Fax From Japan

by Brian Crowley

"Two spring chicken yakitoris and a sake please," I place my order. The waiter, with a stark red bandana stretched across his forehead, steadies the beer crate and the slab of wood that serves as a table, and gestures for me to sit down. This lively part of Tokyo, located in the tunnels under the Shimbashi JR railway station, contains many such makeshift food stalls, called "yatai". It was on my way to dinner on this Friday night that I once again noted the active and positive consuming by the Tokyo natives, as they throw themselves into their buying with Japanese gusto. Unlike Australians, who " have to" or "need to" buy a certain item, the Japanese are noticeably delighted to be spending money. Walking through the Ginza was spectacular. Entering Mitsukoshi, one of the large Ginza Department Stores, Christmas shopping was in full swing. There was a queue of 20 or so people waiting to sample and buy Belgian chocolate cake, while the tempura eating-house queues were merging with the sushi eating-house lines. It was ordered chaos. The hustle and bustle was enormous, as the sound of Christmas carols mixed with the noise of escalator safety-instructions.

Further along, towards Shimbashi Station, the four storey "Toy World" was bulging with shoppers. The world's smallest Polaroid camera was a big hit with this year's Japanese kids, along with framed holograms. '"Yakitori, Brian-san", and my dinner was arriving. Delicious spring chicken, hot, juicy, flavourful and washed down with a superb tasting sake. Ah the Japanese do it all so well! By now, commuters are pouring out of the tunnels from the railway station, and many are stopping at the yatai food stalls. Large, weighted plastic sheets are being pulled down to produce temporary walls to protect the customers from the Tokyo late-autumn temperatures. I am pleased to be working in Tokyo, and delighted to be one of the many addicted shoppers. While the big Japanese banks and institutions are reported to be in dire straits in this Japanese recession, the people in the street don't seem to be affected. If this is a late-autumn economic depression, I'm certainly looking forward to Tokyo in mid-summer boom times.

NEXT ISSUE

FOOD... Sensory applications grow

RECEPTORS... Recent advances

NEWS... From AChemS Florida and around the world

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ChemoSense is produced and published quarterly by the Centre for ChemoSensory Research, University of New South Wales, Australian Technology Park, Sydney, Australia 1430

Production: This issue was written and edited by Karyn Weitzner, Graham Bell, Donald Barnett and Brian Crowley. **Design and layout:** Lawton Design **Photographs:** Graham Bell and Karyn Weitzner

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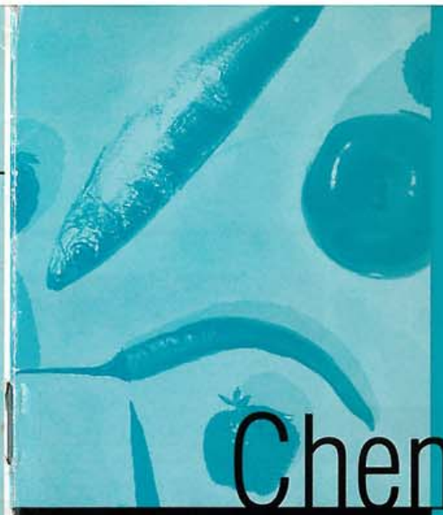

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ChemoSense

SENSORY EVALUATION AND THE WINE INDUSTRY

by Ann C. Noble of UC Davis

Wine is often cloaked with mystique and described by emotional expressions, such as "elegant" or "harmonious". Until the method of descriptive analysis (DA) was developed, most wine evaluations were performed using "quality scorecards". Although the wine scorecards, like milk or cheese grading sheets, purported to be objective evaluations, the scores were assigned based on preference.

In contrast to the hedonic quality scorecards, the technique of DA provides quantitative, analytical information about wine flavour. To facilitate this evaluation, the wine aroma wheel (Fig. 1, page 4) was developed. The wheel provides a starting terminology for both informal consumer evaluations of wine, and formal research studies. The words on the wheel are typical of those used in descriptive analyses: they are analytical and usually can be defined by aroma reference standards. A few drops of vanilla extract, a slice of bell pepper (capsicum), or a few teaspoons of the brine from canned asparagus or canned

cont. pg 4

Fats – Demystifying the Demons

by Karyn Weitzner

From thick dollops of fresh cream to a succulent roast dinner, most people associate fat with great taste and a satisfying meal, if not with a healthy lifestyle. We obviously need some fat in our diet, but how much is too much? More intriguingly, why does fat have such a hold on our taste buds?

At the Centre for ChemoSensory Research (CCR), PhD student Hae-Jin Song is researching the sensory properties of dietary fats...

Functional fats

While excessive fat intake contributes to obesity, heart disease, diabetes and certain types of cancer, there is a definite place for fats in a healthy diet. Body fat exists as a concentrated source of energy ready for utilisation, as well as to provide strategic padding for vital organs. Dietary fats carry several essential fat-soluble vitamins, and provide us with fatty acids for the manufacture of membranes and hormones.

"The recommended intake for fat is no more than 30% of dietary energy, with no more than a third of this from saturated fats," according to nutritionist Dr Katrine Baghurst, of CSIRO Human Nutrition. "Australians consume an average of 32% fat, according to a recent survey by the Commonwealth Department of Health and Aged Care, and 13% of those fats are saturated."

Armed with this knowledge, why can't we all follow the same low fat diet and improve our collective health?

High fat foods tend to dominate low fat foods in popularity. "Taste is still the dominant factor in repeat buying, so if reduction in fat markedly affects taste, you may need

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CONTENTS

Centre for ChemoSensory Research
The University of New South Wales

FATS

to consider other ways of replacing the perceived flavour", says Dr Baghurst.

Until recently, it was generally accepted amongst the experts that fat is sensed via textural cues and associated flavour alone, rather than by a chemosensory mechanism of its own. The crispness of potato chips, and the oily coating they leave in your mouth; the smoothness of whipped cream, and the cooling effect it has on your tongue; the moistness of chocolate cake; all of these textural features are due to fat content.

Fat and flavour

Fat replacers, (usually mixtures of starch, protein and water), or "fake" fats that are not digested by the body, have been designed and used by food manufacturers to mimic the textural properties and mouthfeel of fats. These low-fat or no-fat foods have had only mixed success, as fat substitutes have generally failed to deliver the same richness of flavour that the real stuff does.

Fat appears to enhance flavour by its interaction with other components in food. It may carry flavour molecules and deliver them to taste receptors, and it may mask or temper the strength of unpleasant flavours. The division of fat-soluble and water-soluble flavour compounds into separate phases dictates the flavour profile of a food, and the slow release of flavours from the lipid phase gives a food its after-taste.

With all of these functions to take into consideration, it's not surprising that the task of lowering fat content, or replacing fats in food is such a difficult one to do well. For this
reason, concentrating on textural cues for fat is probably simply not enough.

Evidence for fat receptors

"Some recent evidence suggests that receptors for fats/fatty acids are present on the taste cells of the tongue, and that they convey information about fats to the brain in a similar way to receptors for sweet, sour, bitter or salty tastes," says Hae-Jin Song of the CCR, "Dr Tim Gilbertson of Louisiana State University recently showed that a certain type of potassium ion channel, present in mammalian taste receptor cells (TRCs), was inhibited by the presence of cis-polyunsaturated fatty acids (cis-PUFAs) thereby providing a mechanism by which the cell could register the presence of the fat, and signal it to the brain."

"Knowing that fats act by interaction with receptors allows us to study fats via human sensory perception, with appropriately devised experimental strategies," says Professor Graham Bell of the CCR.

Working with rats that had a tendency to moderate their fat intake when placed on a high-fat diet, Gilbertson also discovered that the TRCs of this breed showed the greatest sensitivity to PUFAs. This may be evidence that sensitivity to dietary fats is due to the expression of a gene.

The future

The Public Health Association of Australia comments that "sustainable" dietary changes are necessary to improve health. Hae-Jin Song hopes that her research will aid consumers in the struggle to change their eating habits, "This could lead to an understanding of why some people have a greater preference for high fat foods than others, and it may also assist in the development of more palatable low-fat foods. Better food and health will be the product," she said.

"Food and health authorities should be tracking and supporting this line of research. I am thrilled to be part of this new approach to the chemosensory properties of fats."

Further Reading

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Hatchwell, L.C. (1994) Overcoming flavour challenges in low-fat frozen desserts. Food Tech., Feb., 98-102.

Feeling peckish after leaving for the day from her A$80 000 p.a. secretarial job, and battling the crowds for an hour on the Tokyo subway, Ms Keiko Nagata, 32, comes home to her small apartment and opens her small fridge.

In it there is a healthy 100 g of beef ($12), a 250 g packet of pre-cut vegetables ($8), a serve of smoked salmon ($10), 50 g of mullet eggs ($15), 500 mL of orange juice ($5), a small tub of cream cheese ($5), a packet of crackers ($5), 250 g of pasta ($8), a small pastry ($4), a small cheese cake ($10), a 250 mL tub of vanilla icecream ($6) and a Fuji apple ($5).

The items tantalise her eyes and her appetite. They are all delicious and tailored for a Japanese consumer like Keiko. And in the appropriate accent, they all say "G'day mate!" They're all Australian products.

In 1999 this doesn't sound too weird, does it? But in 1989, this would have been pure fantasy.

In this decade Australia is exporting food, and other goods and services, to Asia in unprecedented quantities. In Japan, the change began with its surge in buying power in the 70s, followed by the lifting of most of its trade and tariff barriers in the 90s. Consequently, Australia (and other countries) made moves to market their products into Japan, supported by a platform of investment, strategic planning and research in both the private and public sectors.

Asia remains of vital importance to the Australian economy. In October 1998, even after the crashes of Asian economies in the south-east and north, Asia accounted for over 50% of all our export income, with Europe and the USA,

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Asia: what have we learned?

A personal perspective by Graham Bell

"'Ow much?! Tell' im 'e's dreamin' !" from "The Castle," an Australian movie.

combined, accounting for approximately one quarter (Australian Bureau of Statistics).

Austrade is more active than ever in its mission to sustain and grow this trade, and it currently (Jan '99) advises Australian exporters to:

- maintain their presence in Asian markets, but monitor risks carefully
- consolidate business relationships and contacts
- monitor information from each country — don't generalise
- look for new opportunities that emerge.

(see http://www.austrade.gov.au/asianupdate/index.asp?)

So, what have we learned in the past ten years?

1. Asian markets can be penetrated, and are a rich source of export income.
2. Business relationships need to be established and nurtured with care.
3. Consumers in Asia can be understood and serviced.
4. Research pays. Do the "homework" first.
5. Asia is a source of new ideas for export back to Western markets.

What can we learn from Asia in the next decade?

For an example of the last point, consider the food ingredients which confer health-benefits, called functional foods, which originated in Japan in the late 80s. The concept was initially ignored elsewhere, but now it is being heavily invested in, in a global game of "catch-up" (see Aug./Sept. '98 special issue of Trends in Food Sci. & Technol., Elsevier). The idea of functional foods is a spin-off of the importance given to the relationship between health and food in many Asian cultures.

There may be other benefits to be returned to us from Asia. The West no longer has a monopoly on creativity and initiative. Asian scientific research may become a well-spring of knowledge that will astound the world. The Asian diet and associated cultural habits might hold the key to reduced heart disease, cancers and degenerative disorders.

For Australia specifically, doing business in Asia may be our key to globalised business. Disciplines learned in Japan will enhance our performance in other countries, such as the USA.

Australia will continue to increase its trade with Asia, and continue to be seen as, and benefit from being, a stable influence and platform from which to work with, and in, Asia.

SENSORY EVALUATION AND THE WINE INDUSTRY continued

pineapple in a neutral (low-aroma) wine creates reference standards for vanilla, bell pepper, asparagus and pineapple respectively.

Using concrete, specific terms such as these, DA can be used to profile flavours of wines made with different viticultural or enological variables, or varietal wines made from different locations. Judges are trained to rate intensities of specific aroma notes (defined by the aroma standards during training). For example, to quantitatively describe the effects of elevated temperatures during wine transport or storage, heated Chardonnay wines and an unheated control wine were profiled by DA (Fig. 2). Heating the wine for 30 days resulted in a dramatic reduction in the fruity characters, and produced a corresponding increase in terms such as tea/tobacco and honey, which are associated with aging or with oxidised wines (de la Presa Owens and Noble, 1997).

Another important aspect of wine flavour is that of taste and mouthfeel of red wines. Sensations of bitterness and astringency are very persistent, and require the use of temporal methods to characterise them fully. Time-intensity (TI) methods by which subjects continually rate intensity from ingestion, until the sensation is no longer perceived, have been used to profile wines made with varying lengths of skin contact prior to pressing, or from grapes varying in maturity.

The sensation of astringency also exhibits the phenomenon of "carryover". The second sip of a wine is more astringent than the first! Thus to measure the perception of astringency during normal consumption of a red wine, a multiple sipping paradigm must be

"Judges are trained to rate intensities of specific aroma notes (defined by the aroma standards during training)."

used. The average astringency of a Pinot noir wine and a Merlot wine are shown in Figure 3. Both show a progressive increase in astringency with subsequent sips. Research is needed to relate these data to the overall perception of astringency that a consumer registers.

When making overall preference judgements, consumers, like experts, have a wide range of responses. Consumer preference is a function of individual expectations, previous experience with a wide variety of wines, innate likes and dislikes and sensitivity to aroma and taste compounds. However, using preference mapping techniques, the quantitative profiles of wine flavours can be mapped to consumer preference ratings. The demographics of consumers who prefer the intense vanilla, clove, spicy flavours of Chardonnay wines which were aged in oak barrels, versus those who prefer fruitier unoaked Chardonnays, can then be determined, and the wines marketed accordingly.

Although sensory evaluation is an important and vital part of winemaking and quality control, wine flavour is not the only factor which influences acceptance or purchase. Factors such as image, reputation, label, price, celebrity endorsement, and wine show scores also drive consumer acceptance. Conjoint analysis of consumer response patterns to these variables permits identification of the combination of variables that create an optimal product for target consumers.

Sensory analysis is an analytical method which can be used to monitor wine flavour as well as to evaluate the effect of specific treatments, or variables, on wine flavour. However, it is more than a static method for "measuring flavour", it is a valuable tool which can be used to make flavour and marketing recommendations, to optimize consumer acceptance and influence purchasing behavior.

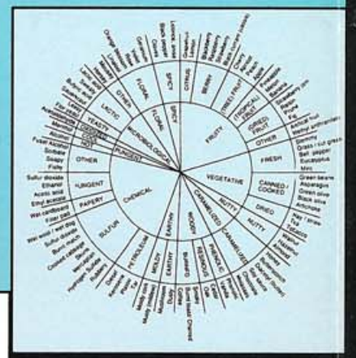

Figure 1 The Wine Aroma Wheel. Copyright A.C. Noble 1990. (Coloured, laminated plastic copies may be obtained from A.C.Noble. All profits support wine sensory research.)

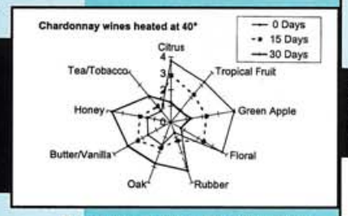

Figure 2 Mean intensity ratings of Chardonnay wines heated for 0, 15 and 30 days at 40°C. At the origin, intensity = 0, at the perimeter the intensity = 4. Mean ratings are connected to provide a profile for each wine. (n=20Jx3reps) (de la Presa Owens and Noble, 1997).

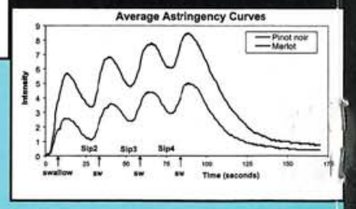

Figure 3 Average Astringency Time-Intensity Curves for 4 sips at 25 second intervals (n=15Jx2R). (Le Drean and Noble, 1998 in preparation).

A.C.Noble, Dept. Viticulture and Enology, University of California, Davis, CA 95616,USA. E-Mail: acnoble@ucdavis.edu Fax: 530- 752 0382

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Sniffers: Replacing the Nose that Knows

by Donald Barnett

Great scope exists for the application of knowledge gained from the chemical and olfactory sensory sciences to many areas of the food industry. One such area is the replacement of the "fickle human nose" with more objective electronic sensors.

Odour is a major contributor to the overall acceptance of foods, and in many cases is a convenient, non-destructive testing indicator for food quality. We are all aware of the exquisite sensitivity and selectivity of the human nose. However, noses are limited in many ways:

- Many substances of interest are not detected by the nose, or are toxic.
- The nose can become saturated and unresponsive, and is generally unsatisfactory for quantification of odours.
- Nose owners are a variable lot and subject to the effects of bias, age, sex and genetics. They may become bored, distracted, tired and can be irritated by some smells.

Traditionally, the food industry has used very few sensing devices and these have mostly been limited to the measurement of temperature, pressure and perhaps pH. Increasing attention to process efficiency, quality control and effective use of material and equipment means that the older food-processing methods are being increasingly replaced by methods that require automatic or robotic operation.

On-line sensors for food-processing

A promising development in this area is that of on-line sensing, using discrete sensors specific for particular substances of interest, or electronic noses with an array of semi-specific sensors that may detect subtle changes in complex odours.

These sensor devices offer the food and packaging industries the possibility of rapid chemical analysis for the improvement of production efficiency and quality control, by detecting and quantifying desirable or unwanted volatile compounds, or by classifying complex volatile mixtures during both processing and storage. Current analytical methods such as gas chromatography and mass spectrometry are unable to satisfy the requirement for rapid, simple operation, which is demanded in the factory situation. Sensor devices can offer competitive advantages to food manufacturers by reducing overall costs, and improving product quality in areas such as on-line process control, new material rejection, control of storage conditions, detection of safety problems, taints, and matching products to specification.

Developing better sensing devices

Presently, few discrete sensors or commercially produced electronic noses are adapted to on-line monitoring or process control. Electronic noses suffer from humidity effects, require temperature compensation and need careful control of sampling conditions. Some sensors have saturation problems and show slow recovery to baseline conditions. Their sensitivity and speed of operation also leaves much to be desired. Additionally, demonstrated software and data analysis techniques of the commercial electronic nose systems are generally unsuitable for feedback or alarm situations.

The CCR and its collaborators have a number of approaches to solve these problems and are being supported by various sponsors, particularly the CRC for International Food Manufacture and Packaging Science (CRC IFMPS). However, we are looking for further applications and sponsorships in this area. Perhaps you have a special problem and are interested in our help?

news from the CCR

Centre for ChemoSensory Research

ASIAN RESEARCH CONTINUES TO HOT UP

In late 1998 the Centre for ChemoSensory Research visited Singapore and Japan, and early this year we were in Indonesia and Hong Kong continuing our research into these burgeoning markets.

Various locations are under consideration for May/June, so if your company has a preferred country in mind, contact Marilyn Styles ASAP. Contact details are on page 8 of this issue.

NEW STUDENTS JOIN CENTRE

Four new fourth-year students will be starting projects with the centre in 1999. One student (Amy Leung) has already contributed to our research in Hong Kong this year. The other students are Fiona Manchip, Sie Boon Gooi and Shu Jun Tong. They will be working on human sensory (food-oriented) projects.

SENSORY BOOK IS ON ITS WAY!

The CCR is producing a book of collected papers based on the Food and Packaging CRC's Sensory Symposium (held in November 1996) "Sensory Science - Meeting Industry Needs".

The book, tentatively titled "New Horizons in Sensory Science for Industry", will be a collection of original reviews by world leaders in the field. It aims to provide an overview of chemosensory science, and its applications and future directions in industry.

The expected date of release is mid-1999. To reserve your copy, contact the CCR.

NEW POST-DOC JOINS CCR

The Centre for ChemoSensory Research welcomes Dr Jane Paton, on sabbatical from the Department of Food Science at UNSW. Dr Paton will spend most of 1999 in the Centre, working on a range of sensory projects.

Dr Paton completed a PhD on The Storage and Metabolism of Sweet Potatoes, and her research interests thus far have been in the maintenance of quality in fruit and vegetables. Dr Paton manages the Food Technology laboratory at UNSW, and is part of the Food Microbiology and Biocontrol Programs within the CRC for Food Innovation.

SEMINAR ANNOUNCEMENT

On March 19th at the CCR, Dr Gert Stange, from the Research School of Biological Sciences at Australian National University will present a seminar entitled, "Discoveries From an Insect's Nose". A discussion of how the insect sense of smell provides hints for the design of an electronic nose and prospects for controlling insect pests.

For details contact Marilyn Styles Ph: (02) 9209 4086 email: M.Styles@unsw.edu.au

SENSORY ANALYSIS SURVEY

Recently, "foodonline.com" reported that a survey of 500 American food and beverage companies found that most respondents had increased their use of sensory analysis in the last five years, and that they planned to continue to do so.

To identify trends in the use of sensory analysis in Australia, the Centre for ChemoSensory Research is conducting its own short survey. The results of the survey will be published in the next issue of "ChemoSense".

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ANNOUNCEMENTS

Upcoming International Events

AChemS XXI will be held at the Hyatt Sarasota in Sarasota, Florida on April 14–18, 1999.

Visit the AChemS website at: http://www.neuro.fsu.edu/achems

A minisymposium on the "Short term impact of environmental chemicals" will be presented during the meeting, on Saturday April 17 from 10 am to noon. This will foster academic-industry interchanges on the sensory impact of odours and irritants.

For details contact Wayne Silver: silver@wfu.edu or Jim Walker: walkerj@rjrt.com

The first ISA (International Sweeteners Association)/IUFost (International Union of Food Science and Technology) sponsored World Conference on Low-Calorie Sweeteners will be held in Barcelona, Spain from April 25–28, 1999. Visit the website at: http://www.isabru.org

The 1999 annual meeting of the Society for the Study of Ingestive Behavior will be held from July 7–11 at Clearwater Beach, Florida. Visit the meeting website at: http://www.ssib.org/SSIB1999.html

Lancet wins Olfactory Prize

Dr Doran Lancet of the Weizmann Institute of Science in Rehovot, Israel, was the 1998 winner of the Frank Allison Linville's R.H. Wright Award in Olfactory Research.

The $25 000 award is made annually to an individual in recognition of an outstanding and ongoing achievement in research in olfaction.

Dr Lancet's work is concerned with the genetic factors that determine olfactory receptor characteristics in humans.

New Sensory Neuroscience Laboratory in Melbourne

A Sensory Neuroscience Laboratory is being established at Swinburne University of Technology (SUT) to conduct research into the neurophysiological correlates of sensory systems. The Laboratory is a strategic initiative supported by SUT, industry and the CRC for International Food Manufacture and Packaging Science.

The Laboratory will be conducting basic and applied research of interest to the food, flavour and fragrance industries using novel, strategic low-cost technologies. It will aim to establish the relationship between brain electrical activity and preference responses, to develop a database of responses to odours and flavours, and to develop storage and delivery techniques for complex research paradigms. The initial focus of research will be on olfactory responses, however future research will investigate the use of taste, visual, auditory and tactile stimuli.

For further information contact:
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Email: cowen@mind.scan.swin.edu.au

In Australia in 1999

Foodservice '99
Melbourne Exhibition Centre, 16–19 May
Enquiries: Ph: (+61 2) 94222567
email:reed.exhib@reedbusiness.com.au

Fresh Produce '99
Melbourne Exhibition Centre, 1–3 June
Enquiries: Ph: (+61 3) 9646 4044
email: exhibman@enternet.com.au

Food Pro '99
Darling Harbour, Sydney, 4–7 July
Enquiries: Ph: (+61 3) 9429 6088

10th World Congress of Food Science and Technology and World Food Expo
Darling Harbour, Sydney, 3–8 October
Enquiries: Ph: (+61 2) 9959 4499
email: iufost10@aifst.asn.au