

Love and physics

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This is a typical physicist's talk on Love. If you expect a nice and sweet love, you will be disappointed. Catastrophe is something like disaster and most people would probably prefer not to see their love affairs or prospective ones in such a metaphor.

On the other hand, popular expressions like "fall in love" do carry some sense of sudden catastrophe. One might be swept away by an uncontrollable flow of energy or consumed in the flame of an affair. What is more, I sense that people have some suspicion or awareness that Death is somehow linked with erotic excitement. Love is like a flower, sweet and beautiful, but we know it is ephemeral. And, perhaps our awareness, though suppressed by our finite being makes us appreciate beauty in ephemeral phenomena. If so, catastrophe is not entirely an impossible metaphor to try.

Besides, I happened to see *Reds* and was very much impressed by the bed scene in which a larger than life size silhouette towered up in the rhythm of the International. Indeed, it was a climax, an up-welling of resonant energy, awakened suddenly after long years of suppression and suffering, blundering and humiliation. In the scene, I saw a Freudian message; "frustrated and alienated men and women of the world, unite!"

Obviously, this is a bourgeois interpretation. But the temptation was too great to resist trying the metaphor. And if I continue the bourgeois view, I would even dare to comment that what happened in October, 1917 was not a revolution in power, but in love. The ideals of equality and liberty were there, but it was primarily an up-rising of fraternity, solidarity, the Soviet in the sense of the Union, comradeship, communion of love.

Of course, too good a thing could not last too long. What goes up must eventually come down, as common sense physics would say. Freud thought that humans are not capable of sustaining such a tremendous gushing of energy, however desirable it is. According to Marcuse, in *Eros and Civilization*, Freud contended that the full liberation of love is too much for finite beings like humans. The "reality principle,"—which is the contrived necessity of work in an economy inflated by civilized wants, and the "performance principle" of Marcuse, which says "people have to do something to stay away from love play"—conspire to keep control on love.

William James talked about economic competition as a "moral equivalent of war." Thus, in the Freudian fear of love, one might talk of war as a "moral equivalent of love." And I observe that in the guise of fighting, humans practice loving. Comradeship in front lines, nationalism, patriotism, etc., would not be permitted if they were openly admitted to be disguised forms of love. And, in the same line of thought, one might go on to say that hate and violence are used to disguise love. The opposite of love is not hate, not violence, but indifference, loss of relation, loss of meaning. The popular expression "meaningful relationship" conveys a good sense of love.

I think, it would be better to imagine two (or multiple) dimensions in the linguistic space for the talk-thinking of love and related affairs. Love and violence do not map well onto a one dimensional metaphor like a line, though behavioral psychologists often use the one-dimensional metaphorical representation. Freud (and Marx, Weber, et al) was not quite a "one dimensional thinker," but his rhetoric seems to fall into the linear metaphor in dealing with dialectical opposites.

To me it is unfortunate. The dialectical opposites are better taken as two different dimensions so that they can both be at the height of intensity at the same time. And it is somewhat disappointing that Marcuse, for that matter, was not clear, despite writings like *One-Dimensional Man* in which he did talk of the geometry of Husserl, etc. I wonder if it is due to the structure of European languages and hence European thinking. The encircling image-symbol of Yin-Yang in Zen is at least two-dimensional and it is presumably a picture of moving relations. In that sense, the Zen symbol resembles Poincare's limit circle traced in a phase space diagram, and it is appealing as an image of dialectics.

There is an irony here. Poincare's limit circle appeared in studies of Newtonian mechanics. Newtonian mechanics are, in my estimate, the essence of the European mentality, the crowning achievement of the western intelligence. Yet Poincare proved that Newtonian mechanics is not deterministic in the naive sense that Laplace boasted—though many scientists even today appear to believe in the determinism of Newtonian mechanics. The topological rhetoric Poincare started is now coming into physics, gradually replacing the analytical rhetoric, as if physics is entering the mind space of Oriental metaphysics.

The catastrophe theory is an extension of Poincare's idea, carried out by R. Thom et al. Thom published *Structural Stability and Morphogenesis* (1972) in which he discussed not only mathematics and biology but also sex, language, and even cogito. A short summary of the catastrophe theory appeared in *Scientific American*, April 1976 (by E.C. Zeeman). I shall use the illustration of the catastrophe theory in Zeeman's article to build a theory of love. Then I shall come back to Freud's problem of free love.

In his article in the *Scientific American*, Zeeman used an illustration of catastrophe giving a beautiful picture of three dimensional linguistic space. The three dimensions are designated as fear, anger, and behaviour. However, since the theory is topological, these terms ought to be taken with poetical imagina-

tion. Something like..."would do nicely." The theory is invariable, though open to the liberal exercise of poetic license. This is the beauty and the strength of topological theory. And, although the illustration is given for "aggression of a dog" it need not be limited to that particular interpretation. The structure or "form" can be applied to many cases, as the accompanying diagram illustrates. Incidentally, what behaviorists are doing appears to me to be topological. Perhaps, they are poets at heart, but their religion does not let them admit their poetic quality.

In the linguistic space, there is a folded surface. The folded part is a double (or triple) valued function of the two parameters, the fear and anger. In this region, the dog's behavior jumps from one layer to another of the surface. The jump is sudden, and presumably unpredictable (this unpredictability is not actually incorporated in the simple illustration model, but it is understood in the theory). And the jump is the catastrophe. The behavior is traced around the folded part of the surface by the dynamics and makes up a limit circle (vicious cycle)—I shall omit talking of equations of motion here. The illustration story does make sense. I recommend you read the story.

One can use the same diagram to represent "prey-predator" dynamics. Then the catastrophic jumps correspond to "catch" or "eating" for one, and the other is, interestingly, referred to by Thom as cogito.

Following the limit circle (vicious cycle) Thom narrates a story. The "predator" after eating become "prey" or "prey-like." The "prey" is rather a self-centered egoist. It is only concerned with itself, though the "prey" is the "giver." Then the motion (change of state) comes to a catastrophe, called cogito. The "prey-like" realizes that it is hungry, becomes a "predator" and starts looking for "prey." The "predator" however, is an "other-centered" being. Its main concern is not him/her-self. It could be said to be "aggressive" but not "selfish" or "narcissistic." And the "predator" is the one who accepts.

