ly, independently, and later became associated with the cytoplasmic colloids, or whether the two were associated intimately from the very beginning as now. However, they may have arisen, it is certain that they are now inseparable, and that their association in the form of living cells is one of the most important facts made known through biology.

We have no way of telling how long it took to establish life. The rocks leave no record of this, the most important episode of terrestrial history. We may be sure that the time was exceedingly long, and that many combinations of colloids were formed which could not function as living systems, unsuccessful attempts as it were at making the living from the non-living. Once established, however, protoplasm by its very nature became self-perpetuating and self-varying so that life has continued from that early time to the present in ever increasing complexity, in ever increasing amount, in ever increasing variety of form, until the earth has come to so teem with it that a balance has become established among living things without which the world would speedily revert to its original lifeless form.

RUTH L. PHILLIPS

A BOTANIST-EYE VIEW OF EUROPE

KNOWING that the International Plant Congress was meeting in England last summer, another botanist and I decided to attend, and since a European trip was more or less of an event in our lives, we decided to make the most of it and see some other interesting places and people before the congress. After landing at Cherbourg and staying over night in Paris, we went directly to Switzerland, which might rightly be called a "country on edge." Geologically, the Alps are mere infants among mountains, being probably not more than six million years old—hence the steep slopes and narrow valleys. One of the occupations of the Swiss people is wine-making, so we expected to see vineyards, and plenty of them. But they did not look like the vineyards with which we are familiar—at first sight they reminded us of fields of pole beans. Each grapevine had its own individual trellis—an upright pole with no cross bars. The Swiss people do not take kindly to mass production; the cultivated slopes are all divided into small plots, each planted with a different crop. Even the meadow slopes are divided. Of course, sometimes these divisions are natural ones—terraces or irrigation ditches. Mention of irrigation ditches seem queer in a land associated with rushing streams, but actually, the un-irrigated slopes are too dry to be good meadows or pastures. The mountain roads are masterpieces of engineering, though they are so narrow and winding that a driver traveling on them with safety must be a very good driver indeed. In many places the road is too narrow for two cars to pass, and on many curves the edge is guarded by scattered concrete posts above a sheer drop.

The alpine laboratory of the Botanical Institute of the University of Geneva was our first stop. It is located at a tiny village eight miles below the pass of Grand St. Bernard. It is a small building on top of a knoll, with no heat except two small electric grills. The "Cours des Vacances" was given this past summer by Professor Chodat and his son, and consisted of morning lectures —mostly in French—and afternoon excursions or research. Some of the morning lectures lasted from nine in the morning till the big cow bell was rung at our hotel down the hill to let us know that the noon meal was ready. On rainy days it was very cold—so cold that our hands became almost too numb to write notes. It was always cold in the morning, and we rarely stripped down to the bottom sweater at any time of the day unless we were climbing. But when

we climbed we found it very warm, and the sunlight was so bright that we had to wear hats to guard against sunstroke. On one memorable day we walked to the St. Bernard Pass—in the rain—and spent the night in the monastery. We were met by the almoner, who showed us to our rooms and told us when supper would be ready. We slept four in a room in beds draped with sheets. The next morning we made the rounds of the library, museum, and chapel, then visited the almoner's garden on the mountainside, where he had made a collection of the unusual plants of the neighboring country. We worked our way back home, "botanizing" over peaks and down valleys, crossing snowfields and landslides, and arrived late at our hotel after almost ten hours of continuous walking.

The group at the laboratory was truly a cosmopolitan one. There were people from Italy, Austria, Germany, Switzerland, England, Scotland, Ireland, Wales, Poland, Hungary, Canada, and the United States. The official language, of course, was French, but so many of the continentals spoke English and spoke it well, that a great deal of the conversation was in English, with occasional digressions in French or German. Much interest in American customs was manifested on the part of the continentals. They were especially interested in our educational system.

The alpine flora is exceedingly interesting. Since the land mass of Switzerland is one so recently raised, the flora is cosmopolitan, being made up of immigrants from the neighboring countries. The meadows are whole flower-beds in themselves. Such a wealth of color and variety of bloom cannot be imagined growing wild, unless one has seen the alpine meadows of the rockies or some similar area. In the meadows we found Dianthus pinks, a small, yellow relative of our sweet pea, a large and beautiful sister of our smartweed, several species of gentians, wild pansies, and many other flowers. I believe that my favorite is the Trollius, a large golden flower like a giant buttercup, with a faint sweet odor. In the middle of July the Rhododendron was past its best in the valleys, but we found it on a trip to a glacier in the neighborhood. One of the interesting plants which we found on our trips was an "herbaceous" tree—a willow which is not woody. Another willow which we found—this time a woody one—had almost decided to be a vine and was crawling over a big rock.

From Switzerland we went directly to Amsterdam, where we joined a group of botanists. Holland last summer had more rain than they had had before in eighty-one years, so raincoats and umbrellas were indispensable equipment. After a visit to the art gallery and a trip on the Zuyder Zee we visited the Botanical Institute and were received there by the successor to the great Hugo DeVries. The professor, Dr. Stomps, showed us through the rooms where DeVries worked and taught, then showed us the garden where the first work was done on Oenothera. It is full of Oenothera (evening primrose) of various species and varieties from the giant Oenothera gigas to a dwarf descendant from one of the experimental species. The work on Oenothera is still going on in the Amsterdam laboratories, and Dr. Stomps told us that he considered it his duty to continue the work there as long as investigators in other parts of the world were working along the same line.

I believe that the afternoon of that day was the high point of the whole summer, for, accompanied by Dr. Stomps, we went out to a suburb of Amsterdam to visit the great DeVries himself. Dr. DeVries met us at the door, and Madame DeVries received us just inside. DeVries is an old man with soft white hair, a twinkle in his eye, and a keen sense of humor. Soon after we arrived we were served tea and then (for a wonder the rain had stopped) we

went out to see the garden. DeVries talked about his plants in excellent English, and showed us a pet of his—a plant which had leaves so closely resembling pebbles that when the plant was growing in coarse gravel it was very difficult to distinguish between leaves and stones. When we had fully inspected the garden and taken a number of pictures, we returned to the house, where we were served an excellent dinner. DeVries has been called the greatest living botanist, and we felt that it was a great privilege to meet him informally.

Dr. Stomps, in his enthusiasm, declared that we must see the Naardemeer, a nature preserve outside of Amsterdam. The Naardemeer had been drained a century or so ago, and an attempt had been made to cultivate the land. The attempt was so unsuccessful that the drainage was abandoned, and the area was allowed to go back to the natural state. Some time ago it was acquired by a group of naturalists in Amsterdam, and is being kept as nearly as possible in its primitive condition. We left Amsterdam in the rain again and finally came to a small station, where we left the train and walked half a mile or so till we were forced to take shelter in a shed containing piles of straw being cured for thatch. When a break in the storm came, we made a dash for a fishing shanty, where our boatmen awaited us to take us on the "lake." The "lake" looked to us very much like a swamp intersected by many canals, and as we rode along the canals Dr. Stomps told us many interesting things about the place. In some places the canals became very narrow and so choked with lily pads that we had to get out and walk along the springy shore while the boatmen pulled the boats through. The waterlilies in the canals were disappointing to us. They were lovely white ones like ours, but they lacked the sweet scent which our lilies have. The shores were lined with viburnums and mountain ash loaded with berries—bright red and orange splashes against a dark green background. The vistas up the canals were interesting, and we were sorry that we had to leave after a short time to return to Amsterdam. Holland is a land of dykes and canals, but I shall remember it as a land of showers.

From Amsterdam we went to London, where we visited places interesting, both botanically and historically. Of course, we made the rounds of the Tower of London, Westminster Abbey, etc., but our main interests were botanical, so we spent a large part of our time in visiting gardens. At Regent Park we saw the Victoria regia in bloom for the second time (we had seen it before in Amsterdam). The leaves of this waterlily were fully five feet in diameter, and would support a whole chorus of frogs. Kew gardens formed the goal of one excursion. There we found a large and interesting collection of trees new to us—Cedar of Lebanon, Araucaria, and others equally interesting. In the conservatories, of which there were many, we saw numbers of tropical plants—ferns, orchids, and vines, and a large collection of cactoid plants. One of the most surprising of these last was a sure-enough grapevine which was trying to masquerade as a cactus. An interesting visit was made to the Chelsea Physic Garden, which is maintained by the London Apothecaries company. It was originally a garden of medicinal plants, in which the prospective apothecaries studied. The plant population is now more representative, and includes many forms of no particular medicinal value.

One trip from London was in the nature of a pilgrimage—a trip to Darwin's last home, Down House. Darwin certainly had an inspiring place in which to work. In front of the house is a view of the old village of Down, behind the house is a wide expanse of lawn, and beyond the lawn a shady walk leading off into the woods. It was easy to imagine Darwin wandering along the walk pondering his ideas for

which he received so much criticism, or walking over the lawn gathering material for his work on the earthworm, where we saw so much evidence of its activity. Darwin's life was not an easy one, as he tells us himself: "My health is very weak; I never pass twenty-four hours without many hours of discomfort, when I can do nothing whatever. At no time am I a quick thinker or writer; whatever I have done in science has been by long pondering, patience, and industry." And we get discouraged if things do not turn out to suit us the first time! Darwin's adversaries were quick to malign him. They said he had no religion. Here is what he said: "I may say that the impossibility of conceiving that this grand and wondrous universe, with our conscious selves, arose through chance seems to me the chief argument for the existence of God; I am aware that if we admit a First Cause, the mind still craves to know whence it came and how it arose. The safest conclusion seems to me that the whole subject is beyond the scope of man's intellect; but man can do his duty." And they called Darwin an atheist!

After visiting the Shakespeare country and Oxford we spent a time all too short in the lake region. We were fortunate in being there when the heather was in full bloom, and made the most of our opportunity to wander through it. The fields are divided by high stone walls which have been there so long that even the traditions of the place do not tell who built them. We climbed the highest hill in the neighborhood and had a glorious view from the top.

The climax of the trip was the International Plant Congress at Cambridge. The enrollment of the congress totaled twelve hundred botanists from all over the world. Half of the number were Americans. Here was a chance to see the eminent investigators in plant science assembled in one place to discuss their views of various questions. The congress opened with a reception in London followed by a reception in Cambridge the next day. On Sunday evening we were treated to an organ recital in the chapel of Kings College. The chapel is a beautiful building, and its beauty was enhanced by the light of the tallow candles, which are the only means of illumination. On Monday the work of the congress began in earnest. Some sessions drew crowds so large that another meeting place had to be found, but some questions were so specialized or so technical that the groups discussing them were very small. The question of whether or not the stem is a collection of leaf traces became an international fight, but no hard feelings prevailed. There were three official languages in the congress—German, French, and English—but since the congress was so largely made up of English-speaking people, many of those using French or German in their papers finished with a summary in English. On one occasion a Viennese rose to speak in the general discussion of a paper, announcing that he would speak in English, as he had been told that previous day that his German could not be understood. The questions discussed were, on the whole, of a very technical nature, ranging all the way from Genetics to Bacteriology. One interesting group was the section in Paleobotany, in which the English palebotanists demonstrated the technique of making sections of fossil plants by flooding a polished surface with a gelatine solution.

Following the congress there were scheduled several interesting trips in and around London. On two afternoons the British Museum of Natural History had a special exhibit for the visiting botanists. Among the interesting features were some sheets from the herbarium of Linnaeus, some of Schleiden's drawings, John Ray's European herbarium, and Clayton's *Flora Virginica.*

Of course, only a few places of botanical interest could be visited on this trip. However, we did not confine ourselves entirely

to gardens and laboratories, but included many places of purely historical or literary interest, such as Anne Hathaway's Cottage, Stratford-on-Avon, Kenilworth Castle, and St. Paul's Cathedral. The summer was an interesting one, and one very much worth while from several standpoints, but no experience was quite equal to that of seeing the Statute of Liberty through the mist as we came into New York Harbor.

M. DORISSE HOWE

COMMENTS ON HIGH SCHOOL LABORATORY EXPERIMENTS

THE purpose of this article is to familiarize the biology high school instructors with the organization and preparation of a wide variety of subject material from the standpoint of the teachers—to give them a series of comments that we have made by performing and testing all experiments found in Peabody and Hunt's *Biology and Human Welfare,* the textbook adopted for use in the high schools of Virginia. We hope to lighten their load in teaching and increase the value and effectiveness in their methods of instruction. On the following pages the instructor will find the number of the experiment and the page on which it will be found in the text. Some experiments are omitted because we had no comments to make other than those already given in the text.

Minimum Requirements

A. Time
   1. Three 40-minute recitations
   2. Two 80-minute laboratory periods

B. Experiments
   1. At least 36 Laboratory Experiments

C. Equipment as listed by the Department of Education

Quantity	*Description*	*Estimated Price*
1	Beaker, 150 cc	$ .15
1	Beaker, 250 cc	.17
4	Bottles, wide mouth 4 oz.	.35
1	Lamp, alcohol	.32
1	Pipette, with rubber bulb	.03
1	Test tube support (10 tubes)	.75
1	Test tube brush	.06
1	Tripod magnifier	.75
1	Evaporating dish, 100 mm. diameter	.40
1	Scalpel	.60
1	Forcep	.25
1	Flask, flat bottom 250 cc	.17
1	Clamp, test tube	.15
1	Tripod, iron	.45
2	Cork sheet, 4x2x16-in.	.60
1	Wire gauze	.40
	Total	$ 5.24

ONE SET FOR EACH LABORATORY

Quantity	*Description*	*Price*
1	Trip scale, Harvard	$ 12.00
1 set	Weights, still in block	5.00
2	Battery jars, 6x8-in.	.90
1	Bell jar, 2 qt.	3.25
1 oz.	Cover glass, ¾-in.	1.80
1 doz.	Directing needles	.30
1 doz. pr.	Petri dishes, 100 M. M.	3.60
1 pkg.	Filter papers	.20
2	Funnels, glass, 4-in.	.80
1 lb.	Glass tubing, 3x16x4-in.	.70
12 ft.	Rubber Tubing, 3/16	.96
1	Graduate cylinder, 250 cc	1.10
1	Microscope	65.00
2	Ring Stands	1.80
36	Slides, glass, 1x3-in. med.	.60
36	Test tubes, 6x¾-in.	.90
1	Thermometer 10-100 C.	.90
1 doz.	Water glasses, plain	1.32
1	Lactometer	.65
2	Thistle tubes	.30
6	Student lamp chimneys	1.08
1	Graduated cylinder 100 cc	.70
1	File, rat tail	.10
1	File, triangular	.10
1	Mortar and pestle, 3½-in.	1.30
144	Corks, assorted, 0-11	.60
1 set	Cork borers	.70
1	Trowel	.25
100	Insect pins No. 2	.45
1 sheet	Parchment paper, 17x22-in.	.10
	Total	$107.66

CHEMICALS

(One set for each laboratory)

2 lb.	Paraffin	$ .50
1 lb.	Hydrochloric Acid	.30
2 pts.	Alcohol, Denatured	.70
1 lb.	Ammonium hydrate	.70
½ lb.	Ether	.35
1 lb.	Formalin—40%	.40
½ lb.	Potassium cyanide	.50
10 grms.	Carmine, red	.60

Biology 412, in which these comments were prepared, contained the following students: Lucille Bywaters, Sue Glover, R. A. Haney, L. B. Hedgecock, Hunter Jackson, Beatrice McCraw, Mrs. Christine Rodes, Mary E. Sanford, Hubert Sandy, and Paul M. Shull.