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Traceability

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Whenever I hear news about a new find of some ancient ruins, the thing I am most interested in is what period the ruins date from. One particular method for dating ruins is to apply the tree-ring dating method by counting the tree rings of excavated wood material that still has bark attached. An annual tree ring is highly sensitive to environmental changes such as weather or the rainfall amount and so such changes are readily reflected in the tree ring record. Being able to ascertain climatic changes provides this method with a special characteristic in comparison with other physicochemical analytic methods of dating in that tree ring dating allows for dating in units of a single year. One physicochemical analytic method, carbon-14 dating, utilizes radioactive carbon (C-14), the concentration of which decreases by half every 5,730 years. C-14 is formed in the atmosphere from neutrons containing gamma rays and nitrogen in the atmosphere, where it easily bonds with oxygen dispersing it throughout the atmosphere. This dating method is based on the hypothesis that the concentration of C-14 in the atmosphere is normally fixed. However, the amount of gamma rays that hit the earth fluctuates in accordance with fluctuations in the earth's terrestrial magnetism making is it necessary to adjust the level of C-14 production. For this reason, C-14 is measured using a test sample of the tree ring dating method as a standard reference, and a calibration curve is created and used a means for increasing accuracy.

In accelerator mass spectrometry (AMS), ions are accelerated to yield test samples of just a few milligrams and allowing for direct measurement of C-14 concentration. This method is an improvement in that miniscule amounts of a test sample are used. This makes it easy to gather highly accurate test samples from excavated artifacts so that, while the equipment used is quite large, it allows for a fairly precise level of verification. Although there are various dating methods, they differ in the size of period units measured and in accuracy meaning that there is no single universal method so that research attempting to trace a period must utilize a combination of the various measurement methods.

- For more on radiometric dating, see:

  http://ja.wikipedia.org/wiki/%E6%94%BE%E5%B0%84%E5%B9%B4%E4%BB%A3%E6%B8%AC%E5%AE%9A

- For an explanation of the radiometric C-14 dating method, go to:

  http://en.wikipedia.org/wiki/Radiocarbon_dating
  http://www.bunkaken.net/index.files/kihon/kagaku/c14.html

- For information about the AMS method, see:

  http://en.wikipedia.org/wiki/Accelerator_mass_spectrometry

・For dating using AMS method, refer to:

http://www.g5-hakuto.jp/accelerator/NEC/ams/ouyou.html

・For an article about AMS radiocarbon dating for the beginning of the Yayoi Period, see:

http://www.rekihaku.ac.jp/kenkyuu/0725/index.html#01

Recently there has been a spate of headlining-grabbing incidents of disguised or intentionally mislabeled food products involving meats, a confectionary maker, and souvenirs among other products.

What is interesting to note in these cases is the fact that they were not revealed due to the efforts of regulatory authorities but rather they were exposed by whistleblowers. As consumers affected by such occurrences, we must demand the establishment of traceability that permits us to understand the route of a product from manufacturer through the distribution chain. Foodstuff traceability means assigning an individual identification to each piece or lot of foodstuffs, and using tracing technology to track the products from production through distribution and to the point of purchase while recording any events affecting the food such as application of pesticides, or the loading and unloading of the product. Use of such technology will allow the consumer to perform “trace-back” by following the path of food products from themselves back to the producer, providing information regarding where it was produced and how it was distributed. Likewise, “trace-forward” refers to following the distribution path of food products from producer to consumer. The introduction of traceability for foodstuffs will allow for consumers and other third parties to verify the safety of their food by accessing the history and reputation of the producer or distributor. Additionally, if some problem regarding food safety occurs, this system provides for the rapid and precise identification of the extent of the problem’s impact.

One method for reducing public insecurity regarding food products and increasing their safety that has been garnering a lot of attention is a food traceability system using RFID tags or two-dimensional bar codes that can store various types of information, with this information accessed via mobile phone. RFID utilizes long wave (135 KHz and less), shortwave (13.56 MHz or less), UHF band (860 to 960 MHz, 433 MHz), and microwave (2.45 GHz, 5.8 GHz), and have been standardized by ISO 18000-2 to 7. In the distribution industry, EPCglobal has been working on worldwide standards for frequencies, codes and protocols used by RFIDs.

・You can visit the EPCglobal homepage to find out about international RFID standardization

http://www.epcglobalinc.org/home

・For information about the current status of RFID, see:

http://www.ehdo.go.jp/niigata/npc/kouza/H19 市民講座 5.pdf

・The traceability homepage of the Ministry of Agriculture, Forestry and Fisheries is available here:

http://www.maff.go.jp/trace/top.htm

・For an article about livestock tracing, see:

http://www.blwisdom.com/rfid/08/

Together with the continuing spread of RFID comes increased anxiety regarding exposure to electromagnetic waves. Sensor gates located at the entrances of buildings such as libraries, bookstores and supermarkets are regulated according to the guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNRP) as well as having to conform to any existing national standards although there are no research reports regarding the health effects of such devices. However, as the use of electromagnetic waves is certainly only going to increase, it is necessary to give ample consideration to the effects the exposure of electromagnetic waves may have on the human body when developing such devices.

Given these factors, the amount of new devices using electromagnetic waves is certain to increase. For this reason, EMC technicians will be called upon to trace out these new electromagnetic environments, and work in collaboration with the institutions and agencies involved to achieve balanced electromagnetic environments.

Automated ticket gate

Library gate

・For International Commission on Non-Ionizing Radiation Protection (ICNRP) guidelines, see:

http://wwwsoc.nii.ac.jp/jhps/j/information/nonioniz/icnirp.html

・The ICNRP homepage is available here:

http://www.icnirp.de/

・A report measuring electromagnetic waves at a library can be accessed at:

http://www.csij.org/04/electromagnetic/emf-paper_library.pdf

・A timeline regarding public health hazards of electromagnetic waves is available at:

http://www.tecnoao-asia.com/press_nenpyo_00-09.html

・For information about a knowledge platform established by the Netherlands Ministry of Housing, Spatial Planning and the Environment, see:

http://www2.vrom.nl/pagina.html?id=10896

I have been writing about analogies between EMC and Japanese culture for six and a half years now and regretfully announce that I am taking a temporary break from this column. I would like to express my warmest regards to all you for kindly reading my column over the years.

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1943	Born in Tokyo
1968	Graduated Osaka University School of Engineering Science
To 1984	Engaged in development of IT equipment at Hitachi Ltd.'s Taga Plant
1991 onward	Engaged in electromagnetic environment related education at Hitachi Technical College
1999 onward	Planning Manager at Hitachi Technical Research Institute
2006 onward	Ability InterBusiness Solutions, Inc. Tokyo Branch