellow and white *Narcissi poetica*. Here, too, are found a group of low-growing spiny evergreens, *cotoneasters* (pronounced ko-to-nee-asters); more of these are found to the north of Abby Aldrich Rockefeller. Overhanging the pool is a great plane tree and to the south of the tree, a marble bench with a large lilac behind it. Another lilac can be found behind the *Ilex* among the blueberries. Just north of the pool are twelve European hornbeams (*Carpinus betulus*) a tree with a hard bone-like wood that is related to our birch, and to the north of these, six *Cryptomeria*. Further north, just against the wall, is firethorn (*Pyracantha*).

East of the pool are six young Ginkgo trees (*Ginkgo biloba*), a tree that has presided over most of evolution. The Ginkgo is the most primitive of all seed plants, dating back 200 million years to late paleozoic times. The Ginkgo was preceded by the ferns and followed by the conifers or gymnosperms which, much later, gave way to the hardwood trees, the angiosperms, that have their seeds packaged in some sort of container, a berry, fruit, nut, or pod. The flat, splayed, semicircular leaf of the Ginkgo resembles that of the prehistoric maidenhair fern, which began the first experiments that led, in the Age of the Great Reptiles, to the broad-leafed trees of modern times. Its pollen, like that of the ferns, has swimming sperm which needs water to reach the ovule; in this they resemble the mosses and ancient algae. The wood structure of the Ginkgo is like that of the pine or fir tree and the seed like that of the coniferous yew or juniper. Like archaeopteryx and the duckbill platypus, the Ginkgo is a signpost at an intersection of evolutionary history. Curiously, this remarkably adaptable plant, which is host to no known pests or blights, is now never found growing wild but only lives where man lives, whether on the New York streets or in the temple gardens of the Orient.

Two more clumps of young Ginkgos can be found in the driveway to the President's House. Between these clumps, along the south of the driveway is a row of young column maples and, across from the maples, two trees dear to all who spent New England childhoods, a beech and an elm, the Queen of the Forest.

A new retreat of special quiet loveliness has been added to the campus this year, the Theodore Berlin Memorial Garden, secluded and half-enclosed between the two residence halls. Here, too, is a pool and fountain, surrounded by pure white marble around which has been planted pachysandra which will grow to form a rich green carpet. *Ilex* grows against the walls to the east and west, dark rhododendrons fill the corners and four young *Cornus kousa* are waiting to flower, next spring or perhaps the one after. This cool formal garden is a memorial to Professor Berlin who was at the Institute for only a fleeting year and a half before his untimely death. Its classic serenity serves as a reminder of the essential harmony of man and nature, a harmony which underlies all beauty and art, as well as science.

"Sunlight and Green Leaves" is a brief excerpt from some informal remarks by Dr. William J. Robbins, a Trustee of the Institute since 1956 and Director Emeritus of the New York Botanical Garden. "Institute Flora" was prepared by Helena Curtis, free-lance writer and editorial consultant to the Review.

NEWS AND NOTES

W. J. V. OSTERHOUT

Dr. Winthrop J. V. Osterhout died on April 8, at the age of 92, following a long illness.

One of Dr. Osterhout's first affiliations with the Institute began in 1920 when he joined the Board of Scientific Directors. In 1925, Dr. Osterhout was appointed Member and Head of the Division of General Physiology. He became a Member Emeritus in 1939 and continued his research in that capacity.

"Dr. Osterhout was one of a few leading pioneers who began to explain living matter in terms of chemistry and biology," said President Bronk at the time of Dr. Osterhout's death. "Modern biology rests on the foundations these men laid half a century ago."

THE GOLD-HEADED CANE

Dr. Peyton Rous, in April, received the Gold-Headed Cane from the American Association of Pathologists and Bacteriologists. The Cane is awarded traditionally to a physician who "represents the highest ideals in pathology and medicine." Dr. Rous is best known, of course, for his discovery of the tumor virus that bears his name and for his work with this now famous agent, but he has been active in many other fields. It was he who first used trypsin to separate cells from one another and their supporting stroma. During World War I, Dr. Rous, together with two colleagues, developed a method for preserving red blood cells—the technique making transfusions possible and remaining in use, with modifications, to this day.

The Gold-Headed Cane has a long history, dating back to the 17th century when the cane was an essential part of the physician's equipment. The head of the physician's cane was usually a hollow knob of gold, silver, or ivory in which were carried aromatic preparations that could be inhaled to ward off contagion. The original gold-headed cane was carried by John Radcliffe of Oxford who, shortly before his death in 1714, presented it to the most promising of his younger colleagues. This started the tradition, and the cane passed from hand to hand as a mark of professional esteem until the widow of Mathew Baillie, the anatomist, gave it to the New College of Physicians, where it was retired. The "autobiography" of the cane is preserved in a charming book written by William MacMichael, M.D., first published in 1827.

The custom of awarding a gold-headed cane as a high professional honor was revived some 40 years ago by the American Association of Pathologists and Bacteriologists. Four members of the Institute have previously received the award: Dr. William H. Welch, Dr. Theobald Smith, Dr. George H. Whipple, and in 1960, Dr. Eugene L. Opie.

Dr. Rous is the twelfth recipient of this high honor.

FOUR HONORS FOR THE PRESIDENT

President Bronk was honored by four institutions during April. At the annual meeting of the National Academy of Sciences, Dr. Bronk was awarded the Marcellus Hartley Gold Medal for "Eminence in the Application of Science to the Public Welfare." John D. Rockefeller, Jr. received this award in 1943 while he was President of the Board of Trustees of the Institute.

The National Science Act prescribes that Presidential appointment and Senate confirmation of membership on the National Science Board be limited to two terms; accordingly, Dr. Bronk's term of office ended in April after fourteen years as a member of the Board from its beginning and nine years as its Chairman. At that time the Board honored President Bronk as "Scientist and statesman of science, educator, philosopher, administrator, public servant, distinguished leader of men and beloved friend." More than 250 scientists and government officials attended the dinner for Dr. and Mrs. Bronk at which the President of the California Institute of Technology, the Chairman of the Board of Trustees of the Massachusetts Institute of Technology, the Director of the National Science Foundation, and the Science Adviser to the President of the United States spoke of Dr. Bronk's many services to science and education through the Science Foundation. In President Johnson's greetings, he said:

"No one has spoken more consistently and eloquently before the committees of the Congress on the nature of basic scientific research, its importance to the national welfare and the role of the Federal Government in its support . . . Yours is a remarkable record of dedication and accomplishment that has earned heartfelt admiration and appreciation . . . To young Americans who aspire to excellence you provide a model of an outstanding citizen and public servant . . . You will remain available in the ranks of those whose advice and counsel are sought at the highest levels of Government."

At the University of Pennsylvania the Detlev Bronk Library was dedicated in the new building connecting the Biological Laboratories and the Alfred Newton Richards Laboratories of Medical Science, and adjacent to the Johnson Foundation for Medical Physics of which Dr. Bronk was the first director for twenty years.

In a quite different sector of activity, Dr. Bronk was the guest of honor of the oldest fox hunting club in America. Before leaving suburban Philadelphia under pressure of suburbanization, the 105th and last annual dinner of the Rose Tree Fox Hunting Club was a tribute to Dr. Bronk's efforts to conserve natural beauty and wild life in the Philadelphia area. For this he was presented with the Club's special silver trophy.

AWARDS AND DEGREES

Professor Alfred E. Mirsky was elected a member of the American Philosophical Society "founded by Benjamin Franklin for promoting useful knowledge." In April Dr. Mirsky received the honorary degree *La Laurea ad Honorem in Scienze Biologiche*, from the University of Palermo. Two of the University Professors of Biology were former members of Dr. Mirsky's laboratory group, Alberto Monroy and Giuseppe Reverberi, both of whom were at The Rockefeller Institute as guest investigators.

Professor Theodosius Dobzhansky has been made an honorary member of the Accademia Nazionale dei Lincei, of which Galileo was the sixth member. Last fall, Dr. Dobzhansky received the Lecomte du Noüy Prize for his book *Mankind Evolving*. This award is presented every other year for writing which makes a significant contribution to "the spiritual life of our epoch and the defense of human dignity." The late Lecomte du Noüy, French scientist, philosopher, and author, was a member of the scientific staff of the Institute from 1920 to 1928. Professor Loren C. Eiseley received the award in 1961.

Professors Stanford Moore and William H. Stein shared the 1964 American Chemical Society Award in Chromatography and Electrophoresis sponsored by the Lab-Line Instruments, Inc., for their work on

the development of automated procedures for amino acid analyses.

Dr. Vincent du Vigneaud received the 1963 Honorary Lectureship Award from Albany Medical College of Union University. Dr. du Vigneaud, head of the Department of Biochemistry at Cornell University Medical College and a Trustee of the Institute since 1949, is best known for his work on the determination of the structures of oxytocin and vasopressin and for the synthesis of oxytocin, the first polypeptide to be made in the laboratory.

THE FACULTY ABROAD

Dr. Gerald M. Edelman attended the Oholo Conference on *Molecular Aspects of Immunology* in Israel from March 23 to March 26 and presented a paper on "Some Relations between the Structure and Activities of Antibodies." He also spoke at the Pasteur Institute in Paris during his trip, holding an informal seminar on "Reconstitution of Active Antibody Molecules from L and H Polypeptide Chains."

Dr. Igor Tamm participated in a Symposium on *Cellular Biology of Myxovirus Infections* in London under the sponsorship of the CIBA Foundation. While Dr. Tamm was in Great Britain, he also spoke at Cambridge University and at the Institute of Virology at Glasgow University.

Dr. George E. Uhlenbeck has been appointed the first van der Waals Visiting Professor of Theoretical Physics at the University of Amsterdam where he is spending the spring semester.

President Bronk has been elected a member of the Athenæum of London in recognition of "distinguished eminence in science, literature and the arts, and for public service."

Dr. Floyd Ratliff participated in the Symposium on Neurophysiology sponsored by the United States-Japan Cooperative Science Program, in Tokyo, in March. During his visit to Japan, Dr. Ratliff lectured at Keio University School of Medicine in Tokyo and Tohoku University School of Medicine in Sendai.

Professor H. Keffer Hartline gave a paper at the International Neurophysiology Symposium held during March at Cambridge University in honor of Lord Adrian, a trustee of the Institute.

BERLIN SYMPOSIUM

A Symposium in memory of Theodore H. Berlin was held on March 25, 1964, during the meetings of the American Physical Society at Philadelphia. Among the speakers at the Symposium was Professor Mark Kac, a colleague and personal friend of Professor Berlin. The following is a brief excerpt from Professor Kac's moving "Personal Reminiscence":

"Ted was a descendant of the 'royal line' in statistical mechanics, for as a student of Uhlenbeck's he traced his lineage through Ehrenfest directly to Boltzmann. He was aware of this heritage and was immensely critical of what he did and what others tried to do in statistical mechanics. He was also a man of great generosity and he shared his ideas and thoughts gladly with others.

"As I look back upon my many years of association with Ted I think of him mainly as a teacher. Even though he was by five years my junior, he was one of the few people from whom I really learned. And though he would probably chuckle at the thought, I am here paying tribute to him not only as a friend and as a colleague — not only as an admirer of his achievements and his gifts — but also as one of his many pupils."

SIGMA XI LECTURES

Professor Charles G. Wilber, Dean of the Graduate School of Kent State University, spoke at the second dinner and lecture meeting of The Rockefeller Institute Chapter of the Society of Sigma XI. Professor Wilber, who was leader of the Fordham Arctic Expedition in 1948, discussed the work of Teilhard de Chardin, paleontologist, anthropologist, Jesuit priest, and author of the controversial *The Phenomenon of Man.* The title of Professor Wilber's address was "Pierre Teilhard de Chardin, A Commitment to Totality."

Speaker at the third meeting of the Sigma XI Chapter, held on April 9, was Professor Leon Brillouin. Professor Brillouin, past president of the French Physical Society, is the author of three classical books: *Quantum Statistics, Tensors in Mechanics and Elasticity,* and *Wave Propagation in Periodic Structures.* He spoke on "Information Theory and the Fundamental Assumptions of Scientific Research."

ILLUSTRATIONS

THE COVER PHOTOGRAPH shows the garden west of Abby Aldrich Rockefeller Hall on a spring day; photo by Richard Carter. ILLUSTRATIONS: PAGE 2 Emil Schulthess, Black Star; PAGES 4, 6 courtesy of The American Museum of Natural History; photo of hand ax, The Rockefeller Institute Illustration Service; PAGES 9, 12, 13, wood engravings by Clare Leighton from *Four Hedges* and *Southern Harvest,* The Macmillan Company.