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All’s right with the world when lilacs are in bloom.

Lilacs -- Overtaken by Scent

“There were few houses that did not contain in their gardens…lilac bushes… And so it came about that, all through the month of May, each small house found itself dowered with an unexpected magnificence, a whole, silent household staff of young lilacs gathered about the door and filling the interior with sweet air and fragrant smells…”

Jean Santeuil, Marcel Proust
(Translated by Gerard Hopkins, 1955)

All’s right with the world when lilacs are in bloom. No other flowering plant elicits such devotion, appreciation and plant-madness in the month of May, as demonstrated by hordes of enthusiasts touring lilac arboretums, rambling along lilac walks and making pilgrimages to sites of 18th century lilac plantings. The big collections are managed by horticultural institutions like the Royal Botanical Gardens in Ontario, Canada which is the official registrar for new cultivars; and the Arnold Arboretum at Harvard University which hosts Lilac Sunday, inviting picnics and dancing among their 500 lilac shrubs on grounds designed by Frederick Law Olmsted. Olmsted was the designer of New York City’s Central Park and also of Highland Park in Rochester, New York, where more than 1,200 lilacs shrubs representing 500 varieties are grown.

As garden plants, lilacs are not unlike other flowering shrubs that put on a large floral display for 3 to 4 weeks, and then subside into leafy greenness until next year. The shrub’s form is nondescript at best – a leggy scaffold of twigs and main branches, generally upright and with a tendency to bloom mostly at the top where light is more plentiful. But the excitement is all about the flowers which extend from branch tips in a thyrse, a densely branched pair of inflorescent florets with hundreds of individual flowers and two axiliary buds hidden behind. Lilacs bloom on wood grown the previous season, and the concealed axiliary buds will form the branches to carry the following year’s flowers.

Lilac colors are classified as white, lavender, lilac (including blue), violet, pink, magenta and purple. The simple flower form has the appeal of uncontrived naturalism, and no one has ever seen a lilac blossom that was anything but beautiful. The same could be said of the clustered coronet flowers of rhododendron, a shrub with generous bloom lasting for a similar period of time in spring, with diversity of species and a broad color pallet. Rhododendrons have their own admirers; but the large heads of colorful petals evince an entirely calmer appreciation. There is not the same devotional thrall, the quickening of excitement when lilac florets are bursting and lilac lovers are on the prowl through dells and laneways.

What distinguishes lilacs is the engagement they inspire between flowers and human emotion. Lilacs appeal to the classic dramas of romance and remembrance, of loss and mourning. And their ability to kindle these warm sentiments is achieved through one basic botanical characteristic – and that is their unique perfume.

Scent is a powerful motivator of human emotion. Catching a whiff of chlorine, the competitive swimmer immediately relives memories of achievement and defeat. The scent of briny spices might smell like 'home', making a similar connection to end-of-summer pickle making in distant kitchens. These connections are made so quickly, in a fraction of a second, that they seem more illusive than tangible. But of course there is a clever intelligence at work here between the petal and the brain.

The scent of lilac is strongest in mid-May when air temperature rises enough to vaporize molecules of volatile oils in the petals of flowers. Vaporization is the process of turning solid matter into a gas, and the perfect technique for communicating fragrance. When the scent of lilac wafts through a warming garden, a large amount of essential oil of lilac has been vaporized into gaseous form by the warmth of sunlight and carried on air currents to the ecstatic gardener. This may be the stuff that sentimental poetry is made from, but it is also the beginning of a highly sophisticated physical process.

The most basic gas is a suspension of vaporized molecules. The molecules of lilac fragrance are sucked into the nose and drawn deeply back toward a moist, pad-like receptor made from mucous membrane tissue. The receptor contains five million densely packed neurons, cells capable of receiving and interpreting scents. Under the awesome magnification of an electron microscope, the cells appear to sprout little dust-mop tassels with receptor-pockets. Molecules are dragged by air intake across the field of tassels and many are caught in the pockets, setting off triggers in the cells which fire up messages to the brain -- lilac!

Time lapsed between the first deep breath of lilac molecules and identification of the scent is a fraction of a second. The neuron message is received in the olfactory bulbs at the base of the brain and routed through the limbic system, a circle of nerves comprising the primitive brain and containing the amygdala (aggression and emotions), the hippocampus (short-term memory and learning); and the hypothalamus, which works with the pituitary gland to control food intake, endocrine levels, water balance, sexual rhythms and the automatic nervous system. The limbic system is named for its similarity to a limbus, the circumference or margin of a bivalve shell creature like a snail, and a diagram of the brain shows it circling round the outer circumference of deeper internal brain structures. When stimulated by sight, smell and memory, the three limbic components can initiate sexual desire, fear, anger and primitive forms of jealousy, all of which can be evoked by a vaporized cloud of lilac molecules settling over a gardener on a fine spring afternoon. Now, that puts quite a different face on the event.

Flower fragrance is suspended in a liquid volatile oil (from the Latin word volare, 'to fly'), and is made up of a compound of complex chemical elements manufactured within the plant. Volatile oils have the substance of water and evaporate quickly. White freesia (Freesia alba) and Spanish jasmine (Jasmine grandiflorum) have volatiles containing 10 chemical compounds. Highly scented roses like antique Rosa damascena 'Hebes Lip' (spicy scent) and the modern hybrid 'Double Delight' (citrus scent) contain from 3 to 10 chemicals. The East Indian lotus (Nelumbo nucifera) and Stephanotis floribunda, a favorite in bridal bouquets, both have volatiles composed of 6 chemical compounds. Some orchids produce up to 100 volatile compounds; and the scent of certain lavender species is composed of an amazing 180 individual chemicals. It seems the perceived intensity of scent isn't reliant on the numbers of chemicals in the mix, but on their individual characters and qualities. The sweet, candy-like scent associated with many garden flowers (such as primulas, violets, petunias and honeysuckle) is a homogeneous sweetness and without distinction from flower to flower. But catch a whiff of marigold or lilac, and you know right away what it is. The chemicals in lilac volatile are a selection of antiseptic alcohols and aldehydes exclusive to its genus, which explains the quick recognition of lilac molecules floating into the gardener's brain.

In the belief that there can never be too much of a good thing, perfumers have tried to extract floral volatiles for commercial purposes. Extraction is a very expensive business, accomplished by various methods: distillation using heat or steam; expression, in which the oils are pressed mechanically or by hand; gas extraction, involving nitrogen or carbon dixoide gas solvents and high pressure; or the new process of phytonics, using environmentally friendly solvents. Thirty thousand Rosa damascena blossoms are required to make 2 ounces (15 ml) of rose absolute (referred to as rose oil or attar), at a cost of thousands of dollars. And the scent is corruptible, beginning to change as soon as the flowers are cut from the plant. Despite all forms of conditioning and sustaining cut flowers with warm water soaks and anti-bacterial solutions, they begin to die as soon as they are removed from the stem. Consequently the floral scent in an expensive perfume will always vary from the original flower growing live in the garden.

However, chemists have persevered in developing synthetic substitutes for floral absolutes that are easily manufactured and readily available in large galvanized drums weighing 185 kgs. each. These manufactured floral scents are used in cosmetics and fancy soaps, health and personal hygiene products, and industrial cleaning agents of every imaginable kind. Even products sold as unscented contain manufactured floral essences.

The synthetic lilac fragrance is Terpineol, an essence with 10 atoms of carbon, 18 atoms of hydrogen, and 1 atom of oxygen, combining to make a fragrance of lilac that is fresh and clean smelling. It takes nothing away from Terpineol's refreshing lilac scent to know that it is also used as a solvent for ethyl cellulose, and as a plasticizer for epoxy resin. With minute chemical adjustment the pale yellow, sticky oil takes on a woodsy smell and can be used as pine or citrus fragrance in floor cleaners and air fresheners. Terpineol is combustible and reaches flash point in a closed cup at 90 degrees centigrade. In concentrate form it may act as an irritant, causing redness and pain. In the standard toxicity testing protocol, referred to as LD50 and meaning the lethal dose necessary to kill fifty percent of the test animals within a period of time (usually 24 hours), it has a low dermal or skin toxicity rating (tested on rabbits) and a significantly higher oral toxicity rating (tested on rats) if taken internally. Recommended personal protection equipment to minimize exposure when handling Terpineol concentrate includes goggles, lab coat, vent hood, rubber gloves and a class-B extinguisher.

The ability of a plant to produce floral scent is controlled at the genetic stages of development. If scientists could understand which genes and enzymes turn on the scent characteristic, they could put them to other purposes. Isolating and transferring the floral scent gene to insect pollinated agricultural crops like buckwheat would result in more attention from pollinators and a heavier yield of grain. Through genetic engineering of this sort it would also be possible to create floral novelties (some would say, monstrosities), such as a banana-scented rose. Plants like roses and cyclamen play a hide-and-seek game by turning the scent gene on and off, producing both scented and unscented flowers within the same specie group and frustrating the efforts of researchers to understand where the gene is located and how plants manipulate it.

Plants use floral scent for strategic purposes – to attract pollinators and repel pests, to communicate between cells and to send distress ‘signals’ to other plants. A floral scent attracts the healthy attentions of pollinators, but plants suffering from drought will emit a distress scent to warn their neighbors. Opportunistic insects like the bronze birch borer (Agrilus anxius) and the elm bark beetles (Hylurgopinus rufipes and Scolytus multistriatus), zero in on the distress scent of trees under environmental stress and quickly find their prey. Trees infected with disease can also produce a communicative distress scent to warn surrounding neighbors of potential infection.

Bees use a method called ‘blocking’, following only certain chemicals in the floral compound, and in this manner cut down on search time and the need to remember more complex scents. Bee memory has more to do with reflexive conditioning than the actual storage of imperical information. They ‘remember’ or respond to scents by processing them through a sensory input structure called the glomerulus, which categorizes floral scents as long-distance or short-distance. Linool is one of many long-distance volatile compounds that can be detected from almost a mile away, allowing bees and moths to follow the scent to closer range, and then pick additional scent indicators to direct them to specific flowers. Because many flowers rely on insect pollination to perpetuate the specie, they will accommodate themselves to the pollinator’s shape and timetable. Daily floral scent production in many flowers is highest between the hours bees are most likely to be flying (10 a.m. to 2 p.m.), and some construct their architecture to enhance the event. The rounded helmets of monkshood blossoms (Aconitum spp.) are perfectly molded to a furry bee’s shape, and snapdragon flowers cleverly emit their scent only from the upper and lower lobes of petals where bumblebees must trespass to reach the nectar.