

SEEING EYE TO EYE,  
THROUGH A GLASS  
CLEARLY

WE LAUGH AT THE STUFFINESS OF VICTORIAN PRONOUNCEMENTS, AS TYPIFIED by the quintessential quotation from the woman who gave her name to the age—the Queen’s reaction to an imitation of herself by her groom-in-waiting (as stated in the regal first person plural): “We are not amused.” Yet we (that is, all of us poor slobs today, not her majesty alone) must also admire the unquestioned confidence, in matters both moral and material, of our Victorian forebears, especially from the ambivalent perspective of our own unsure and fragmented modernity.

In a popular book of the mid-1850s, Shirley Hibberd (an androgynous name, but male in this case, as for most publically eminent Victorians), praised the acme that his age had achieved, not only in larger affairs of state, but in the domestic tranquillity of homes as well:

Our rooms sparkle with the products of art, and our gardens with the curiosities of nature. Our conversation shapes itself to ennobling

themes, and our pleasures take a tone from our improving moral sentiments, and acquire a poetic grace that reflects again upon both head and heart.

Hibberd argues for an intimate tie between happy homes and triumphant governments, for "our domestic life is a guarantee of our national greatness." But how shall such purity and edification be achieved on the home front? Hibberd appeals to the concept of taste:

A Home of Taste is a tasteful home, wherein everything is a reflection of refined thoughts and chaste desires . . . In such a home Beauty presides over the education of the sentiments, and while the intellect is ripened by the many means which exist for the acquisition of knowledge, the moral nature is refined by those silent appeals of Nature and of Art, which are the foundations of Taste.

Since Hibberd was a nature writer by profession, and since I am quoting from his most famous work, titled *Rustic Adornments*, readers will not be surprised by his primary prescription for domestic improvement: the enhancement of good taste by cultivated displays of living things. "The Rustic Adornments of the household," Hibberd asserts, "embrace the highest of its attractions apart from the love which lights the walls within." Hibberd could not have been more sanguine about the beneficial moral effects of an interest in natural objects: "It would be an anomaly to find a student of nature addicted to the vices that cast so many dark shadows on our social life; nor do I remember among the sad annals of criminal history, one instance of a naturalist who became a criminal, or of a single gardener who has been hanged." (So much for the Bird Man of Alcatraz!) Moreover, an interest in nature defines both our tranquillity and our prosperity—no strife or ignobility please, we're British!

It is because we are truly a domestic people, dearly attached to our land of green pastures, and shrubby hedgerows, and grey old woods, that we remain calm amid the strife that besets the states

around us, proud of our ancient liberties, our progressing intelligence, and our ever-expanding material resources.

But nature has always been "out there" for our edification on her turf. The greatest advance of his age, Hibberd argued, lay in the invention of devices—rustic adornments—that allowed home-dwellers, even of modest means in highly urban settings, to cultivate nature *within* domestic walls. Hibberd's book contains successive chapters on all forms of indoor natural display, from fern cases to aviaries to floral arrangements. But he devoted his opening chapter to the great craze that defined his decade of the 1850s—the establishment of marine aquariums in almost any home coveting a cachet of modernity. "I commence," Hibberd writes, "with the Aquarium, which, for its novelty, its scientific attractions, and its charming elegance, deservedly takes the first place among the Adornments of the House."

Aquariums seem so humble in concept and so common in occurrence—a staple of your dentist's office or your kid's bedroom—that we can hardly imagine an explicit beginning, or a concept of original excitement and novelty. In fact, the aquarium had a complexly interesting and particular birth during the mid-nineteenth century, and then enjoyed (or endured) one of Victorian Britain's most intense crazes of popularity during a definite interval in the 1850s. I do not, of course, claim that this invention marks the first domestic display of aquatic organisms. The owner of any respectable Roman villa could look down upon the animals in his fishpond. Similarly, the simple bowl had allowed, also since classical times, the contemplation of a fish or two in the more direct, edge-on, eye-to-eye orientation (through glass, or some other transparent medium that did not always come easily or cheaply before the last few generations).

But these precursors are not aquariums in the technical sense, for they lack the defining feature: a *stable community* of aquatic organisms that can be viewed, not from above through the opacity of flowing waters with surface ripples, but eye-to-eye and from the side through transparent glass and clear water.



A fishbowl presents a temporary display, not a stable community. The water quickly goes foul and must be changed frequently (engendering the amusing and frustrating problem, so well remembered by all childhood goldfish enthusiasts, including yours truly, of netting your quarry for temporary residence in a drinking glass while you change the water in his more capacious bowl—a process that can keep Grumpy the Goldfish going for a while, but surely cannot sustain a complex community of aquatic organisms). The concept of an aquarium, on the other hand, rests upon the principle of sustained balance among chemical and ecological components—with plants supplying oxygen to animals, fish eating the growing plants, and snails (or other detritus feeders) scavenging the wastes and gobbling up any algal film that might grow on the glass walls. Western science did not discover the basic chemistry of oxygen, respiration, carbon dioxide, and photosynthesis before the late eighteenth century, so the defining concepts scarcely existed in a usable way before then. The aquarium represents but one of many practical results for this great advance in human knowledge. To quote Shirley Hibberd again: “The Aquarium exemplifies, in an instructive manner, the great balance of compensation which, in nature, preserves the balance of equilibrium in animal and vegetable life.”

A few naturalists, before the invention of the aquarium, had managed to keep marine organisms alive for considerable periods in indoor containers—but only with sustained and substantial effort (entrusted to domestic servants, and therefore reflecting another social reality of the times). For example, Sir John Graham Dalyell, a Scottish gentleman with the euphonious title of Sixth Baronet of Binns (and a day job as a barrister to enhance the alliteration), maintained marine animals in cylindrical glass vessels during the early nineteenth century. But he kept only one animal in each jar and had to change the water every day, a job allocated to his porter, who also lugged several gallons of sea water from nearby ocean to baronial home at least three times a week. Sir John did enjoy substantial success. His hardest specimen, a sea anemone named “Granny,” moved into her jar in 1828 and survived until 1887, long outliving the good baronet and several heirs who

received this lowly but hardy coelenterate as a legacy that may not have been entirely welcome.

(The history of aquariums has spawned a small but thorough literature. I read this story of Sir John in an excellent article by Philip F. Rehbock, cited in the bibliography to this book. I also benefited from Lynn Barber's general book, published in 1980, *The Heyday of Natural History, 1820–1870*. But I have relied mostly on two primary sources from my personal library: Shirley Hibberd's *Rustic Adornments*, second edition, 1858; and the classic work by one of the greatest Victorian naturalists, *The Aquarium*, by Philip Henry Gosse, second edition, 1856.)

In a similar story, recounted by all major sources on the origin of aquariums, Mrs. Thynne, a lady of means, brought some corals from Torquay to London in 1846 “for the purpose of study and the entertainment of friends” (again quoting Shirley Hibberd). “A stone jar was filled with sea-water; the madrepores [corals] were fixed on a large sponge by means of a needle and thread. They arrived in London safely, and were placed in two glass bowls, and the water changed every other day. But the six gallons of water brought by Mrs. Thynne was now exhausted and must be used again. She here devised means to freshen it for second use.” We now switch to Mrs. Thynne's own account, and to another statement about the source of actual work in homes of leisure:

I thought of having it aerated by pouring it backwards and forwards before an open window, for half or three-quarters of an hour between each time of using it. This was doubtless a fatiguing operation; but I had a little housemaid, who, besides being rather anxious to oblige me, thought it rather an amusement.

In later experiments, Mrs. Thynne did add plants to approximate a natural and sustaining balance, but she never abandoned her practice (or her housemaid's effort) of aeration by hand, and thus never built a truly self-sustaining aquarium: “I regularly placed seaweed in my glass bowls; but as I was afraid that I might not keep the exact balance required, I still had the



water refreshed by aeration. I do not know from which, or whether it was from both causes, that my little flock continued to thrive so much, but I seldom had a death."

Interestingly, the key discovery that led to the aquarium of the 1850s did not arise directly from experiments with marine organisms, but by creative transfer from another technology for rustic adornment that had spawned an even more intense craze during the 1840s—the Wardian case for growing and sustaining plants in small, "closely glazed cases." Nathaniel Bagshaw Ward, a London surgeon by profession, began his experiments in the late 1820s. By enclosing plants in an almost airtight glass container—a "closely glazed case" in his terminology—Ward learned how to encourage growth and avoid either desiccation or fouling of the air, all without human input or interference. The moisture transpired by plants during daylight hours would condense on the glass and drip back down to the soil at night. So long as the case remained sufficiently sealed to prevent escape of moisture, but not tight enough to preclude all movement of gases in and out (so that oxygen could be replenished and carbon dioxide siphoned off), the Wardian case could sustain itself for long periods of time.

Dr. Ward's invention provided far more than a pleasant bauble for moral enlightenment in Hibberd's settings of domestic bliss, for the closely glazed case played a key role in Victorian commerce and imperial expansion. Plants in Wardian cases could survive for months at sea, and distant transport became practical for the first time (for species not easily cultivated from seed). In her 1980 book, *The Heyday of Natural History*, Lynn Barber writes:

The directors of Kew Gardens began to plan even more large-scale movements of plants . . . Literally millions of plants were ferried to and fro in Wardian cases, [and] they eventually succeeded in establishing tea as a cash-crop in India (from China) and rubber in Malaya (from South America), thus adding two valuable new commodities to the British Empire's resources. Kew's Wardian cases were probably one of the best investments the British Government

has ever made, and in fact they were only very recently superseded by the use of polythene bags.

On a humbler, yet massive, scale, Wardian cases also became a fixture in almost every British home of approved taste. Although many kinds of plants could be grown in such cases, a passion for ferns—so spectacular as a social fad that the epidemic even received a latinate description as Pteridomania, or the fern craze—swept Britain in the 1840s. When this mania inevitably subsided, the technology of Wardian cases remained, ready to be utilized for the next enthusiastic bout of rustic adornment—the aquarium craze of the 1850s.

All fads, however brightly they may burn for the moment, seem to run their appointed course in relatively short order. The aquarium craze dominated amateur interest in natural history during the 1850s, but quickly subsided during the next decade. By 1868, another popular naturalist, the Reverend J. G. Wood, could write:

Some years ago, a complete aquarium mania ran through the country. Every one must needs have an aquarium, either of sea or fresh water, the former being preferred . . . The fashionable lady had magnificent plate-glass aquaria in her drawing room, and the schoolboy managed to keep an aquarium of lesser pretensions in his study . . . The feeling, however, was like a hothouse plant, very luxuriant under artificial conditions, but failing when deprived of external assistance . . . In due course of time, nine out of every ten aquaria were abandoned . . . To all appearance the aquarium fever had run its course, never again to appear, like hundreds of similar epidemics.

Even the most ephemeral episode of public fascination teaches us many lessons about the social and ideological context of all scientific movements. We have already seen how the aquarium craze relied upon chemical discoveries, a philosophical notion about natural balances, a social system that supported a substantial class of domestic servants in wealthy homes, and the development of a technology first exploited in a previous craze for ferns.



Further reading reveals other important ties to political and technological history, most notably the necessary repeal, in 1845, of the heavy tax that had been levied upon glass. Gosse's "how to" book of 1856, *The Aquarium: An Unveiling of the Wonders of the Deep Sea*, exposes the social or technological solution to a number of practical problems that would probably not occur to a casual reader today. How, for example, could an urban enthusiast get sea water for his home aquarium? Gosse advises:

In London, sea-water may be easily obtained by giving a trifling fee to the master or steward of any of the steamers that ply beyond the mouth of the Thames, charging him to dip it in the clear open sea, beyond the reach of rivers. I have been in the habit of having a twenty gallon cask filled for me, for which I give a couple of shillings.

And how can specimens be safely transported to town with adequate speed? By fast train, of course. Gosse writes:

The more brief the period during which the specimens are *in transitu* the better. Hence they should be always forwarded per mail train, and either be received at the terminus by the owner, or else be directed "To be forwarded immediately by special messenger." The additional expense of this precaution is very small, and it may preserve half the collection from death through long confinement.

Any social movement must illuminate its own time, so we should scarcely be surprised by such enlightenment from the aquarium craze of the 1850s. But what can we say about the even more interesting (and practical) matter of definite and permanent influences extending forward to our own day? Can a movement that trod so transiently (however intensely) on the pathway of history—and then was gone like the wind—leave any lasting imprint upon posterity? In one trivial sense, of course, we can only answer this question affirmatively, for aquariums retain strong popularity in all scales of life—from hokey commercial theme parks, to lofty public muse-

ums, to research laboratories throughout the world, to home displays (with an interesting tie to social circumstances, at least in the United States, where cultivation of tropical fishes remains as resolutely working-class as bowling, while the skiing and sailing crowd favors bird watching or African safaris for their natural-history fix).

I take a far greater interest in "invisible" matters usually passing beneath overt notice, because solutions seem so obvious that we do not even acknowledge the existence of a question. Some ways of knowing or seeing seem so blessedly evident, so unambiguously ineluctable, that we assume their universal and automatic practice from time immemorial. Og the caveperson, Artie the australopithecine, even Priscilla the Paleocene primate ancestor, must have used the same devices. But when we can show that such a strategy of thought or sight arose from a recent and specific episode in our actual history, then we obtain our best proofs for the important principle that all knowledge must arise within social contexts—even the most "obvious" factual matter based on direct and simple observation (for one must first ask the right question to secure the proper observation, and all questions emerge from contexts).

Little examples of big principles strike me as most intriguing of all—for I declare my allegiance with several common mottoes proclaiming that God, the devil, or any matter of great pith and moment, lies in the details. I believe that we can identify one of these admittedly small but "obviously" permanent and universal modes of seeing as, instead, a direct legacy of the mid-nineteenth-century aquarium craze, and therefore not much more than one hundred years old as a Western way of knowing.

How shall we draw marine organisms and more-general scenes of underwater communities? The answer to such an inquiry seems so evident that we may wonder why anyone would bother to pose the question at all. We always draw such scenes in their "natural" orientation today: in the "eye-to-eye" or edge-on view, where a human observer sees marine life from within—that is, as if he were underwater with the creatures depicted, and therefore watching them at their own level. Isn't this orientation obviously

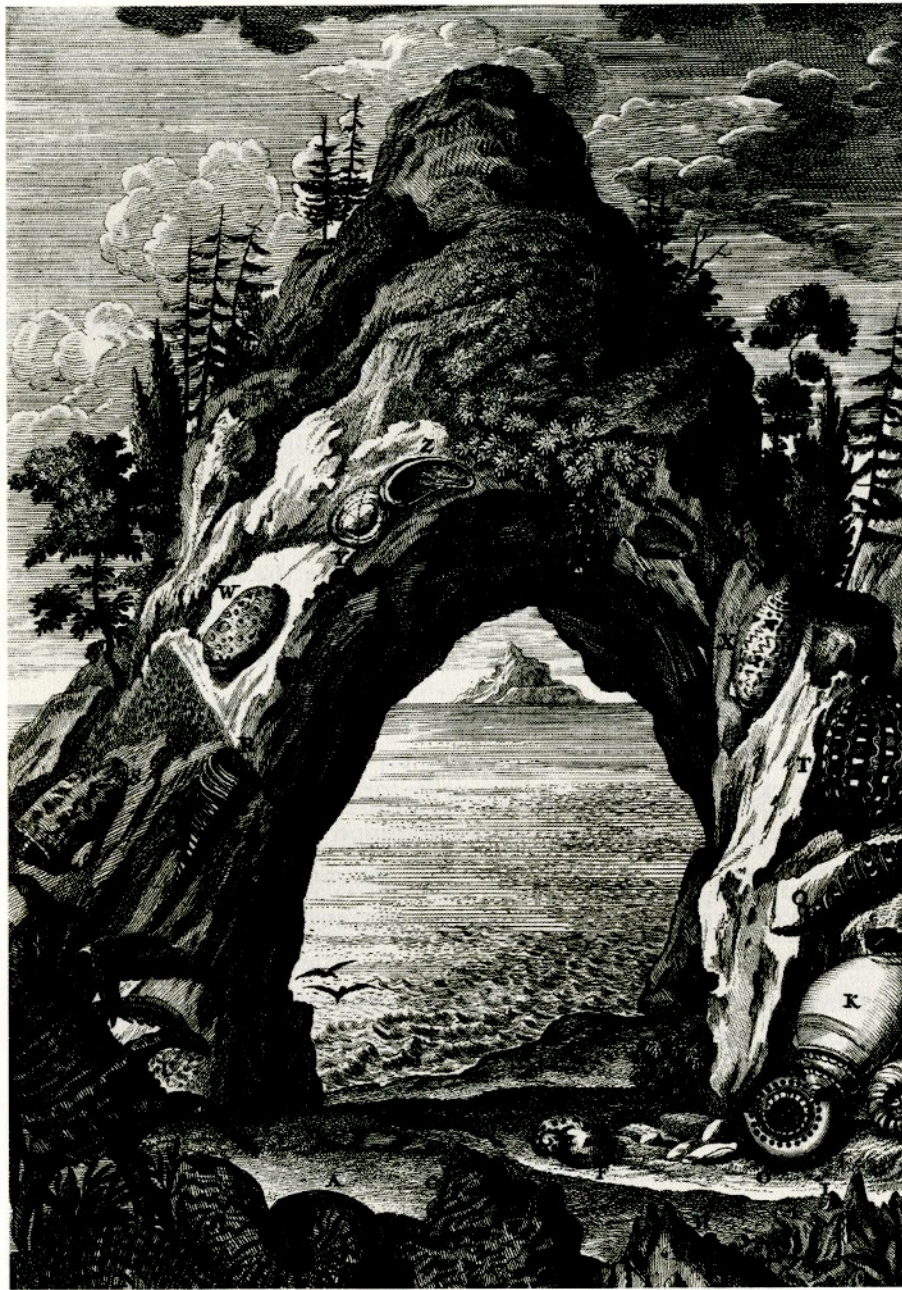


best? After all, we wish to show these creatures as they live, pursuing their ordinary behaviors and interactions. How else could we possibly draw them except from within their own marine environment?

Such a preference may seem both natural and unassailable—and therefore constant and permanent in human practice—but the history of illustration reveals a different and much more interesting story. Until the mid-nineteenth-century, marine organisms were almost always drawn either on top of the waters (for swimming forms, mostly fishes) or thrown up on shore and desiccating on land (for bottom dwellers, mostly invertebrates). These views from above, and from a terrestrial vantage point, had become conventional in the history of art. For example, to invoke the “gold standard” of pre-nineteenth-century illustration for the history of life, consider the engravings for the origin of fishes and marine mollusks in the *Physica sacra* of the Swiss savant J. J. Scheuchzer, published in the 1730s.

This amazing work—the equivalent, for its time, of an elaborate television series with the usual tie-ins from books to coffee mugs—includes 750 gorgeously elaborate, full-page engravings depicting every biblical scene with any plausible implication for natural history. The creation stories of Genesis 1 and 2 provide obvious fodder for an extensive series of illustrations. All marine organisms appear on top, or out of, the waters—that is, from the perspective of a human observer standing on shore. The figure for the creation of mollusks shows clams and snails draped over a rocky arch, or lying on the beach in the foreground, while no organisms at all appear in the background ocean. The creation of marine vertebrates shows a garland of fishes along top and upper side borders (that is, *above* the ocean), while a few swimming whales and fishes partially protrude above the surface, and flying fishes grace the air spaces above!

I can only imagine one reason for a strong convention of such strikingly suboptimal illustration. Artists must then have avoided—or not even been able to conceptualize—the eye-to-eye, within-their-own-environment viewpoint so “naturally” favored today. Illustrators must have eschewed this edge-on orientation because most people had never seen marine organisms



In J. J. Scheuchzer's *Physica sacra*, marine invertebrates are arranged in "preaquarium" perspective.



in such a perspective before the invention of the aquarium, and the craze for maintaining such a display as a rustic adornment in the home converted the formerly inconceivable (because unseen) into a commonplace. Water is usually muddy and largely opaque when in motion. No technology of face masks, diving bells, snorkels, or oxygen tanks existed—and humans do have to come up for air after very short periods of potential observation. The vast majority of Western people (including most professional sailors) couldn't swim, and wouldn't think of immersing themselves voluntarily in marine waters. So where, before the invention of aquariums, would most people ever have seen (or even been inclined to imagine) marine organisms in their own environments? The conventional, if uninformative, view from the shore (and down upon the waters) surely represented the "natural" way of human knowing before aquariums opened a new perspective.

Martin Rudwick, an excellent paleontologist in his early career and now the world's most distinguished historian of geology, first made me aware of this interesting change in the history of illustration, and the probable inspiration provided by the invention of aquariums. In his remarkable book on the history of drawings for prehistoric life (*Scenes from Deep Time*, 1992), Rudwick noted that virtually all early illustrations depict marine organisms exclusively as assemblages desiccating on shore—quite a limit for learning about past communities and environments, especially when you realize that most of life's history featured marine organisms only! Rudwick writes:

Most scenes from deep time . . . portrayed ordinary marine organisms as having been washed up on a shore, in the foreground of a landscape seen unproblematically from a human viewpoint. In this respect, they simply continued the established pictorial convention . . . In effect, the aquatic world from which most fossils were derived was depicted only from the outside, from the subaerial-world to which a time-travelling human observer could, more plausibly have had access . . . This suggests how difficult it may have been for the public . . . and perhaps for most of the geologists too, to



*Scheuchzer's marine fishes (seen on the surface of the ocean and as a framing garland) are portrayed from the top-down vantage point of a shore-bound observer.*



imagine a viewpoint that was not only prehuman but also subaqueous—at least until mid-century, when the famous aquarium craze made the underwater world generally accessible for the first time.

I don't mean to exaggerate the exclusivity of this theme. The eye-to-eye view is not *that* hard to imagine, even if one has never seen marine life in this orientation—and fishbowls did provide some simplified hints. Thus, one occasionally encounters the “modern” view in old illustrations. (The earliest I have seen comes from a sixteenth-century German book on military tactics, and shows a soldier—or should I say a marine—stealthily walking along a lake bottom to access an enemy ship and drill some holes for a sinking. The figure shows a few fishes swimming in the water, but in a very stiff and clearly subsidiary role.)

But Rudwick is surely correct in noting the rarity of such drawings—and he also points out that occasional exceptions usually involve irregular or humorous purposes, while the same artists then used the conventional on-shore view in textbooks and other standard sources. For example, in 1830 and long before the aquarium craze, Henry de la Beche, the first director of the British Geological Survey and a skilled illustrator as well, made a famous drawing of Mesozoic marine life in Dorset—from the “modern” eye-to-eye perspective. He printed this figure as his contribution to a campaign designed to raise money for Mary Anning, the celebrated fossil collector who had become impoverished. But when de la Beche, only two years later, published figures of the same ichthyosaurs and plesiosaurs in a popular textbook, he drew these animals either on shore or on top of the waters.

I have informally monitored this theme in my historical readings during the past five years—and I can affirm Rudwick's claim that the “natural” edge-on view did not become at all “obvious” until the aquarium provided a venue for ordinary human observation. Moreover, since all inventions experience some “lag time” before general acceptance, I have also noted that eye-to-eye marine views do not predominate during the aquarium craze of the 1850s, but only achieve preferred status during the next two decades. To



*In the first edition of Louis Figuier's The Earth Before the Flood (1863), a lithograph depicts Devonian sea creatures cast up on the beach.*

cite two examples of reluctance to abandon old conventions, Shirley Hibberd (in 1858) does show several figures of aquariums from the side. But nearly all Hibberd's drawings, while presenting a side view through glass, take the perspective of an observer looking down upon an aquarium from above, not directly from the side (and level with his fishes). Moreover, Hibberd's decorative drawings for the first page of each chapter continue to promote the desiccating shore-bound view, as illustrated by the grotto of invertebrates gracing chapter one on the “marine aquarium.”

In a striking example (cited by Rudwick as well), the immensely popular French naturalist Louis Figuier—the Carl Sagan or David Attenborough of his day—published the first major book of chronologically ordered scenes for each period of life's history (*La terre avant le déluge*, or *The Earth Before the Flood*). His lithographer, Edouard Riou, also worked for Jules Verne (among others) and was the most celebrated illustrator of popular science in his time. In the first edition of 1863, Riou drew all marine creatures in positions of death and desiccation on shore. He retained these

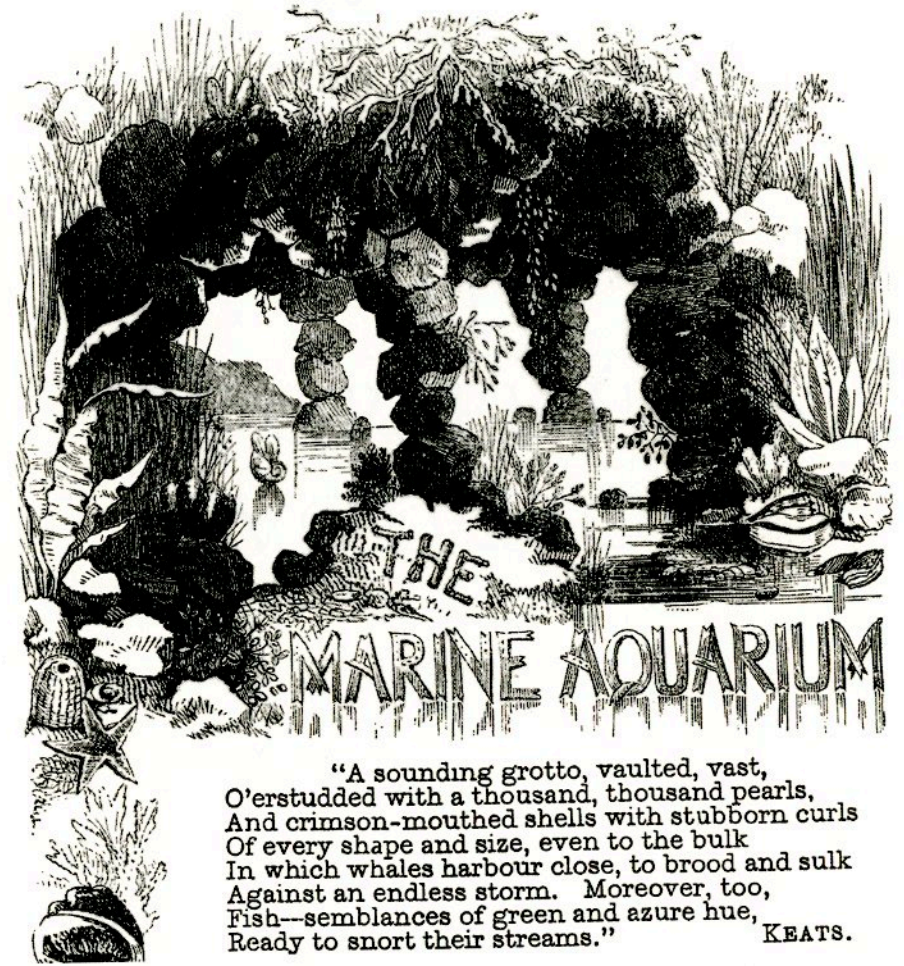




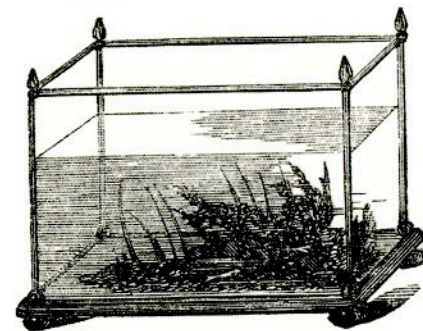
*Illustrating marine animals of the Carboniferous period, a postaquarium perspective is evident in Louis Figuier's fourth edition (1865).*

figures in later printings, but added, in the fourth edition of 1865, a much more informative drawing of Carboniferous fishes and marine invertebrates in the newly familiar edge-on aquarium view.

Very little comes easily to our poor, benighted species (the first creature, after all, to experiment with the novel evolutionary inventions of self-conscious philosophy and art). Even the most "obvious," "accurate," and "natural" style of thinking or drawing must be regulated by history and won by struggle. Solutions must therefore arise within a social context and record the complex interactions of mind and environment that define the possibility of human improvement. To end with a parody on a familiar text, we only learned the "natural" way to see marine life when the invention of aquariums permitted us to see through glass clearly, and to examine a brave old world face to face.



"A sounding grotto, vaulted, vast,  
O'erstudded with a thousand, thousand pearls,  
And crimson-mouthed shells with stubborn curls  
Of every shape and size, even to the bulk  
In which whales harbour close, to brood and sulk  
Against an endless storm. Moreover, too,  
Fish—semblances of green and azure hue,  
Ready to snort their streams." KEATS.



*A chapter heading in Rustic Adornments reflects the old style of marine illustration, as does the top-down view of the aquarium itself.*