ON THE BEAUTY OF SEX AND THE TRUTH OF MATHEMATICS

C. Marchetti

April 1983
PP-83-2

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS
A-2361 Laxenburg, Austria

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Naive questions often call for sophisticated answers. Why flowers are beautiful always puzzled me. With the "why" I intend the philosophical quia, the deep cause or connection. Not the propter hoc, i.e. the actual contrivances through which that beauty is expressed.

Flowers are in fact vexillar structures to call the attention of pollinating insects. As many other things in the biological realm , they select for their efficiency, in a close loop with insect choices. Every mutation that will not match the efficiency rule will not be fixed and will fade out. During hundreds of million years of probing, every possible configuration has presumably been tested, so finally the flower could be considered as a kind of ectoplasm, a transcodification, of the physics, physiology, neurology, and value system of the insect. Why it should be the same for a biological object so far apart like me is obviously a most intriguing mistery.

Because flowers are so vastly different, as the insects serving them, the unifying concept must be quite abstract, like the value system mentioned above. With physics and chemistry sitting somewhere behind. The question can be formulated then, why a subset of my value system coincides with that of pollinating insects. Because my appreciation of flowers is intuitive and emotional, the coincidence must lie in the area of aesthetics.

This leads to a first suspicion of philosophical importance, that aesthetics must be somehow "objective". Perhaps not like physics and chemistry but somehow.

This question of objectivity kept me pondering for years, because it implied, like any other biological function, take e.g. the sense of smell, a process of mutation and selection in view of a final objective, that of survival if we want to draw the outer wrap. The problem was in fact to identify the level and context into which it actually operates. Heuristically, it should be a selective filter in information flow, and its generality suggests that it operates at a deep level. But where?

Some years ago I was studying the question of the advantages for a species to have sex. The question about what the advantages are is still debated (clades vs. clones) but advantages there must be if sex is so solidly entrenched in most of the biological realm to the point that even monocellular organisms developed tricks to transfer DNA from one another.

Right or not, my idea was that sex is a kind of language, spoken across a species, where genetic experiences from one reproductive line can be transferred to another one. Consequently, information gathering about favorable mutations becomes a species affair, and that increases enormously the rate at which a sexed species can evolve, by respect to one where information can be transferred only vertically, from father to son, so to speak. Furthermore, bits and pieces of this information can be scattered around into the species, creating a genetic pool, where it is kept fluid for recombination. This keeps the species flexible and resilient with relatively short time constants, even when generation times are many orders of magnitude larger than in monocellular organisms.

As the technique of this swapping of information becomes more and more sophisticated along the evolutionary lines, I asked myself if the process of stochastic recombintion cannot itself be improved. We observe in fact that e.g. animals, from deer to fruit flies, seem to go through elaborate rituals just to avoid this stochasticity, presumably for good reasons. To keep an image from a precise example, the male fruit fly starts courting the female by standing eye to eye in front of it. The female then swings right and left, swift and aperiodic, and the male tries to follow. Only if it is able to sharp tune, it is accepted as a mate. Obviously the female checks the neuromuscular fitness of the partner as a criterion of choice. Perhaps only one of many.

A step forward can actually be imagined if we think a "value" can be attached to the mating partner, connected with the probability of success of the future offspring in the struggle for life. The process is made abstruse by the fact that the message has to be extracted by the observation of the partner, with no direct connection to the offspring still to come, and only a partial one to the environment into which it will move.

The criteria must then operate at a quite abstract and general level, let me say ethical, using an anthropomorphic concept. Or, by analogy with the choice of partners in humans, aesthetical.

If a certain mechanism of choice, even simple and crude, gives a selective advantage, if small, then it will become fixed. It will progressively expand and improve, as any other positive character. The choice is made at the brain level, and can be considered as an "instinctive" information processing.

The instinctive program has to be very subtle at least intrinsically, because it has to match somehow the great complexity of the external world, and also very "true". The way this is

insured is very simple. Signals are sent out and come back, filtered by offspring selection, insuring a progressive tuning between the signal generator and the filter. But the filter is the external world and so the generator progressively acquires a "knowledge" of universals, actualized in form of (instinctive) criteria of choice, i.e. of value tags.

The process is well imaged in a children's game, where each of two players draws a war fleet on a grid of squares, and plays shooting at each other by naming coordinates. If a ship is hit, the feedback message is "hit". This yes or no, success or failure string of information, permits the reconstruction of the enemy fleet's consistence and distribution.

Tools tend to expand their niches, and the tooth so useful in crunching roots can occasionally crunch an enemy leg, or the hand so swift in grabbing branches can grab a screwdriver to fix a watch. The natural way to expand is to apply value tags to objects other than potential mates. After all we all float in the same world, and basic rules may be of general applicability. My outstretched statement here is that aesthetics and physics are much of the same thing.

To give some support to this naughty statement, I will take a couple of examples from our daily life. Mathematics is formally a logic game, where possible interactions between certain statements, the axioms, are constructed using certain rules, and called theorems. The process is relatively simple and can be computerized. However, when the theorems so generated are presented to a mathematician, his reaction will be one of bore. The theorems are correct, he will say, but they are trivial.

Because they are correct, they are mathematically impeachable, but when he says trivial, he implies a value system external to the mathematical one. In other words, a mathematic provides a large grid of neutral statements, actually tautologies, to which the mathematician, for his own reasons, applies value tags. If one listens to creative mathematicians' talk, it is clear that the tagging machine is aesthetics.

If this point of view is accepted, a certain number of things start acquiring significance or finding an explanation. A mathematical statement is a tautology, and this occasionally bothers purists. But its value comes from the fact that it has been selected out of a sea of equivalent tautologies, and brought to life by implicitly stating that it belongs to the physical world. This is why, the mistery unveiled, mathematics is so efficient in describing the external world. It comes from there, and its fitness has been painfully checked and rechecked for eons.

If one trembles at such a complexity brought in through such a trivial game like the naval battle, parallel examples abound. Our body chemistry, and by the way that of a minute bacterium, is orders of magnitude more complex and subtle than anything man has been able to conceive. I did not say realize. And is operated with magic smoothness and perfection.

At this point we can go back to square one and observe that the chemistry of the insect has an ample intersection with ours, especially on basics. DNA is there, as ATP and many other things. So, an intersection in the value system for visuals should not be so disturbing. We live in the same physics. A curious and perhaps important observation is that when certain dull flowers were photographed in the spectral sensitivity region of their

pollinators they showed beautiful and stimulating patterns. Kind of negative check.

Every tool, as I said, tries to expand its niche. Nimble hands only rarely hold branches nowadays. A value system can be precious outside the original area of mate selection. To asses the right and wrong. It is curious that in children and primitive languages beautiful and good often confuse.

And that an aesthetic surrounding releases stresses and anxiety. When man in the Middle Ages, for social reasons, had to live in a walled city they poured beauty into it, to make it holy, to make it natural, to make it reassuring. With these consoling notes I close my little exercise and hope that my aesthetic sense made a hit, as it often does.