



## International Research News

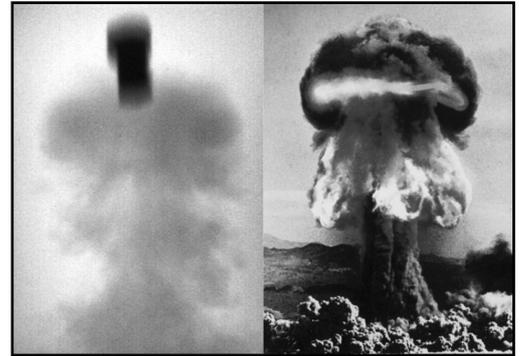
### Beaujolais is the best for superconductivity

Last year, a group of Japanese physicists announced that they could induce superconductivity in iron telluride by soaking it in red wine (*Winetech Scan* March 2011). Other alcoholic drinks such as white wine, beer and sake also worked, but red wine was by far the best. Now further investigation has found that, of gamay, pinot noir, merlot, cabernet sauvignon and sangiovese red wines, the gamay (a 2009 Beaujolais) was the best. As the Beaujolais had the highest tartaric acid concentration, they believe tartaric acid is one of the key factors to induce superconductivity. However, using a mixture of water and tartaric acid performed better than water alone, but not as well as the Beaujolais. So while tartaric acid is part of the answer, there must be another component of red wine that encourages the transition to a superconducting state. <http://arxiv.org/abs/1203.4503>

### The physics of champagne

A fascinating and detailed study of the physics of champagne has been carried out. The role of carbon dioxide (CO<sub>2</sub>) was followed, from its ingestion into the liquid phase during the fermentation process, to its progressive release in the headspace above a glass as bubbles collapse. Impacts of various physicochemical and geometrical parameters of the wine, bottle, and the glass itself, in tasting conditions, are presented. Physicochemical processes behind the nucleation, rise, and burst of gaseous CO<sub>2</sub> bubbles found in glasses poured with champagne and sparkling wines are analysed. Those phenomena were observed close-up through high-speed visual and infra-red photography and are often visually appealing and informative.

As an example, the burst of CO<sub>2</sub> from a bottle of champagne when it is opened resembles the explosion of an atomic bomb (right). Of the energy available from gas pressure when the cork is 'popped', only 5% goes into propelling the cork and most of it is dissipated in the form of a sound shock wave (the characteristic 'bang'). Another example is the scientific examination of the merits of different ways of pouring champagne into the glass, such as directly, or letting it run gently down the side of the glass so as to minimise bubbling. [www.springerlink.com/content/h4p453p524t2010x/](http://www.springerlink.com/content/h4p453p524t2010x/)



### Plant roots CAT scanned in situ

X-ray microcomputed tomography is an invaluable tool for visualizing plant root systems within their natural soil environment noninvasively. However, variations in the x-ray attenuation values of root material and the overlap in attenuation values between roots and soil caused by water and organic materials make it difficult to clearly distinguish between the roots and surrounding soil and organic matter. Now scientists at the Centre for Plant Integrative Biology (CPiB) at the University of Nottingham in the UK have developed imaging software called RooTrak to analyse the scans and display the roots as a distinct three-dimensional structure. Previous approaches have employed significant levels of user interaction and/or fixed criteria to distinguish root and non-root material.

RooTrak requires minimal user interaction and is able to adapt to changing root density estimates. As well as providing clearer imaging, the method is fast and non-invasive because roots can be analysed without having to be removed from the surrounding soil. Researchers have welcomed the new technique as it will open enormous possibilities for understanding the interaction between trees and annual crops at the level of their root systems, particularly under conditions of drought and root competition between species. The technology could help researchers to select plants with favourable root architecture, shape, depth and size that could thrive in adverse conditions. [www.plantphysiol.org/content/158/2/561](http://www.plantphysiol.org/content/158/2/561)

### Wine experts taste differently

A study which examined relationships between taste phenotype (traits which are manifested due to the combined action of inherited genes and environmental circumstances) and food and beverage adventurousness has found that a wine expert's acute sense of taste may mean that expert ratings and recommendations are irrelevant to wine consumers who were not born with the ability to discern small differences over a broad range of tastes. In a taste test, wine experts showed more sensitivity to tastes than average wine consumers. 330 participants at wine-tasting events sampled an odourless chemical, propylthiouracil, that is used to measure a person's reaction to bitter tastes. People with acute tasting ability find the chemical extremely bitter, while people with normal tasting abilities say it has a slightly bitter taste or is tasteless. Prior to the taste test the participants had been divided into wine consumers and wine experts on the basis of responses to a questionnaire.

Statistically, the two groups were very different in how they tasted the bitter compound. The researchers also found that people who were more adventurous in trying new foods were also more willing to drink new types of wines and alcoholic beverages;

but this food adventurousness did not necessarily predict wine expertise. While wine experts were more likely to try new wines and alcoholic beverages, they were not more likely to try new foods. Assessment of wine quality is dependent on both experience (and resulting expectancies) and liking, which is associated with taste responsiveness; both of these appear to vary significantly between wine authority figures and wine consumers. <http://dx.doi.org/10.5344/ajev.2011.11050>

### The effect of red wine on atherosclerosis

Atherosclerosis is a condition in which an artery wall thickens as a result of the accumulation of fatty materials such as cholesterol. The main cause of atherosclerosis is yet unknown, but is hypothesized to be initiated by inflammatory processes in the vessel wall in response to retained low-density lipoprotein (LDL) molecules and the accumulation of macrophage white blood cells. As few clinical studies have focused on the alcohol-independent cardiovascular effects of the phenolic compounds of red wine (RW), a study was carried out to evaluate the effects of ethanol and phenolic compounds of RW on the expression of inflammatory biomarkers related to atherosclerosis in subjects at high risk of cardiovascular disease. Sixty-seven high-risk, male volunteers, of whom about half were taking ACE inhibitors, statins, aspirin, and/or oral hypoglycaemic drugs (a real world situation), participated in a randomized, crossover consumption trial.

After a washout period, all subjects received RW (30 g alcohol/day), or the equivalent amount of de-alcoholised red wine with the same polyphenol content as the RW, or gin (30 g alcohol/d), each for a 4 week intervention period. Before and after each intervention period, 7 cellular and 18 serum inflammatory biomarkers were evaluated. The results suggested that the phenolic content of RW may modulate leukocyte adhesion molecules, whereas both ethanol and polyphenols of RW may modulate soluble inflammatory mediators in high-risk patients. These positive changes in the inflammatory profile in high-cardiovascular risk patients could contribute to the benefits of moderate wine consumption against both the early stages and the progression of atherosclerosis. <http://dx.doi.org/10.3945/ajcn.111.022889>

### Cosorption of Sulphur Dioxide and Water on Cork

Although cork has been used as stopper material for several centuries, interactions of sulphur dioxide (SO<sub>2</sub>) and water (H<sub>2</sub>O) with cork are not yet fully understood. Oxidation reactions can occur randomly in wine during bottle aging, so SO<sub>2</sub> is generally added before bottling as an antioxidant. However, it has been shown that SO<sub>2</sub> concentration can abnormally decrease after a few months of storage and thus wine is less protected against oxidation. It is not known whether this decrease results from the sorption of SO<sub>2</sub> on cork or from the diffusion of SO<sub>2</sub> through cork. Moreover, in real conditions of wine storage, whether bottles are kept vertically or horizontally, cork is highly hydrated. Thus the question arises whether the hydration favours the sorption and reactivity of cork with other molecules, such as SO<sub>2</sub>.

The cosorption of gaseous SO<sub>2</sub> and water vapour on raw cork powder using calorimetry coupled with manometry was studied. Previous results obtained by thermogravimetry, that SO<sub>2</sub> is well chemisorbed on cork surface while H<sub>2</sub>O is only physisorbed, were confirmed. Chemisorption of SO<sub>2</sub> occurs first, and after all chemisorption sites are saturated with SO<sub>2</sub>, the cosorption process becomes selective for H<sub>2</sub>O. The amount of SO<sub>2</sub> sorbed on cork is rather low compared to H<sub>2</sub>O. So sorption of SO<sub>2</sub> on cork cannot explain the decrease in SO<sub>2</sub> content observed during wine aging.

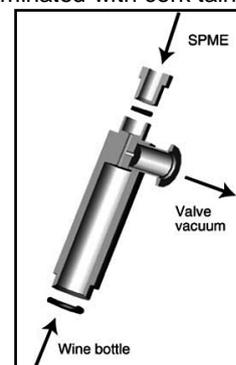
In some cases, the sharp decrease in SO<sub>2</sub> concentration in wine during the first months of storage can be attributed to the presence of oxygen in the bottle headspace at bottling and its subsequent dissolution in wine and reaction with SO<sub>2</sub>. It can also be due to the release of oxygen initially present in the closure. The more gradual loss of SO<sub>2</sub> observed in subsequent months in those studies can unambiguously be attributed to mass transfer mechanisms of oxygen or SO<sub>2</sub> through the closure. According to the chemical potential gradient of these diffusing molecules, oxygen can diffuse from the outside to the inside of the bottle, while SO<sub>2</sub> diffusion will occur in the opposite direction. <http://dx.doi.org/10.5344/ajev.2011.11058>

## Other News

### Non-invasive Identification of Tainted Corks in Full Intact Wine Bottles

Spoilage in bottled wine translates into a \$10 billion global loss, with about 2.5% to 5% of bottles contaminated with cork taint 2,4,6-Trichloroanisole (TCA). The design and operation of a wine bottle screening device that non-invasively and non-destructively determines the presence of TCA in bottle-mounted corks is described.

A stainless-steel sampling wand (right) provides a reduced pressure environment around a wine bottle neck that is used to moderately reduce the pressure above the bottle-mounted cork. The lower pressure increases the TCA mobility and decreases the rate of TCA re-adsorption back onto the cork surface. A commercially available solid-phase microextraction (SPME) fibre is mounted inside the wand to collect and pre-concentrate TCA before gas chromatography–mass spectrometry (GC–MS) detection. The 15 minute SPME sampling time used to study full intact bottles is not enough to cause any measureable pressure reduction inside compression-mounted cork sealed bottles. The method can detect the presence of TCA in bottle-mounted corks to 11 ± 2 ng, about an order of magnitude less than the amount of TCA reported for corks removed from cork-tainted wine bottles. This suggests that reduced-pressure full-bottle screening is a viable qualitative method for identifying bottle-mounted TCA tainted corks without violating the bottle or harming the bottle seal and label. <http://dx.doi.org/10.5344/ajev.2011.10106>



Winetech Scan is available on the Winetech website [www.winetech.co.za](http://www.winetech.co.za)

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