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Pouring Old Wine into a New Bottle

A Modern Alchemical Interpretation of the Ancient Hermetic Vessel

Steven M. Rosen

Over the past two decades, I have been engaged in phenomenological research that has drawn extensively from topology, an area of modern mathematics dealing with the qualitative properties of surfaces. Specifically, I have examined the characteristics of two paradoxical and highly integrative structures, the Möbius surface and the Klein bottle, and have explored their holistic implications for several fields of scientific and philosophical inquiry (Rosen 1975a, 1975b, 1980, 1987, 1988). In the course of this work, I was more or less vaguely aware of a possible connection with the old hermetic discipline of alchemy but only recently was the relationship brought home to me in a concrete, vivid way.

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In the summer of 1990, I had turned my attention to the quaternity, the question of the fourfold ordering of nature and the psyche, and this led me to C. G. Jung's three volumes on alchemy (Jung 1944, 1955-1956, and *Alchemical Studies, CW*, vol. 13). As my reading of these texts progressed, I was struck by what appeared to be a remarkable correspondence between the paradoxical Klein bottle I had been studying and the enigmatic vessel in which the work of the alchemists purportedly took place.

The present article provides a detailed account of this conjunction. I describe the properties of the hermetic vessel, primarily as brought out by Jung, then turn to the Klein bottle and my "alchemical" interpretation of it. In laying these two structures alongside each other, I believe it becomes clear that their correspondence is more than adventitious, that the coincidence goes beyond a mere superficial resemblance of entities that are essentially different. The paper concludes with a brief postscript on the archetypal significance of pouring "old wine" into a "new bottle."

The Ancient Bottle of Hermetic Tradition

The popular misconception is that alchemy was nothing more than an absurd flirtation with transmuting base metals into gold. Jung's extensive research into the hermetic enterprise did much to dispel this view. His investigations disclosed that the work of alchemy, sustained over many centuries, entailed a serious effort, not merely to transform matter, but the human psyche as well.

Let us begin by taking note of the unique way the alchemist saw the relationship between psyche and matter. In the words of Jung:

The alchemical *opus* deals in the main not just with chemical experiments as such, but with something resembling psychic processes expressed in pseudochemical language. . . . [I]n alchemy there are two . . . heterogeneous currents flowing side by side, which we simply cannot conceive as being compatible. Alchemy's "tam ethice quam physice" (as much ethical—i.e., psychological—as physical) is impenetrable to our logic. If the alchemist is admittedly using the chemical process only symbolically, then why does he work in a laboratory with crucibles and alembics? And if, as he constantly asserts, he is describing chemical processes, why distort them past recognition with his mythological symbolisms? (Jung 1944, par. 342)

Of course, as Jung well knew, alchemy is "impenetrable to our logic" precisely because our logic separates "hard reality" from that

which is "merely symbolic," divides *physis* from *psyche*, object from subject. By contrast, the alchemical object is at the same time subject. Jung took pains to bring this out, speaking of alchemy as both a laboratory procedure and a meditation, referring to alchemical "imagination" as "a hybrid phenomenon . . . half spiritual, half physical" (1944, par. 394). "There was no 'either-or' for that age," says Jung, "but there did exist an intermediate realm between mind and matter. . . . This is the only view that makes sense of alchemical ways of thought, which must otherwise appear nonsensical" (*ibid.*). In fact, Jung goes so far as to imply that the disciplines of contemporary physics and transpersonal psychology, both of which touch "on an impenetrable darkness," may be reawakening "the intermediate realm of subtle bodies [. . . wherein] the physical and the psychic are once more blended in an indissoluble unity" (*ibid.*).

Now, the remarkable work of alchemy was to be carried out in a vessel with remarkable properties in its own right. Jung introduced his discussion of the hermetic vessel with these words:

Although an instrument . . . it is no mere piece of apparatus. For the alchemists the vessel is something truly marvellous: a *vas mirabile*. Maria Prophetissa says that the whole secret lies in knowing about the Hermetic vessel. "Unum est vas" (the vessel is one) is emphasized again and again. It must be completely round . . . (the spherical or circular house of glass). (Jung 1944, par. 338)

Elsewhere Jung speaks of the "house of the sphere" as the "*vas rotundum*, whose roundness represents the cosmos" (1955-1956, par. 373), this "rotundity" being associated with the realization of wholeness; evidently, the "roundness" must be "simple and perfect" (Jung 1944, par. 116). But I suggest that this "perfect roundness" is not fully grasped just by imagining the unbroken surface of a sphere or the circumference of a circle, for, as Jung's studies reveal, the "roundness" of the hermetic vessel is decidedly *paradoxical* in nature.

One indication of this lies in the fact that the vessel was to be *bene clausum*, well closed or "hermetically sealed" (Jung 1944, par. 219). By maintaining the absolute closure of the vessel's surface, the simplicity and perfection of its roundness would be upheld. However, the vessel was also thought of as a sieve (Jung 1944, par. 338), an apparatus with openings in it to allow finer substances to pass through. Apparently, then, the vessel was to be closed and open at the same time!

The way in which this peculiar requirement could be met becomes clearer when a key symbol of the alchemical enterprise is

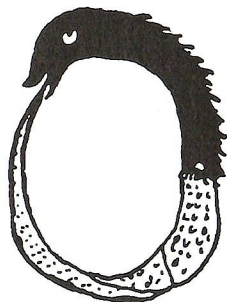


Figure 1. The uroboros

taken into account: the *uroboros*, the ancient figure of the serpent or dragon swallowing its own tail (figure 1). According to Jung, "Time and again the alchemists reiterate that the *opus* . . . is a sort of circle like a dragon biting its own tail" (1944, par. 404). Bearing in mind that the hermetic vessel is not merely a piece of equipment to be used in the work of alchemy but is identified with that work in a primary way, we may suppose that the roundness or circularity of the vessel is itself uroboric in character.¹ So when we see the symbol of the serpent appearing on the vessel (e.g., Jung 1944, par. 404; Metzner 1971, p. 96; Read 1966, plate 35), we may interpret this to mean that the vessel's very structure is that of the uroboros. Indeed, the surface of such a vessel would not merely be closed as is the surface of a sphere, but open as well. For, while the dragon that has swallowed itself is contained within its own skin (as it would be in a closed vessel), at the same time it is ecstatically *un*contained, that is, beside itself, outside its skin in the open.

Evidence confirming the ecstatic structure of the hermetic vessel is found in its association with the symbol of the pelican. Read illustrates a form of the vessel called the "double pelican" (figure 2a), which "was mystically connected with the process of conjunction [the union of opposites]" (1966, p. 149). And Jung, in the course of describing the Paracelsan version of alchemical transformation as a *retorta distillatio*, presents another illustration of an alchemical container shaped like a pelican. According to Jung, the *retorta distillatio* presumably "meant a distillation that was in some way

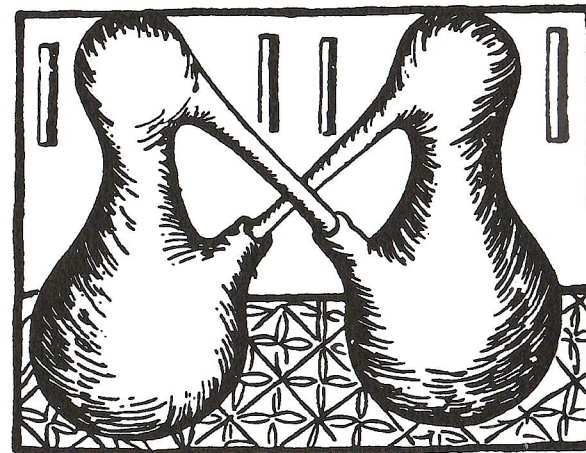


Figure 2a. Double pelican

turned back upon itself. It might have taken place in the vessel called the Pelican [figure 2b] where the distillate runs back into the belly of the retort" (1942, par. 185). Earlier in the same volume, Jung refers to alchemist Gerard Dorn's characterization of the hermetic vessel as the *vas pelicanicum* and further notes:

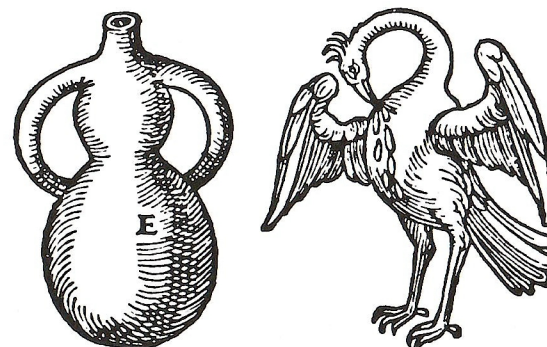


Figure 2b. Pelican as vessel and as bird

The anonymous author of the scholia to the "Tractatus aureus Hermetis" says: "This vessel is the true philosophical Pelican, and there is none other to be sought for in all the world." It is the lapis [the Philosopher's Stone] itself and at the same time contains it; that is to say, the self is its own container. This formulation is borne out by the frequent comparison of the lapis to . . . the dragon which devours itself and gives birth to itself. (Jung 1954, par. 115)

So the curious roundness of the hermetic vessel is embodied both in the uroboros and in the pelican, creatures portrayed as penetrating themselves in such a way that they are inside and outside of themselves at the same time.

In Jung's final major work on alchemy, he develops the theme of the pelican still further:

In the scholia to the "Tractatus aureus Hermetis" there is a quaternio consisting of *superius/inferius* [upper/lower], *exterius/interius* [outside/inside]. They are united into one thing by means of the circular distillation, named the Pelican. . . . For when she [the pelican] applies her beak to her breast, her whole neck with the beak is bent into the shape of a circle. . . . "Let all be one in one circle or vessel." "For this vessel is the true philosophical Pelican, nor is any other to be sought after in all the world." (Jung 1955-1956, par. 8)

Jung concludes this paragraph by reproducing the diagram of the "circular distillation" that appeared in the original text he has examined (figure 3). He explains that:

B C D E represent the outside, A is the inside, "as it were the origin and source from which the other letters flow, and likewise the final goal to which they flow back," F G stands for Above and Below. (1955-1956, par. 9)

In Jung's earlier volume, the same illustration appears in a footnote, along with a quotation from the "Tractatus aureus Hermetis" describing the "circular distillation":

the outside to the inside, the inside to the outside, likewise the lower and the upper; and when they meet together in one circle, you could no longer recognize what was outside or inside, or lower or upper; but all would be one thing in one circle or vessel. For this vessel is the true philosophical Pelican, and there is no other to be sought for in all the world. (1944, par. 167)

For the third time, we encounter Jung's reference to the hermetic vessel as the "true philosophical Pelican," now accompanied by the preceding text which makes it easier to appreciate its self-penetrating, ecstatic character. Referring to the drawing, Jung goes on to comment that the "little circle is the 'inside,' and the circle

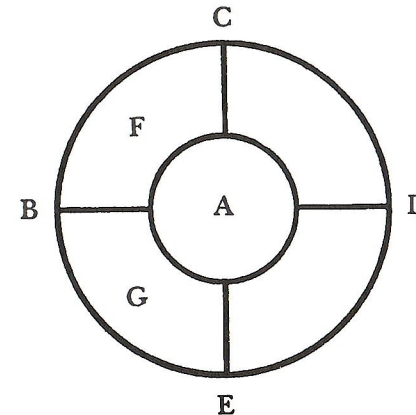


Figure 3. Circular distillation

divided into four is the 'outside': four rivers flowing in and out of the inner 'ocean'" (1944, par. 167).

In a chapter devoted to examining the many paradoxes of alchemy, Jung offers still another perspective on the vessel. According to Jung, the alchemical paradoxes culminate in the so-called "Enigma of Bologna," which he characterized as "a perfect paradigm of the method of alchemy in general" (1955-1956, par. 88). On an allegedly ancient monument said to have been found near Bologna, there appeared an inscription that concluded with the following passage:

(This is a tomb that has no body in it.
This is a body that has no tomb round it.
But body and tomb are the same.) (Ibid., par. 51)

This seemingly nonsensical text attracted much attention among the alchemists, who meditated upon it and devoted great effort to its interpretation. The mysterious persona for whom the inscription was supposed to have been written was named "Aelia Laelia," and according to alchemist Michael Maier, Aelia herself "is the container, converting into herself the contained; and thus she is a tomb or receptacle that has no body or content in it, as was said of Lot's wife, who was her own tomb without a body, and a body without a

tomb" (ibid., par. 64). Jung identifies the enigmatic tomb of Bologna with the hermetic vessel. So we witness again the vessel's ecstatic property: outside ("tomb") and inside ("body") permeate each other as one.

Of particular interest for our purpose is the appearance of the vessel in the material of *glass*. As already noted, it was referred to as the "house of glass," as a "vessel of diaphanous glass" (Jung 1955-1956, par. 261), a "glass vessel that is 'furnished before and behind with eyes' and 'sees the whole universe'" (Jung 1954, par. 114). The symbolic significance of glass is brought out in Jung's association of the hermetic vessel with the Grimms' fairy tale "The Spirit in the Bottle" (Jung 1948, pars. 239-246).

In Jung's view, this story "contains the quintessence and deepest meaning of the Hermetic mystery": a powerful spirit is trapped in the earth beneath an oak tree, enclosed within "a well-sealed glass bottle" (1948, par. 239). Hearing the spirit cry "Let me out!" a passing youth opens the bottle, whereupon the spirit rushes forth, identifies himself as mighty Mercurius, and threatens to strangle his liberator. But the boy tricks the spirit back into the bottle, and the tamed Mercurius then promises that, if freed again, he will serve the boy in a beneficial way.

Jung relates the glass bottle of the Grimms' fairy tale to the hermetic vessel with the following words:

The bottle is an artificial human product and thus signifies the intellectual purposefulness and artificiality of the [alchemical] procedure, whose obvious aim is to isolate the spirit from the surrounding medium. As the *vas Hermeticum* of alchemy, it was "hermetically" sealed. . . . [I]t had to be made of glass, and had also to be as round as possible, since it was meant to represent the cosmos in which the earth was created. (Jung 1948, par. 245)

In Jung's interpretation, the Mercurial spirit represented to the alchemists the initially unconscious, wildly irrational power of instinct, of embodied nature. In turn, the "bottling up" of Mercurius signified the necessity of gaining intellectual control of nature. But Jung's construal of the problem of freeing Mercurius (1944, pars. 250-251) seems less than complete, and I will venture to carry it further.

The fashioning of the hermetic bottle symbolizes a process of purification which culminates in the *unio mentalis* (see Jung 1955-1956, p. 465), a state of intellectual maturity that is the climax of mental development. This is the challenge symbolically faced by the boy in the Grimms' fairy tale, and the challenge the alchemist

faced. Prior to "properly sealing the bottle," Mercurius was always a threat to escape, a regression to the primal past that would overwhelm the alchemist. In the meanwhile, the alchemist had to keep the "spirit" imprisoned as best he could.

Note Jung's observation that "the alchemists rightly regarded 'mental union in the overcoming of the body' as only the first stage of conjunction or individuation. . . . In general, the alchemists strove for a *total* union of opposites" (1955-1956, par. 676). This meant that once mental integration was attained, there would need to be additional "distillations," alchemical processes entailing a reunion of mind with the body, and with the rest of nature. But mental purification had to come first. In this regard, Jung cited alchemist Gerard Dorn: one must "free the mind from the influence of the 'bodily appetites and the heart's affections'. . . . In order to bring about their subsequent reunion, the mind (*mens*) must be separated from the body . . . for only separated things can unite" (1955-1956, par. 671).

As I see it, the secret of fluid passage from the *unio mentalis* to the subsequent stage of reunion with the freed Mercurial body lies in the very structure of the hermetic vessel. What would be discovered up on sealing that bottle in earnest? That it is a *vas pelicanicum*, an *uroboros*. Therefore, at the moment the bottle would be truly sealed, when Mercurius would be closed into it hermetically and no longer able to escape, one would find that the spirit would be outside the bottle as well, now as a beneficial agent of healing, of wholeness. By genuinely completing the vessel, by closing the body within the mind in an "airtight" fashion, the simple containment of body by mind would be overcome and the body set free in union with mind. The body contained within this finished bottle, like the body of Aelia Laelia, would be at once *uncontained* ("a body that has no tomb round it").

In sum, the completed hermetic vessel would be a structure that would contain itself, flow through itself, that would be "both content (mother liquid) and container" (Jung 1955-1956, par. 439). The inside and outside of this remarkable bottle would be united paradoxically as a single side.

The Inside-Out Bottle of Modern Topology

As I noted in the introduction, my work with the qualitative mathematics of surfaces long preceded my study of alchemy. The Klein bottle is a curious topological surface named after its

discoverer, the German mathematician, Felix Klein. To comprehend this structure, let us first examine its lower-dimensional counterpart, the surface of Möbius. The unique character of the latter is exhibited through the comparison shown in figures 4a and 4b.

A cylindrical ring (figure 4a) is constructed by cutting out a narrow strip of paper and joining the ends. The Möbius surface (figure 4b) is produced simply by giving one end of such a strip a half-twist (through an angle of 180 degrees) before linking it with the other.

The cylindrical ring possesses the conventionally expected property of two-sidedness: at any point along its surface, two distinct sides can be identified. In the Möbius case, it is true that if you

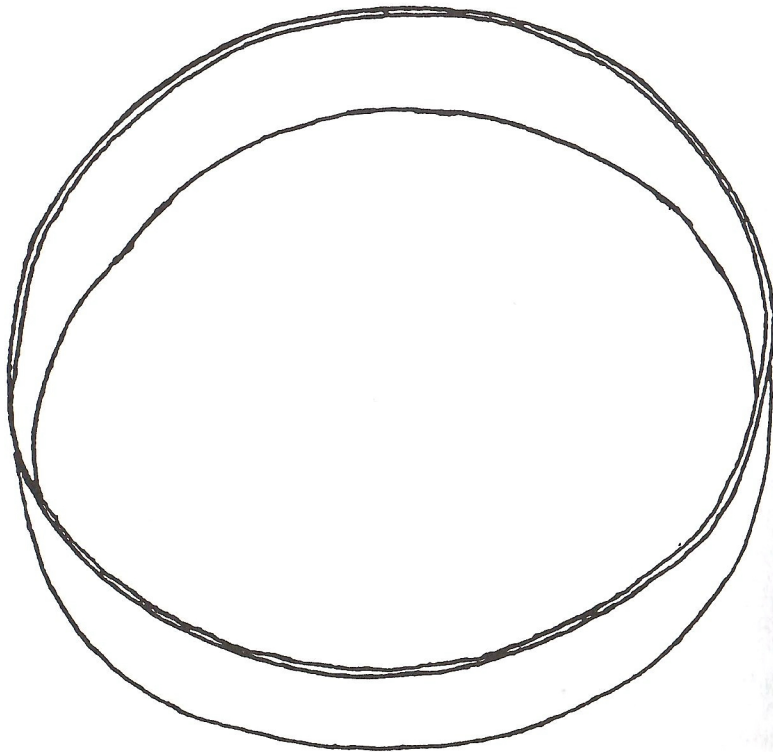


Figure 4a. Cylindrical ring

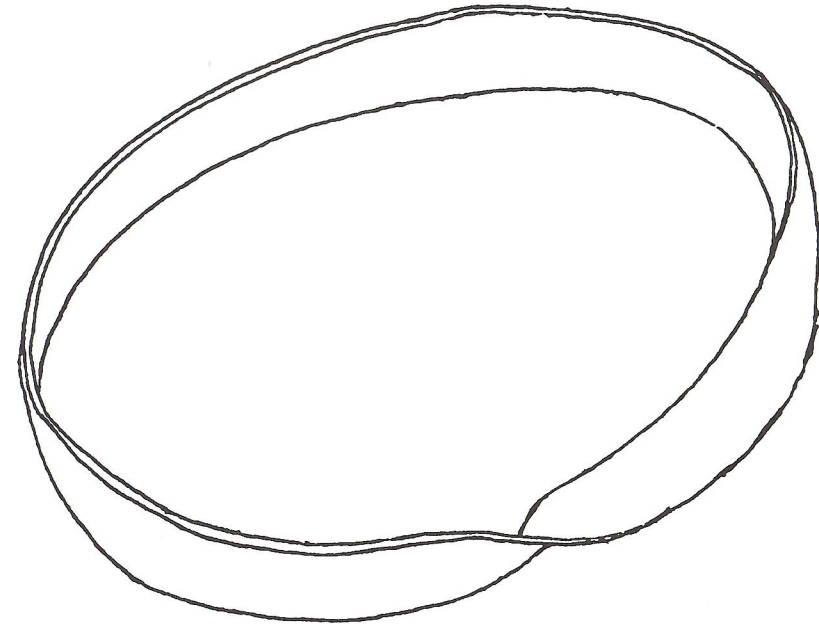


Figure 4b. Surface of Möbius

place your index finger anywhere on the surface, you will be able to put your thumb on a corresponding point on the opposite side. The Möbius strip does have two sides, like the cylinder. However, this holds true only for the local cross-section of the strip defined by thumb and forefinger. Taking the full length of the strip into account, we discover that points on opposite sides are intimately connected—they can be thought of as twisting or dissolving into each other, as being bound together internally. Accordingly, mathematicians define such pairs of points as *single* points, and the two sides of the Möbius strip as but *one* side. (If the Möbius property of one-sidedness is difficult to imagine in the abstract, it is very easy to demonstrate. For instance, when you draw a continuous line along the whole length of the strip, on returning to your point of departure you will discover that your ink mark has covered both sides of the surface!)

It is important to realize that the surface of Möbius is not one-sided in the homogeneous sense of a single side of the cylindrical

ring. It is one-sided in a paradoxical sense, one-sided and also two-sided, for the local distinction between sides is not simply negated with expansion to the Möbius as a whole. When the sides come together, their distinct identities are not merely washed away. The sides of the Möbius remain distinct, yet they also are one and the same.

What is the significance of this topological conjunction of opposite sides? In an earlier work (Rosen 1977), I explored the relationship between Möbius integration and the integration of *psyche* and *physis* (mind and matter, subject and object). Of course, just this marriage of opposites is found in alchemy, in the "hybrid," "half spiritual, half physical" hermetic vessel. However, the true topological counterpart of the hermetic vessel is not the Möbius surface, for the Möbius lacks sufficient dimensionality.

The surface in question is a two-dimensional structure embedded in objective three-dimensional space.² What is the dimensionality through which we *observe* this structure? The observing human psyche is not itself extended in three-dimensional space but operates in a fourth, *intensive*, subjective realm. Therefore, while the Möbius surface indeed may effectively symbolize the *coincidentia oppositorum*, the paradoxical union of object and subject, in itself it is but an object, an entity simply appearing before us in physical space, thus incapable of directly incorporating the inner depths of our psyche. What would be needed to accomplish the latter? Not a two-dimensional body enclosed as mere object in three-dimensional space, but a body of paradox that is itself three-dimensional, one standing open to the fourth dimension.

Enter the Klein bottle. This higher-dimensional counterpart of the Möbius surface does seem to leave the necessary opening for our inwardness. By way of introduction, notice an interesting feature of the Möbius: its asymmetry.

Unlike the cylindrical ring, a Möbius surface has a definite orientation in space; that is, it can be produced either in a left- or right-handed form (depending on the direction in which it is twisted). If both left- and right-oriented Möbius surfaces were constructed and then "glued together," superimposed on one another point for point, the resulting topological structure would be the Klein bottle.

The Klein bottle (figure 5) has the same property of asymmetric one-sidedness as the two-dimensional Möbius, but embodies an added dimension (Rosen 1975a, 1975b, 1980, 1988). Note that we cannot actually produce a proper physical model of the bottle. That

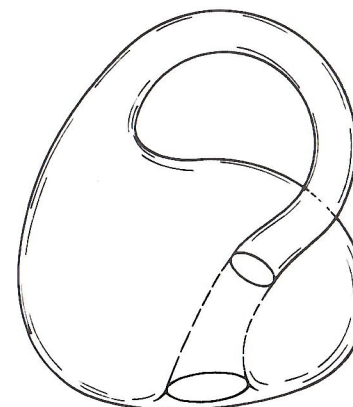


Figure 5. Klein bottle

is, left- and right-facing Möbius bands cannot be superimposed on each other in three-dimensional space without tearing the surfaces. This inability to objectify the Klein bottle in three-dimensional space derives essentially from the fact that the bottle indeed calls a fourth dimension into play, as we are about to see.

There is a different but mathematically equivalent way to describe the making of a Klein bottle that, for our purposes, will be very instructive. Once again a comparison is called for.

Both rows of figure 6 on the following page depict the progressive closing of a tubular surface that is initially open. In the upper row, the end circles of the tube are joined in the conventional way, brought together through the three-dimensional space outside the body of the tube to produce a doughnut-shaped form technically known as a *torus* (a higher-dimensional analogue of the cylindrical ring). By contrast, the end circles in the lower row are superimposed from *inside* the body of the tube, an operation requiring the tube to pass *through* itself. This results in the formation of the Klein bottle. Indeed, if the structure so produced were cut in half, the halves would be Möbius bands of opposite handedness. But in three-dimensional space, no solid structure can penetrate itself without cutting a hole in its surface, an act that would render the model topologically imperfect. So, from a second standpoint, we see that the construction of a Klein bottle cannot effectively be carried

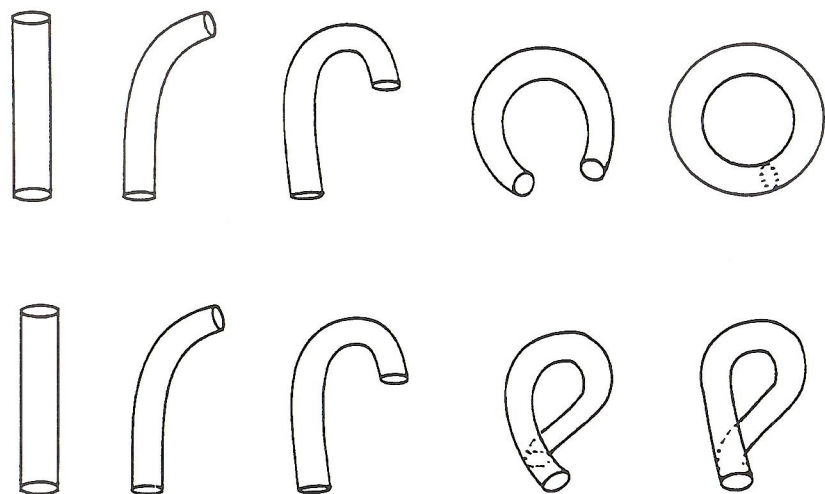


Figure 6. Construction of torus (upper row) and Klein bottle (lower row)

out when one is limited to the three dimensions that frame our ordinary experience of external, objective reality.

Now, mathematicians are aware that a form which penetrates itself in a given number of dimensions can be produced without cutting a hole if an *added* dimension is available. The point is nicely illustrated by Rucker (1977). He asks us to imagine a species of "flatlanders" attempting to assemble a Möbius strip. Rucker shows that, since the "physical" (i.e., externally experienced) reality of these creatures is limited to *two* dimensions of space, when they try to make an actual model of the Möbius, they are forced to cut a hole in it. Of course, no such problem arises for human beings, who have full access to three external dimensions. It is the making of the Klein bottle that is problematic for us, requiring as it would a fourth dimension. Try as we might, we find no fourth dimension "out there" in which to execute this operation.

We are now prepared to examine the critical distinction between the standard mathematical interpretation of the Klein bottle and a modern alchemical one. The crux of the difference lies in the fact that while conventional mathematics tacitly upholds the split between *psyche* and *physis*, alchemy aims to overcome it. In the

conventional approach, the concrete subjectivity of the *psyche* is denied and attention limited to the mathematical object. If an object requires three or fewer dimensions for its construction (as in the case of the cylindrical ring, the Möbius surface, and torus), a "real" (i.e., tangibly perceptible) model of it may be fashioned; if the object cannot be assembled in three-dimensional space, objective reality may be extrapolated, extended by an act of abstract imagination in which one or more additional dimensions are summoned. In this view, the "fourth dimension" required to complete the Klein bottle essentially remains an external dimension, albeit an imaginary one, and the Klein bottle is regarded an "imaginary object." Therefore, whether the mathematical object can be concretized or must be approached through abstraction, the conventional mathematician's attention is always directed outward, toward an object; it may take passing note of its own subjective operation, but never will make this its primary focus.

The alchemical approach to the Klein bottle would be decidedly different. Let us look at this difference by placing it in historical perspective.

We know that ancient and medieval alchemy imposed no categorical demarcation of psychological and physical spheres of human experience, but operated in an "intermediary" realm. That "hybrid" mode of apprehension was predominantly pre-rational; that is, it involved a certain absence of discrimination between *psyche* and *physis*, an inability to distinguish the two sharply. It was in this deficient sense that "the physical and the psychic [were . . .] blended in an indissoluble unity" (Jung 1944, par. 394). Just this confusion was reflected in old alchemy's essential difficulty with sealing the "Spirit Mercurius" into the bottle.

Apparently, alchemy itself foresaw what would be needed to address its problem: the perfection of the hermetic vessel in "glass," that is, the further purification of the intellect. How did this *unio mentalis* begin to be brought about? It was effected through the revolution in thinking that occurred with the Renaissance, and the attendant rise of scientific rationalism and modern mathematics. As Berman (1989) recently documented, the first modern scientists were alchemists. Seen from this point of view, the scientific enterprise may be regarded as having originated in the goal of furthering the program of alchemy, not repudiating it. But first things did have to come first. Although *psyche* and *physis* were to be reunited in the end, the process of their hermetic isolation had to be carried

forward; for, as alchemist Gerard Dorn said, "only separated things can unite" (Jung 1955-1956, par. 671). Essentially, this meant dividing *psyche* and *physis* in such a way that the old embodied *psyche* that had participated directly in nature (in *physis*) became the coolly objective scientific mind observing nature "out there" as if at a distance, and in the process denying its own primordial origin. Thus, beginning with the Renaissance and for centuries thereafter, individual awareness was directed away from its concrete source, projected outward to an exterior world—a world now witnessed from the detached perspective of the "objective observer."³ Science devoted itself so single-mindedly to this task of division that it completely lost sight of the unitary aspect of its activity which had been evident at the outset.

But now, in the twentieth century, it appears that the work of science is reaching a point of culmination in which its preoccupation with an objectified *physis* observed from the detached viewpoint of an abstracted *psyche* may be ready to yield, in preparation for the concrete reunion of *physis* and *psyche*. This was Jung's basic reading of contemporary physics.⁴ In what specific form appropriate to our modern context will the integration of *psyche* and *physis* become manifested? I suggest it will be expressed as a dimensional integration. That is, *physis*, the dimension associated with extensive, objectified three-dimensional space, will become integrated with a fourth dimension. The latter will not be a dimension that is simply extended before us in the manner of an externalized space, as in the standard mathematical approach. Rather, *physis* will merge with the *intensive* dimension, that which is folded within us, involving our thoughts, feelings, sensations, and intuitions—the whole of our subjectivity. It will be through this conjunction of outer and inner dimensionality that the new alchemy will consummate the marriage of *physis* and *psyche*.

Again, it is a question of properly fashioning the alchemical vessel. The bottle must be "hermetically" sealed, closed so "tightly" that it is also open; the outer surface of the vessel must be finished in such a way that what lies within it is set free—not merely by being separated from the containing surface but by being integrated with it, thus bringing to fruition the bottle's ecstatically uroboric, inside-out nature ("the outside to the inside, the inside to the outside"; Jung 1944, par. 167). Clearly, the merged "sides" of the completed vessel would not be just the sides of some object appearing out in space, some entity observable to a subject who would remain de-

tached from it. Objectivity and subjectivity themselves would be the "sides" that would permeate each other.

What the modern alchemist can grasp that the ancient alchemist could not is that the merger of objective and subjective sides entails precisely that interpenetration of extensive, external three-dimensionality with our fourth, intensive, interior dimension. Just this *coincidentia oppositorum* is embodied in the one-sided Klein bottle, understood in the light of alchemy. We have seen that the bottle does have an objective side to it, that a palpable model of it can be approximated in three-dimensional space; but we have also realized that it is not simply objectifiable, not an entity like the torus, whose construction in three-dimensional space appears unambiguously completable. That is because the Klein bottle penetrates itself, and, when it is confined to three dimensions, this penetration can only be achieved by cutting it open. Yet, we have also found that the opening which appears in the objective, three-dimensional model of the bottle is filled by introducing a fourth dimension. Interpreting that dimension alchemically, viewing it as the inner dimension of *psyche*, the Klein bottle becomes identified as the present-day counterpart of the hermetic vessel (as even its outward appearance seems to suggest; compare illustrations of the vessel shown in figures 2a and 2b on page 125 with figures 5 and 6 on page 133 and 134). The new incarnation of the bottle, being made of "perfected glass"—constructed in terms of the conceptually mature, highly differentiated idea of mathematical dimensionality—can ecstatically contain the "Mercurial wine" in a way the old bottle could not. When the sides of the Klein bottle fuse, they do so without *confusion*, without losing their distinctiveness (this was also noted for the sides of the Möbius surface, the bottle's lower-dimensional equivalent). By means of the Klein bottle, outside and inside, *physis* and *psyche*, are sealed off from one another in such a way that, paradoxically, they totally mesh.

Let me emphasize that the Klein bottle, as hermetic vessel, seals outside and inside from one another *hermetically*; that is, opposing sides are actually differentiated more completely than in conventional structures. The implication here is that the conventional post-Renaissance division of object and subject is by no means a complete division. In viewing an object in the conventional way, we assume that it is complete within itself (a self-standing, simply autonomous entity) by neglecting our own subjective role in the process. In the twentieth century this attitude has come to be

called "naive realism." Both in contemporary science (especially theoretical physics) and contemporary philosophy (consider the phenomenology of Husserl, Heidegger, and Merleau-Ponty), recognition has come that the observer and observed are so intimately interconnected that, in effect, they are inseparable. This makes it naive indeed to continue thinking of the observed object as being merely "out there," standing on its own in simple autonomy from the observing subject "in here." By continuing to assume a separation that does not exist and can never be realized, the process of authentic separation is obstructed.

This idea is nicely brought out in Jung's concept of individuation. From the Jungian standpoint, the goal of development is to make the unconscious conscious, to overcome defensive denial and confusion about oneself and gain full-fledged self-knowledge. What the individual is not consciously aware of in himself or herself makes its presence felt *unconsciously*, in a deficient, undifferentiated form. Now, the *most basic* impediment to individuation lies in our most basic self-misconception: we mistakenly view ourselves as isolated, simply self-subsistent individuals. For Jung, and indeed for alchemy in general, one completes one's development as a distinct individual only when one recognizes fully the truth of one's intimate entwinement with others, with nature, with the cosmos as a whole. Thus, to be fully individuated means to be fully integrated. Whereas the conventional dualism of post-Renaissance experience achieves neither of these aims, the new alchemy would realize both.

And precisely this thorough differentiation and integration of subject and object is found in the "new alchemical vessel," embodied in the Klein bottle's transpermeation of intensive and extensive dimensions. Without regressively dissolving, each side of the bottle expresses itself *as* the other side and, in so doing, expresses its individuality more truly and fully than in conventional structures such as the torus, which lend themselves to the dualistic "separation" of object and subject that obscures their underlying relatedness. By manifesting the full truth of what they are, the sides of the Klein bottle come into their own, are wholly individuated. Each side is the other side, and each is completely itself, thus completely differentiated from the other side. By virtue of the latter quality, the Klein bottle indeed can be deemed *bene clausum*, "hermetically sealed."

It seems appropriate to end this paper by taking note of the general nature of the work I have done here. It is primarily intellec-

tual work. If the foregoing identification of the old hermetic vessel with the Klein bottle has helped to facilitate an *unio mentalis*, by itself it certainly would not suffice to complete the alchemical *opus*, for, as already intimated, there are deeper orders of the psyche than the intellect, "denser" strata of the subjective dimension that would need to be engaged (*viz.*, feelings, sensations, etc.). In this regard, remember Jung's observation that beyond intellectual development, additional "distillations" are required by alchemy (see p. 129). To quote him further on this:

The second stage of conjunction, the re-uniting of the *unio mentalis* with the body, is particularly important, as only from here can the complete conjunction be attained. . . . The second stage of conjunction therefore consists in making a reality of [concretely embodying] the man who has acquired some [abstract] knowledge of his paradoxical wholeness. (Jung 1955-1956, par. 679)

What does this mean with respect to the hermetic vessel, the Kleinian medium in which alchemical transformation is to be carried out? I propose it implies that the alchemist must not only *think* the Klein bottle's paradoxical fusion of *physis* and *psyche*, but that this "inside-out" way of thinking must ultimately become a way of *feeling, sensing, and intuiting*.

So the Klein vessel can be understood as an "object" with an opening perfectly contoured for our subjectivity; a "physical" entity hollowed out to the exact specifications of the psyche. Accordingly, this container properly could be completed, its hole filled, only by going "out" to it through our inner depths, through the hole within ourselves. This is the only way to seal the Klein bottle "hermetically." The very shape and nature of the Klein "object" seems to invite this "subjective" movement, this self-transmutation. Of course, we may decline the invitation, and in that case, the Klein bottle would not have the "extra dimension" it requires to thoroughly express its inside-out character. As a consequence, it would remain but an incomplete model, seen as simply external to us.

Postscript on Archetypes

From the Jungian perspective, we may regard the Klein bottle, *née* hermetic vessel, as rooted in *archetype*. M.-L. von Franz (1975) recounted how, toward the end of his life, Jung saw the need for discovering more universal archetypes, structures he expected would take a mathematical form. Von Franz herself carried this

work forward after Jung's death, the research culminating in her book *Number and Time* (1974). Number here is interpreted in a qualitative manner and hypothesized as the primordial organizing principle for the *unus mundus* or "hidden continuum" from which less fundamental archetypes emerge. It is clear from von Franz's subsequent commentary on these efforts that their primary purpose was to promote Jung's ultimate aim of integrating *psyche* and *physis* (1975).

For my part, I would suggest that if archetypes express the underlying unity of *psyche* and *physis*, the most powerful archetype would be one that would go beyond a merely indirect or symbolic expression of this unity to an immediate, fully conscious embodiment of it. A less potent archetype might well symbolically point to said union, but in a manner that implicitly would preserve the division of *psyche* and *physis*, since the split between the archetype as conscious psychic image and the archetype as unconscious, transpsychic ("psychoid") potential would be upheld (the latter being viewed as completely "irrepresentable"; see Jung 1960, par. 840). By contrast, I propose that the Klein bottle, in its four-dimensional realization, would be neither a psychic image nor a material object alone, nor even a linear combination of these, but both *at the same time*—a full-fledged, literal fusion of *psyche* and *physis* giving hermetically differentiated expression to alchemy's "intermediate realm of subtle bodies" (Jung 1944, par. 394).

Notes

1. The literal identification of the alchemical work with the vessel in which it is performed is brought out in a phrase quoted more than once by Jung: "One is the stone, one the medicine, one the vessel, one the method, and one the disposition" (1944, par. 404).
2. For a more technical, detailed treatment of the issue of dimensionality, see Rosen 1988.
3. The interpretation of the Renaissance and its aftermath as a transition from a relatively undifferentiated, concretely participatory mode of consciousness to one that is dualistically detached, accords with a number of writings in cultural philosophy. For examples, see Gebser 1985, Barfield 1988, and Ong 1977.
4. In addition to Jung 1944, par. 394, see Jung 1960, par. 840, and Progoff's discussion of this (1973, chapter 10). See also my own interpretations of Einsteinian relativity and quantum indeterminism, in Rosen 1994.

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