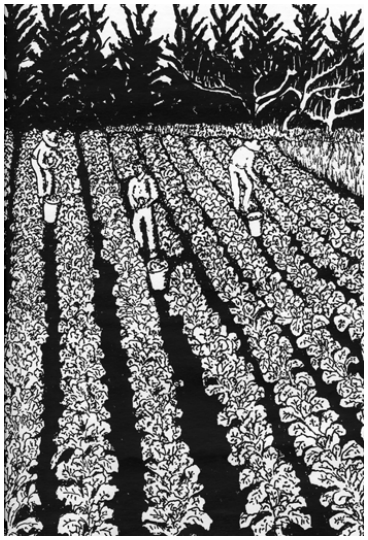

Forrest Cook

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For the Home Orchardist

Scion Basics

– Orin Martin

Note: This is the first in a series of article for the "home orchardist" or "backdoor fruit grower," the theme being: this is what the tree does, in terms of physiology and seasonality; and this is what you can do to the tree — how, when, and with what. This first article deals primarily with the scion.

The managed temperate zone, deciduous fruit tree is composed of two genetically distinct individuals fused together via budding or grafting. These two parts are the scion and the rootstock, collectively referred to as the "stion."

Principal fruit tree genera:
Malus – Apples
Pyrus – Pears
Prunus – Peaches, nectarines, prunes, plums, almonds, cherries, apricots, etc.
Cydonia – Quince

In thinking about scions and rootstocks, four operative questions need to be asked and answered (in a colloquial sense): 1. What is it? 2. Where does it come from? 3. What does it give you? 4. Where can I get it/them?

What Is It?

Defined as a family member or offspring, the scion refers to the fruit-bearing or top portion of the tree. Synonyms for the scion are *variety* or *cultivar* (short for cultivated variety). Thus the references would be: the *scion* Fuji apple; the *variety* Fuji; the *cultivar* 'Fuji.'

Where Does It Come From?

Fruit tree scions are generally of three origins: chance or volunteer seedlings; seedlings that result from conscious breeding programs; and chance mutations, often referred to in the trade as "bud sports." In truth, mutations can be from a bud, a branch, or a whole tree mutation.

While all scions are the result of seedlings via sexual propagation or chance mutations, once their characteristics and qualities have been acknowledged they are then cloned or reproduced asexually by budding or grafting. Thus clones are created and designated, e.g., the Fuji apple clone or the Bartlett pear clone. This ensures genetic (and performance) uniformity and reliability, and gives rise to the fruit tree industry. So, while there are literally millions of Fuji apple trees worldwide, there is really only one Fuji tree (genetically). This is good for reliable production, but perilous if disease or pest problems enter the clone, as there is little or no resistance due to a limited gene pool. The Irish potato famines of the 1840s are a graphic example of over reliance on a limited gene pool for a staple food crop.

Many excellent varieties of fruit occur as chance seedlings. One such volunteer is Hudson's Golden Gem apple, arguably the biggest and most sugary of the rough, dull-skinned, russeted types. In blind taste tests it is often mistaken for a pear. Hudson's Golden Gem is a "found seedling," discovered in a fencerow near Hudson's Wholesale Nursery in Tangent, Oregon (Willamette Valley, near Corvallis). It is thought to be an open-pollinated seedling of Golden Delicious.

Golden Delicious itself is probably a chance seedling cross from Grimes Golden and an old (1600s) European apple, Golden Reinette (reinette = French for russeted). It sprouted on a farm owned by Anderson Mullins of Clay County, West Virginia in the 1890s. In 1914 he sold the tree to Stark Brothers Nursery of Missouri. The Stark Brothers cloned it and named it Golden Delicious (resembling Red Delicious in shape but thankfully not in taste or genetics). It is one of my favorite apples, with a couple of caveats –

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– When allowed good "hang time" or fully ripened on the tree.

– When eaten dead ripe, fresh off the tree (it's a hand-to-mouth affair) and not out of cold storage. If picked prematurely it does not live up to its name, as it is green, not golden, and hardly delicious. At full maturity it's thin skinned, coarse fleshed (leading to a long taste sensation) and cloyingly sweet and juicy – wear a bib!

Golden Delicious has gone on to become the second leading commercial apple in the U.S. (after Red Delicious) and enjoys a loyal following in Central and Northern Europe.

As breeding stock, Golden Delicious breeds with almost any other apple, producing outstanding progeny: Jonagold, Elstar, Freyberg, Spigold, Corailor, Pinova, Rubinette, Arlet, Gala, Russet Beauty, …

Many scions come into being as a result of conscious breeding programs (often at University or Agricultural Experiment Stations). In the early 1900s the Japanese embarked on an ambitious apple breeding program. The first notable release was Mutsu (known as Crispin in Europe and the Eastern U.S.). A cross between Golden Delicious and Indo, Mutsu was raised in 1930 and named and released in 1948, but didn't achieve fame until the 1970s.

Mutsu exemplifies the tenets of Japanese apple breeding:

•Large fruit, often approaching 1 pound per apple, with Mustu, Sayaka, and Seiki-Ichi

• Supersweet, with a balancing percent of acidity

• Coarse fleshed

• High juice quotient

• And unlike the U.S., Japanese consumers are not hung up on an apple being all red—so generally, they're not

Further breeding releases from Japan include:

• Fuji: a cross between Rall's Janet (an old Virginian apple preferred by Thomas Jefferson) and Red Delicious (who would have imagined something worthwhile lurking in that gene pool?)

• Many varieties with Mutsu genes in their parentage – often referred to as "sisters of Mutsu," e.g., Kinsei, Sayaka, Tsugaru, Shizuka and Orin (a sweet but late-maturing Mutsu – a fact that my wife Stephanie doesn't dispute)

It is worth noting that breeding a fruit scion is a long and arduous process. It can take up to 30 years to breed and successfully introduce a new variety. This includes up to 10 years raising and discarding tens of thousands of seedling crosses as part of evaluative processes to assess tree vigor and performance, pest, disease resistance, fruit quality and storage capability, etc. Then up to 10 years of grower trials and grower acceptance. And finally, up to 10 years of consumer trials and acceptance. For example, the Fuji apple was bred in 1930 but not named and released to the public until 1962. A fruit tree breeder can spend his or her life in the profession and never have a successful introduction.

Scions also occur from chance mutations. Both Red and Golden Delicious as well as Fuji apples seem "susceptible" to mutations, resulting in more compact, earlier-maturing and more highly colored (in Fuji's case, redder) strains. There are also red strains of both D'Anjou and Bartlett pears.

Genetically modified fruit trees are possible (today), but breeders fear consumer resistance and the resultant political and public relations turmoil that would ensue.

What Does It Give You?

The scion determines the fruit variety and its characteristics: flavor, aroma, texture (coarse, crisp, or melting flesh), ability to keep (both on and off the tree), uses (fresh, juice, cooking), season of ripening, and disease and pest resistance or susceptibility.

The scion also genetically determines tree growth habits and is a secondary contributor to tree size or height. Rootstock (more on this in the next issue) is the principal genetic determinant of tree height. Obviously, horticultural practices also contribute to tree vigor.

The scion influences tree growth habits such as: upright, spreading, weak or strong growth, lateral bearer of fruit, stem bearer, strong or brittle wood. Scion also determines flowering and fruit patterns: light (Spigold, Holstein apples), heavy (Gala), annual (Golden Delicious), or biennial (Spigold, Yellow Newtown Pippin, Hudson's Golden Gem).

More specifically, several independent genetic scion characteristics influence the size and shape of a tree. These characteristics can act independently or in combination –

Internode length (rate of vigor): Some scions, most notably compact or spur strains of apples Granny Smith, Golden Delicious, McIntosh, Fuji, and Redhaven peach, have shorter internode distances (at maturity), resulting in a shorter tree.

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A sample of russeted and Golden Delicious-type apples grown at the Chadwick Garden and UCSC Farm, available for tasting at this year's Harvest Festival.

SCION BASICS – FROM PAGE 2

Wide angle branching (>60–90°): This trait creates a tree that is wider than it is tall. The wide branch angle (crotch) also contributes hormonally to earlier and heavier fruit production. As fruit is an extreme nutrient sink (i.e., requires significant energy to produce), this further restricts tree height. The ideal branch angle for balanced vegetative:fruit ratio is 45–60°. Wider (up to 80–90°) branch angles are mechanically stronger than either narrow or very wide angles. Conventionally, some growers and nurseries apply cytokinin-type growth regulators to buds to induce wide-angled branching. In the world of organics this would be considered cheating.

In *basitonic* (basi=low or wide) scions, wide-angle branching is extremely predominant, especially at the base of the tree. This genetic trait dictates a vigorous rootstock to impart more height or vigor, and greater spacing between rows (within the row as well as row to row).

Examples of wide-branching scions include: apples Fiesta, Cox's Orange Pippin, Belle de Booskop; many prune plums; and Starfire peach.

Conversely, scions with *narrow angled* (<45°) branches tend to be lower in indoleacetic acid (IAA), which control apical dominance. Thus all branches tend to grow upright and be tall.

Acrotonic (acro=height) trees combine a high rate of vigor with narrow branch angles. They often have an upright, candelabra- or menorah-like growth pattern. Such trees are candidates for dwarfing rootstocks to control their height, and best trained to an open center form. Examples of acrotonic scions include: Granny Smith, Pink Lady, Chehalis, Elstar, and Ginger Gold (apples), along with almost all cherries and pears, Japanese plums and pluots.

Examples of the effect of scion vigor on overall tree size:

Cox's Orange Pippin (weak scion)

Rootstock	*Tree Height*
M111	10–12′
M7	6–8′
M27	4–6′

Mutsu Apple (a very strong scion)

Rootstock	*Tree Height*
M111	18–20′
M7	10–12′
M27	6–8′

Unfortunately, there are no reliable compendia of information describing scion characteristics. Ferreting out such important information involves trial and error; reading between the lines in fruit tree catalogues (e.g., "Galas have long, arching branches" = vigor!); and chatting up your local orchardist or hobbyist fruit grower.

Where Can I Get Some of the Scions Discussed Here?

Small-Scale Tree Nurseries (for the home gardener)

Raintree Nursery
www.raintreenursery.com
360.496-6400

Sandy Bar Nursery
www.sandybarnursery.com
530.627-3379

Trees of Antiquity
www.treesofantiquity.com
805.467-9909

Santa Cruz-area nurseries such as ProBuild (Lumbermens/San Lorenzo) on River Street and The Garden Co. on Mission Street feature high quality Dave Wilson Nursery trees, although the scion/rootstock choices are somewhat limited.

Large-Scale Nurseries (these will generally sell you a few or even just one tree)

C and O Nursery
www.c-onursery.com
800.232-2636

Columbia Basin Nursery
www.cbnllc.com
800.333-8589

Dave Wilson Nursery
www.davewilson.com
(web site offers tips on backyard fruit production)
800.654-5854

Van Well Nursery
www.vanwell.net
800.572-1553

PLANTING CALIFORNIA NATIVES – FROM PAGE 5

ing. Mulch to protect the soil, but be careful not to build compost up against the plant's stem or trunk, as natives need a good "swing" between wet and dry conditions.

This article has touched on just a few of the myriad California natives that can be incorporated into the landscape. In future issues of the *News & Notes* we'll discuss other favorites, including the native Salvias as well as some of the edible natives.

For more information on selecting, planting and caring for California native plants, contact your local chapter of the California Native Plant Society (www.cnps.org). Many local nurseries stock natives, including Sierra Azul Nursery and Gardens, Elkhorn Native Plant Nursery, Native Revival Nursery, The Garden Company, ProBuild (formerly San Lorenzo Garden Center), and others.