Victorian Literature and Culture (2007), **35**, 635–647. Printed in the United States of America.

*UN*NATURAL HISTORY: WARD'S GLASS CASES

By Margaret Flanders Darby

IN 1829, NATHANIEL BAGSHAW WARD buried a sphinx moth chrysalis in some soil – he called it "mould" – in a closed glass bottle. While he waited to observe the insect's metamorphosis, his attention shifted to something quite unintended and unexpected: a tiny fern and a few blades of grass emerged in the mould and continued to grow without the addition of more water to the bottle. Thanks to this diminutive event, an unsuccessful gardener was empowered, and his frustrated desire was liberated into a genesis story of radical potential in the least forgiving of circumstances.

N. B. Ward (1791–1868) was a doctor among the docklands near Wellclose Square, Whitechapel, London, a dark and poisonous place throughout the 1820s, 30s and 40s. Having inherited a medical practice from his father, Ward lived and worked among those whose health was every day at risk from the very air they breathed; he saw both the horticultural and the human cost of filthy air. As he explained in his single book-length work on the subject, *On the Growth of Plants in Closely Glazed Cases*, his own house was "surrounded by numerous manufactories and enveloped in their smoke"; moreover, a nearby black ash manufactory on the Thames "stunted or blasted altogether the vegetation to a third of a mile away in the prevailing direction of the wind" (Ward 25 and 16–17). Unable to garden in such conditions despite years of effort, Ward learned from the fern in the bottle that he had by accident established a better environment: a glass box with a tight-fitting lid, or as he called it, a closely glazed case. All greenhouses are designed to protect plants from the outside air, but this miniature structure was tightly closed in order to contain its own atmosphere, its own weather: a garden enclosed within its own protective crystal. The Wardian case, as it is still called, thereby escaped the degraded nature surrounding it in every Victorian city and industrial town.

An enthusiastic naturalist from early adolescence – at thirteen he had explored the flora of Jamaica – Ward's frustrations as doctor, collector, and gardener in Wellclose Square led him to the principle of the closely glazed case and the self-sustenance of the plants within it, a scientific discovery breath giving as well as breathtaking, "simple and yet beautiful," (Ward, appended letter, unpaginated) profound in its implications and benefits across the globe, yet as intimate as the breath of clean air on which all terrestrial life depends. As I will demonstrate, however, the atmosphere within Ward's glass cases was not as easy to establish in cultural understanding as in horticultural technique. The exact difference between Ward's

new design and ordinary glass houses was not readily apparent; his first admirers thought his cases worked so well because they were hermetically sealed, but, in fact, as with all glass gardening structures, the plant life within depended on some movement of air.

In his highly polluted, almost soil-less inner London hardscape, Ward had tried in particular to grow ferns, continually frustrated by failure in spite of careful experimentation with soil, aspect, and moisture. Again and again he transplanted ferns collected in the countryside to a rock wall moistened with the steady trickle of water he had engineered for it; again and again the poisonous environment defeated him. The initial accident of the fern in the bottle, coupled with his longing for a fern garden, inspired Ward to undertake a methodical program of domestic horticultural experimentation. When the seedling fern appeared in the bottle, Ward discovered a minute, self-sustaining world:

> In watching the bottle from day to day, I observed that the moisture which during the heat of the day arose from the mould, became condensed on the internal surface of the glass, and returned from whence it came; thus keeping the mould always in the same degree of humidity. About a week prior to the final change of the insect, a seedling fern and a grass made their appearance on the surface of the mould. I could not but be struck with the circumstance of one of that very tribe of plants, which I had for years fruitlessly attempted to cultivate, coming up *sponte sua* in such a situation; and asked myself seriously what were the conditions necessary for its growth? (Ward 26)

As Ward explained to John Claudius Loudon five years later in 1834, the fern's sudden appearance suggested a train of thought unrelated to the moth:

> Curious to observe the development of plants within so confined a situation, I placed the bottle outside one of my windows with a northern aspect. The plants proved to be one of *Poa annua*, and one of *Nephrodium [Aspidium Swz.] Felix-mas*. In this situation they lived for more than three years, during which time no fresh water was given to them, nor was the lid removed. The fern produced four or five new fronds every year; and the Poa flowered the second year, but did not ripen its seeds. Both plants ultimately perished, from the admission of rain water, in consequence of the rusting of the lid. (Loudon 208)

Writing his book eight years later still, Ward reflected on the relationship between desire and attentiveness, finally understanding the complex demands of successful nurture, regardless of scale: the gardener's power over nature is at the deepest level only submission, finally a surrender to nature's insistence on the basic requirements of the organism. When the gardener honors the plant's needs, and only then, will it grow. Some plants have a wide window of tolerance; for others the opening is narrow, but in every species the limit to the gardener's power will be reached sooner or later. If a worthless weed had sprung up rather that the fern he wanted, his crucial insight would still have eluded him:

> The simple circumstance which set me to work must have been presented to the eyes of horticulturalists thousands of times, but has passed unheeded in consequence of their disused cold frames being filled with weeds, instead of cucumbers and melons; and I am quite ready to confess, that if some groundsel or chickweed had sprung up in my bottle instead of the fern, it would have made no impression upon me: and again, after my complete success with the ferns, had I possessed the inductive mind of a Davy or a Faraday, I ought, in an hour's quiet reflection, to have anticipated the results of years. I

> should have concluded that all plants would grow as well as the ferns, inasmuch as I possessed the power of modifying the conditions suited to the wants of each individual. (Ward 42)

Twice Ward quotes Herschel to underscore his new understanding: "'If the laws of nature, on the one hand, are invincible opponents, on the other they are irresistible auxiliaries'" (Ward 8). A few chapters later, the paradox becomes clear: "The power of man over Nature is limited only by the one condition that it must be exercised in conformity with the laws of Nature" (Ward 17).

Ward demonstrated to his own satisfaction his understanding of the gardener's power over natural law, as well as his powerlessness under it, in the years of his experimentation with glass that followed: planting ferns and other species in glass containers of many sizes, from box, to case, to house, systematically varying the relevant factors – genus, soil, aspect, moisture, light, exchange and volume of air – using not only every window, but the roof and the narrow spaces separating his house from his neighbors. This garden, created out of such unpromising circumstances, inspired Loudon's visit in 1834:

> We lately (March 6.) had the pleasure of seeing the most extraordinary city garden we have ever beheld, viz., that of Mr. Ward of Wellclose Square, a gentleman enthusiastically devoted to botany. Along the tops of all the walls of his dwelling-house, of the offices behind, and of the wall round the yard, even up the gable ends and slopes of lean-tos, is a continuation of boxes or troughs, about 14 in. wide, filled with soil and divided crosswise by tiles, so as to form distinct compartments about 1 ft. by 6 in., in each of which one species of plant is grown. We should suppose there must be at least room found in this way for 1500 species. The sloping roof of a shed is wholly covered with soil, and divided into compartments by slips of wood; in these compartments sedums, saxifrages, and other succulents are grown . . . . In the interior of Mr. Ward's house, there are boxes in every window, some on the outside, and others on the inside, containing plants.

After planting, the boxes were well watered, drained, and plugged at the drain hole. The glass lid was closed over the box

> and seldom, or never, afterwards taken off . . . . The great advantage of admitting air only in this way is that it is, as it were, sifted, or filtered, from the impurities which float in it; which impurities, and not anything in its chemical composition, are now generally understood to be the cause why the air of London is less favourable for both animal and vegetable life, than the air of the country. (Loudon 162–63)

Eventually, the largest case was 24 feet long, by 12 feet wide, by 11 feet high: "My object in this building was to obtain as many varied modifications of the natural conditions of plants as it was possible to procure in the small space to which I was confined" (Ward 35). Ward built up rock-work to within a foot of the glass and varied the surface in every possible way in order to experiment as fully as possible. He reasoned that given their extraordinary adaptability and variability throughout full-scale nature, plant cycles of growth and dormancy succeed within varying ranges of tolerance. In a controlled environment of minimal air exchange under close glazing, the necessary heat, light, moisture, and air can be balanced so that more of one variable will enable tolerance of less than another. In this almost but not quite completely closed environment, with minimal drying action from the movement of air, a balanced sequence of condensation and evaporation ensues with hardly any loss of moisture.

If the soil in the Wardian case is well watered to begin with, it will stay that way with little or no additional watering for a very long time, up to several years in Ward's initial experiments.

Ward's insight was to understand not only the dynamic equilibrium of close glazing, but that a plant's tolerances can be established in multiple alternate ways: if light is more plentiful than usual – as on the deck of a ship, for example – lower temperatures can be tolerated. If protected completely from strong winds, less moisture is needed, and so on. The dynamic interaction is what keeps the ecosystem viable; the glass walls and roof of the tiny house enable it to balance the competing forces within its separate weather system. This self-sustenance depends on the interaction of all the factors demanded by natural law, an interaction requiring imperceptible movement within the seemingly closed case. It was this imperceptible interaction among natural forces that many of his readers did not understand.

In his book, Ward addressed himself to the failure as well as the success of his readers, documenting in an appendix the commercial success that made him famous, offering in a chapter on "the poor" his benevolent horticultural and dietary advice, and, finally, in exploring his conviction that his cases demonstrate divine will, suggesting the complex interaction of the bourgeois ideologies that made the table-top Wardian case very popular in genteel drawing rooms during the second half of the nineteenth century, where it became a miniature conservatory. Unlike the greenhouse intended for propagation and cultivation, the conservatory is a social space where people meet among beautiful plants. On a miniature scale, the conservatory becomes a decorative object among the other furnishings of a parlor or drawing room. To study variations in the cultural reception of Ward's invention across these three Victorian discourses, in such widely differing locales, is to gain insight into their contrasting ideologies.

Ward included testimony from grateful ships' captains at the end of his book because plant explorers and their sponsors, through commercially motivated trial and error, were first to discover uses for his invention. When John Loudon visted Wellclose Square, Ward assured him that the principle of close glazing made possible "a ready mode of importing most plants, without risk, from the most distant regions of the globe" (Loudon 208). Loudon quickly saw how the principle applied to either greenhouse or conservatory, and published the implications:

> the success attending Mr. Ward's experiments opens up extensive views as to their application in transporting plants from one country to another; in preserving plants in rooms, or in towns; and in forming miniature gardens or conservatories, either in rooms or on the inside or outside of windows, as substitutes for bad views, or for no views at all. (Loudon 163)

Ships' captains and their crews discovered that as long as the glass cases were left on deck so the light could be controlled, and as long as the glass was cleaned of the salt and dirt that accumulated during months at sea, they needed no further attention and were best left alone. Supplies of water could be saved for human consumption; on a voyage across oceans with few landfalls, fresh water on board might make the difference to the crew between obedience and mutiny. On 26 March 1840, Dr. W. Stanger reported that on one voyage, in a case left open for frequent inspection and cultivation, all but one of the plants died. In a case left closed and unattended, all the plants arrived in perfect health (Ward Appendix 83). Given the extreme variation in conditions on the deck of a ocean-going ship, the integrity of the miniature self-contained atmosphere was soon understood to be crucial. A ship rounding

Cape Horn in an eight month journey would experience temperatures ranging from 20 degrees F. on the snow-covered deck at the Horn, to 120 degrees at the equator (Ward 47). George Loddiges, personal friend and plant supplier to Ward in London, is responsible for the often quoted summary of the difference that Wardian cases made to the plant trade: "whereas his nursery had been lucky to receive one specimen out of twenty intact before, to lose one out of twenty was now a misfortune" (Elliott 18). Wardian cases became so essential to the transport of plants that they were used to bring plants to locations from which the popular imagination now thinks of them as originating: tea from China to India, rubber from South America to Malaya, and a dwarf banana from Derbyshire to Somoa. In their new environments, these plants became the basis of agrarian economies that would prove vital to Britain's imperial interests (Barber 112 and Allen 67–68).

What mattered most to Ward among the implications of his invention, however, was not better plant collecting, but the amelioration of human misery. His fifth chapter is entitled "On the Application of the Closed Plan in Improving the Condition of the Poor." Beginning with an epigraph on "how close-pent man regrets the country," Ward underscores his neighbors' longing for green plants by detailing his own determination to grow ferns, as we have seen (Ward 57), but it is very difficult to know to what extent the urban industrial poor, his immediate neighbors, heard him. Carter suggests that by the end of the century, as anti-pollution legislation and technology began to take effect, window gardening among the lower classes did enjoy some popularity, but by then Ward had long since retired to a leafy suburb; he died in 1868 (Carter 180). In 1842 when he published his book, the most impoverished urban poor lived several families to a single room, with at most one small window and minimal natural light. Clearly, Wardian cases make far fewer demands on the environment than full scale horticulture, but sufficient time, energy, space, and light are still required, for gardeners as well as plants. Moreover, only the well educated read about his experiments; his book refers familiarly to fellow naturalists and scientists around the world, and contains many untranslated Greek and Latin quotations and epigraphs. Ward preferred to think that sophisticated botanical knowledge was not necessary, but in fact it was. Heavy labor might not be required, but the knowledge of basic principles, the patience to experiment with the atmosphere, and, perhaps most important, a willingness to leave the case unopened once a viable micro-climate had been established, explain in part why Wardian cases did not always work. They also were expensive compared with traditional gardeners' bell jars and cloches. Since in theory he had made glasshouse gardening accessible to people of small means and less space, Ward regretted that those most in need seemed first to ignore the benefits of his work. Instead, even the poor with enough windows saw the Wardian case as alien to themselves: an expensive, middle-class drawing room embellishment, a small conservatory rather than a greenhouse. Everyone shared Ward's longing to escape the polluted urban environment, but working class gardening was a very different practice, having originated in menial labor, close to the soil. A working class man would be more likely to rent an allotment than buy a Wardian case.

A working class man would also be more likely to take up floriculture, the selective breeding and cultivation of a single species, than take Ward's advice of growing salad greens in window boxes. Ward cautioned his readers against "fancy flowers" (Ward 61), whose practitioners were largely recruited from the rural working class; often far from destitute, they usually had access to some open ground. Having established floristry in Britain before 1830, artisans of the cloth and other trades pursued this very popular hobby

through masculine companionship and intense competition, strengthening guild solidarity, often meeting in pubs. Mill and factory owners encouraged gardening among their employees, both for food and for pleasure, as a "means of control over the moral and physical lives of the labouring population" (Gaskell 481). Here we find an important triangular class tension among independence, benevolence, and control; some middle class projects were universally beneficial, like municipal supplies of clean water, but some were primarily class-based, like religious observance or abstinence from alcohol.

When used indoors, Ward's cases seemed to him a kind of superior blind for windows one does not wish to look through, providing privacy, light and space to grow food:

> These cases form the most beautiful blinds that can be imagined, as there is not a window in London which cannot command throughout the year the most luxuriant verdure. The condensation of the moisture upon the colder surface of the glass effectually obscures the view from without, and at the same time admits far more light than is allowed to enter by ordinary blinds. Nothing can be conceived of more cheerful than the appearance of rooms thus furnished. (Ward 60)

He did not seem to really imagine this in the poorest dwellings, however, because in the next sentence he moved immediately to the middle classes who would hire the poor to supply plants and decorations for their own, expensively constructed cases:

> As these cases become more general among the higher and middle classes, a new field of healthful industry will thus be opened to the poor, who might not only be employed in procuring plants for these cases from the country, but whose ingenuity might be called into play in executing various models of old towers, ruins, etc, in sand-stone, chald, or other suitable material, which, at the same time that it served to ornament the case, would afford a suitable place for the growth of little Sedums and any plants that require less moisture than those which are planted in the mould. (Ward 60–61)

In Ward's imagination, the poor thus returned to their accustomed place as dependent craftsmen and servants to the genteel. He did not acknowledge that working class gardeners knew the basic principles of horticulture from apprenticeship and shared oral tradition, not from reading learned accounts of scientific experimentation.

As a doctor, Ward probably understood how optimistic, even unrealistic, his advice was, and he retreated to a condescending piety, edged with scorn for florists and their trivial, highly artificial, enthusiasms. His cases must inspire gratitude and awe in contemplating the divine will, he claimed, and he contrasted this with pansy fanciers: "So far from the love of God, and the good of his fellow creatures, being the end aim of the fancy florist, he values everything in proportion as it is removed from Nature, and unattainable by the rest of mankind. 'A long time must elapse ere the world can hope to see a perfect Pansy' !! says one of these fancy writers" (Ward 61). But how is a "perfect," that is, newly bred, pansy further removed from nature than an exotic under glass in a drawing room or on a ship's deck? Ward attributed the knowledge of how "to promote the glory of God, or the good of man" to himself and other well-educated bourgeois who knew the "true value" of things, for example, the "innumerable plants . . . created with latent powers of usefulness for the purpose of exercising the mind," or the development of flavor in vegetables and fruit through "horticultural exertions, directed by Science" (Ward 61–62). In chapter six, "On the Probable Future Applications of the Preceding Facts," Ward listed the scientific

experiments that could benefit from the controlled environments of glazed cases. He was thinking especially of tuberculosis and how if the air breathed by consumptives could be controlled under glass, they would not have to be sent to distant climates for an uncertain cure and more likely lonely death.

The Wardian case was most embraced and at the same time most misunderstood among the middle classes, where the attentive neglect required for success was often absent. Even on the smallest scale, nature could be misunderstood, and to examine the history of this mistake is to understand not only Ward's frustration, but some of the reasons for miscommunication between gardeners and their employers. Contradictions of intention and meaning expanded beyond the inventor to the enthusiast. Wardian cases are most renowned for transporting plants safely, thereby supporting the nation's ability to imagine and reproduce exotic locales from around the globe, but the domestic bourgeois cultural reception of Ward's brilliant innovation reveals a longing for a shortcut on the much more arduous journey back to what might be the original, universal destination of the imagination – to paradise – garden of perfect beauty, of life everlasting, and best of all, of an escape from the burdens of complex knowledge. The genteel wanted a shortcut to perfection.

Of special interest in the narrative of Ward's insight is how it was frequently misapplied within the cultural imagination of those who embraced the Wardian case as drawing room furniture. Ships' crews were too busy to tinker with the cases stored on deck once closed at the start of the voyage, and so their results were an impressive reversal of pre-Ward failure to keep plants alive. But in Victorian drawing rooms laden with coal and gas fumes, cases were either closed too tightly or opened too frequently, the better to submit beloved plants to enthusiastic pampering. For example, note the mistake in the following 1872 account of a visit to a garden that could well have been Ward's own:

> Many years ago, we accepted an invitation to visit a gentleman living in the very centre of the densest part of London . . . . We were ushered into a room well enough as to size, but in which darkness was nearly visible. Here we found every window occupied by a glass case, in which plants were growing in a manner which astonished us; ferns of the greenest and freshest hue; orchids, such as we have rarely seen surpassed, were growing there, redolent of health and vigour; and we were told, to our great surprise, that the cases were hermetically sealed, and that no water had been administered for many months. This was the first we had seen of the Wardian cases, since so celebrated. (Beeton qtd. in Carter 171)

The cases could not have been "hermetically sealed"; if airtight, the plants would long since have died. But Beeton's mistake is not anomalous. By 1872, over forty years had elapsed since Ward's discovery, thirty since his book was first published. Carter recounts the problems encountered by enthusiasts, for example the frustration with cases that were too airtight: "Can any reader of this Paper [the *Chronicle*] recollect a Wardian case in which the imprisoned plants were in good health?" and in response, from wiser gardeners: "Throw away all ideas of any talismanic power existing in such a plant receptacle with respect to plant developments, and consider the total exclusion of air as a popular fallacy" (Carter 176). "Talismanic" offers a clue here: like many new techniques, Wardian cases were so effective when used correctly that they stimulated hopes for shortcuts to solutions for many gardening problems, and allowed amateur gardeners to neglect the patient observation and care that successful nurture actually requires. Protection could become imprisonment almost

overnight in inattentive hands, and what seemed a magic talisman was in fact the strict application of the basic principles of horticulture.

According to David Allen, Ward was a modest, unassuming, hard-pressed doctor who had neither time nor inclination to publicize his hobby, except as it might benefit others (Allen 10–11). Various brief notices of his experiments were published between 1830 and 1842, including those quoted above from Loudon's *Gardener's Magazine*, but Ward did not write his book until he became aware that the public, although enthusiastic, were not necessarily learning from experience as he had done. His 1842 account thus intervened at an interesting moment. His discoveries were by then famous, and in careful hands were extraordinarily effective, as his appendix of testimonials from ships' captains and nurserymen implied, yet the techniques he pioneered were causing confusion as well, as Beeton's testimony demonstrates. In his 1842 Preface Ward himself acknowledged:

> The simple yet comprehensive principle . . . upon which plants are grown in closed cases does not appear to be clearly understood, and many misconceptions yet exist upon this point. The object of the present work therefore is to remove these erroneous notions, and thereby to enable those who wish to experiment upon the subject to do so without risk of disappointment. The author is fearful that in this attempt he will be condemned by the learned for having entered into needless details, while to those who are wholly unacquainted with the leading principles of botanical science he may not have rendered his meaning sufficiently clear. (Ward v-vi)

If determining and then meeting a plant's needs is so basic to known botanical principles, why were the cases so readily misunderstood? Unlike Ward, parlor gardeners seldom understood scientific principles of the exchange of air, nor did they know from empirical observation how delicately balanced the factors influencing the plants' health might need to be, nor did they acquaint themselves with an appreciation of the variability of species and environments in nature. When they asked how much water is required, for example, they wanted a simple answer, not "it depends": on the individual circumstances, on the inherent nature of the species, on the point in the plant's cycle of growth when the question is asked. In his book, Ward did offer specific advice. After blooming, a plant might need to dry out: take the cover off the case. Slugs might appear: wash the soil with lime water. If enclosed plants become "mouldy," it is because of the interaction of light and moisture; there is either an excess of moisture or a deficiency of light or a combination of both. In his conscientious way, Ward surveyed the most frequently asked questions, concluding with "It is a very common impression that great knowledge of Botany is required before any successful attempts at the cultivation of plants in closed cases can be made; now, it must be obvious, from all that has been said, that whether the plant be grown in a closed case or in the open air, the natural conditions must be fulfilled to ensure success" (Ward 41). This success depends not only on the "natural conditions," but also on close observation and a readiness to respond, in short, on a capacity for true nurture. Parlor gardeners wanted a shortcut; Ward knew one must take the long way around.

James Shirley Hibberd was one of many who did not read Ward's book carefully. Since Hibberd was not only an expert gardener himself, but also a very successful writer of horticultural advice, his misunderstanding of Ward's published explanation of the principle of close glazing indicates the extent of the confusion. In the 1856 second edition of his *Rustic*

Adornments for Homes of Taste, Hibberd criticized Ward for misleading the public with his precise calculations of air exchanges, tolerances, and balances:

> Mr. Ward himself industriously taught that a plant-case is a self-supporting structure . . . . I made a series of definite experiments, the results of which confirmed my doubts, and compelled me to regard the Wardian theory as "a delusion and a snare;" and when I insisted that a Wardian Case was nothing more nor less than a *greenhouse on a small scale*, and that all the learned dust about oxygen, and carbon, and the production of local atmospheres, was worthless, I had to bear with much obloquy and perversion of my views, and was even charged with unfair conduct towards Mr. Ward himself. Nevertheless, every line that has been written on the subject since I first broached my views in the pages of a public journal, has added strength to my position; and I once more repeat that Mr. Ward has led the public astray, and that his own theory has been the great impediment to the improvement and the general adoption of plant-cases. (Hibberd 136–37)

Hibberd added that Ward was a Christian gentleman who would not mind being reproached in print if it would help the middle class readers of gardening advice to achieve more success with their Wardian cases, which Hibberd considered so valuable an adornment to the home of taste that he devoted several chapters to it. In those chapters he enlarged on his advice to think of a glass case as no different from any glasshouse, either greenhouse or conservatory, except in size, with the same requirements for ventilation or drainage (see Figure 14, where the domestic glasshouse references the Crystal Palace). Its small size meant he saw it primarily as intended for pleasure and so required the best possible display at all seasons. This meant propagating and growing a steady succession of differing species so that at all times the plants were at their peak of beauty. In order to have enough at any one time, full-scale greenhouses located in the kitchen garden might be necessary. For Hibberd, the integrity of a closed environment was a distracting side issue. Unlike Ward, Hibberd earned his living producing fail-safe gardening encouragement to the general public, especially to women of leisure, so his emphasis was on the moral lessons and pleasures of small scale gardening in domestic interiors, not on scientific principle.

One woman reader asked Ward if the passage of time could not be halted altogether, since his cases could go for so long, often years, without watering or other intervention; he had to remind her that although, "as with the wand of a magician" he could "turn a desert into a paradise," he could not stop the growth cycle itself: "A lady once called upon me, imagining that I had invented a case in which half-blown Roses or other flowers would remain *in statu quo* for an indefinite period" (Ward 38). Glass case horticulture was considered particularly well suited to the lady of means and leisure, but, usually, of haphazard scientific training. What was thought right for the amateur in fact required sophisticated knowledge of natural law. Bourgeois culture shared Ward's fascination with ferns – Wardian cases were particularly popular for fern culture – but the ecological principle of dynamic interaction required more knowledge and discipline than the feminine ideologies of the domestic sphere could readily supply. The cults of domesticity and femininity that embraced the drawing room Wardian case tried to use his invention to escape natural law.

One of the cases he described was dedicated to spring flowers, among them primula, scilla, cyclamen, and crocus. In the still air of the glass case, they bloom for months: "It is not, I believe, possible to see these plants to such advantage in any ordinary garden. Here, undisturbed either by wind or rain, their flowers are developed in the greatest luxuriance;

and most of them continue for two or three months, realizing the beautiful description of Catullus: 'a flower blooming in a secret place is like children's souls developing without violence or disturbance from the outside'" (Ward 34).[1] The glass case's protection allows the soul, the essential nature, to express itself, either of plant or child. It is a paradise of suspended animation as the bloom reaches its greatest potential and then is held there. Ward compared the inside of his cases to a recoverable but long lost Garden of Eden: ". . . when we reflect upon their independent state, we may, without any great stretch of imagination, carry our minds back to the primaeval condition of vegetation, when 'the Lord God had not caused it to rain upon the earth, and there was not a man to till the ground'" (Ward 28). The educated classes, on the other hand, thought in orthodox religious terms and succumbed to the traditional desire for the perfections of an Eden accessible only through an imagination unfettered by material realities or the laws of nature. Unless they followed Hibberd and abandoned the demands of close glazing, many could not sustain the finely balanced oppositions of the Wardian case and so upset the delicate equilibrium. If they relied on Ward's principle as a shortcut back to paradise, their plants died.

For the 1852 second edition of Ward's book, one of his most remarkable glass cases was chosen for an illustration, not a traveling or table-top case but a window greenhouse that featured a small-scale model of one wall fragment of Tintern Abbey (Figure 15). This tiny vista, which included a perforated pipe around the top so that "I can rain upon the plants at pleasure," formed Ward's view through a window that otherwise would have looked out onto the dreary townscape of Wellclose Square (Ward 31). Its gothic fantasy is framed by ferns, with the plants growing through unglazed mullions. Tintern Abbey symbolized for Ward's readers many of the values held most dear by the Victorian bourgeoisie: the moral and spiritual implications of the crumbling relics of a romantic and gothic past; a cozy domesticity conveyed in miniature; an aesthetic of ornamentation that exploited the subtle intricacies of delicate ferns. The model called to mind not only Britain's medieval past but one of her most revered poems, Wordsworth's "Lines Composed a Few Miles Above Tintern Abbey":

> These beauteous forms,
> Through a long absence, have not been to me
> As is a landscape to a blind man's eye:
> But oft, in lonely rooms, and 'mid the din
> Of towns and cities, I have owed to them
> In hours of weariness, sensations sweet,
> Felt in the blood, and felt along the heart;
> And passing even into my purer mind,
> With tranquil restoration: – feelings too
> Of unremembered pleasure; such, perhaps,
> As have no slight or trivial influence
> On that best portion of a good man's life,
> His little, nameless, unremembered, acts
> Of kindness and of love. (11. 22–35)

As intermediary between the urban room and the inhuman street, the miniature Abbey window intervenes to supply a verdant prospect worthy, if one is a weary, virtuous doctor,

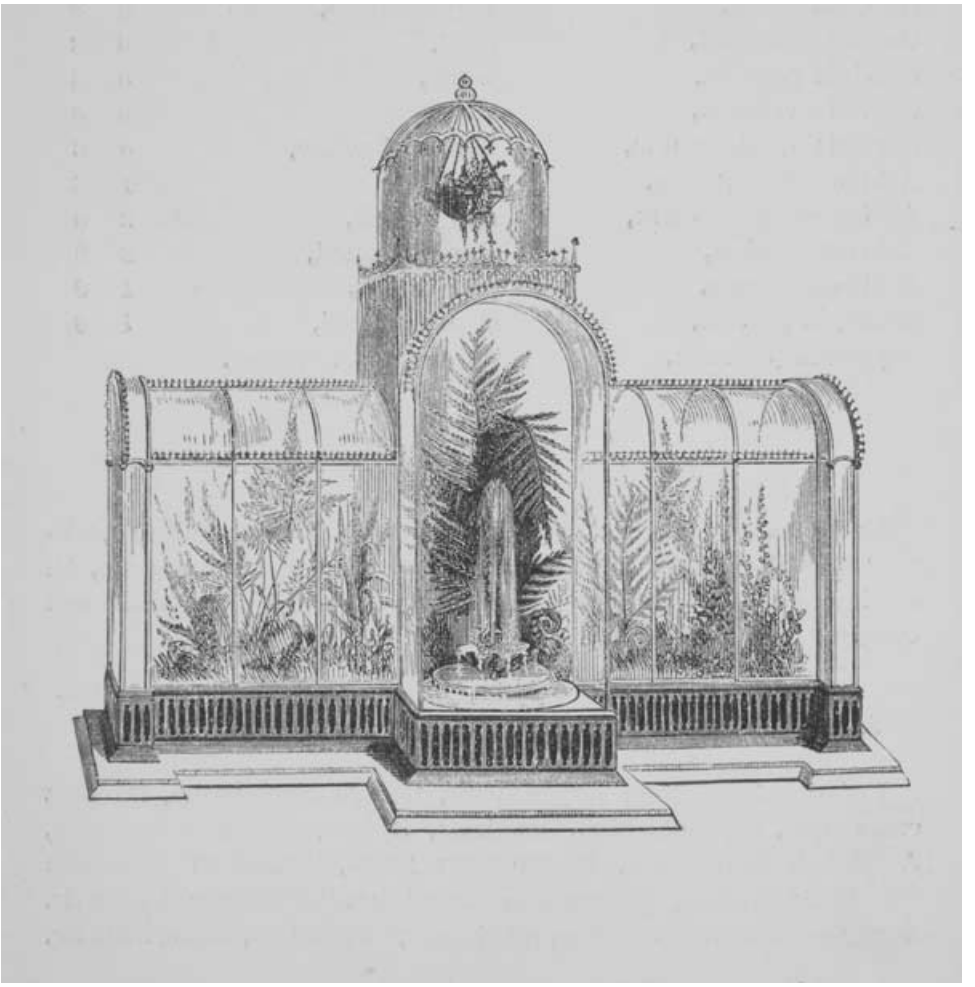

Figure 14. Illustration, from [James] Shirley Hibberd, *Rustic Adornments for Homes of Taste* (London: Groombridge, 1857): 168. Courtesy of Dumbarton Oaks Research Library & Collections, Washington D.C.

of Wordsworth's source of inspiration. It becomes a doorway to the imagination, linking the inner and outer worlds.

The several narratives of Ward's invention thus reveal both the aspirations and some of the imaginative and intellectual limitations of mid-nineteenth century bourgeois gardening, both commercial and domestic. It is a story of frustration and desire, of compression and confinement in tight spaces both literally and imaginatively, of mistake, happenstance and confusion where there is little tolerance for error. Ward himself discovered the principle of close glazing by chance; it was followed by trial and even more by error. He understood that his book was necessitated by confusions, and yet he failed to appreciate why those he most wanted to serve would not understand. Through his scientific experimentation with glass,

Figure 15. Frontispiece, from N.B. Ward, *On the Growth of Plants in Closely Glazed Cases* (London: John Van Voorst, 1852). Courtesy of the L. H. Bailey Hortorium Library, Cornell University.

https://doi.org/10.1017/S1060150307051686 Published online by Cambridge University Press

Ward moved nature to the edge of impossibly unnatural circumstances. Yet in the account we have examined, he made clear that what might have seemed unnatural was in fact strictly in accord with the laws of nature: the environment must meet all the plants' needs, whether large or small.

Thanks to the clarity of their commercial motives, plant importers learned through experience. Thanks to their traditional horticultural expertise, working class gardeners ignored the Wardian case. But the bourgeoisie, having embraced close glazing with enthusiasm, encountered trouble. They saw the Wardian case through distracting lenses – aesthetic, moral, religious – which sometimes reflected a failed paradise rather than natural law. As parlor accessory, Ward's invention is both an extreme and characteristic example of the Victorians' artificial manipulation of nature: a portable, frugal expression of Victorian collecting manias, of the development of the private sphere, of a response to industrial pollution that depended on the very innovative industrial technologies that created the problem. The Wardian case shows how *un*natural Victorian natural history could be.

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NOTE

1. I am indebted to Margherita Azzi Visentini for the translation of Catullus.

WORKS CITED

Allen, David Elliston. *The Victorian Fern Craze: A history of pteridomania*. London: Hutchinson, 1969.

Azzi Visentini, Margherita. Personal interview. 28 June 2000.

Barber, Lynn. *The Heyday of Natural History 1820–1870*. Garden City: Doubleday, 1980.

Beeton, Samuel Orchart. *Beeton's Book of Garden Management*. London: Ward Lock, 1872.

Carter, Tom. *The Victorian Garden*. London: Cameron, 1984.

Elliott, Brent. *Victorian Gardens*. Portland: Timber, 1986.

Gaskell, S. Martin. "Gardens for the Working Class: Victorian Practical Pleasure." *Victorian Studies* 23 (1980): 479–501.

Hibberd, [James] Shirley. *Rustic Adornments for Homes of Taste, and Recreations for Town Folk, in the Study and Imitation of Nature*. 2nd ed. London: Groombridge, 1857.

Loudon, John Claudius. *Gardener's Magazine* 10(1834): 162–63; 207–08.

Ward, Nathaniel Bagshaw. *On the Growth of Plants in Closely Glazed Cases*. London: John Van Voorst, 1842.

Wordsworth, William. *The Complete Poetical Works of Wordsworth*. New York: Houghton Mifflin, 1932.