ENVIRONMENT

PCB's in you and me

On June 28 the Food and Drug Administration tightened the limit of PCB's (polychlorinated biphenyls) allowed in fish from 5 parts per million to 2 ppm. PCB's are believed to cause cancer, still births, bone and joint deformities, skin rashes and liver damage. In 1976 the Environmental Protection Agency banned the chemicals, which are used in electrical transformers and capacitors, in pigments, in plastics, as flameproofing for yarn and in hydraulic fluids. PCB's do not break down easily and are readily absorbed into animal fats. They are found in eggs and dairy products (PCB tolerances in these products have also been lowered by the FDA) and in freshwater fish such as trout, catfish, salmon, carp and striped bass — especially in the Hudson River and in the Great Lakes.

At the Sheboygan Environmental Laboratory on the shore of Lake Michigan, ecologist Steve Spigarelli is studying the metabolism of PCB's and other "fat-seeking materials" in game trout. These trout are attracted to the warm water released by power plants and other lake shore industries — water 5 to 10 degrees warmer than usual. The high temperature causes the fish to eat more and breathe faster, absorbing more PCB's than normal. Spigarelli told SCIENCE NEWS he expects to find PCB levels as high as 10 ppm in fish held at high temperatures. He hopes to learn how fish metabolize these "fat-seekers," which are then passed on to the fish eater.

Heavy air

In the past ten years the earth's atmosphere has been laden with a total of 74 million kilograms of cadmium, 585 million kilograms of copper, 4.3 billion kilograms of lead, 4.5 million kilograms of nickel and 3.3 billion kilograms of zinc — or so says a report published in the May 31 NATURE.

Researcher Jerome O. Nriagu traced the origins of these five airborne trace metals from natural sources (volcanos, forest fires, dust and sea salt sprays) and from man-made sources (mining, iron and steel production, combustion of coal, wood and wastes, and sprayed fertilizers). Predictably, man-made sources spew out a far larger share of air pollutants than do natural sources.

In 1975, for example, oil combustion (including gasoline) produced 273 million kilograms of lead. Volcanos, the greatest natural source of lead aerosols, contributed only 6.4 kilograms of lead.

The high-lead phenomenon is relatively recent in world history. In the 1910s there were 493 million kilograms of lead in the atmosphere. The amount rose to 1.1 billion kilograms in the following decade. Nriagu attributes the rise to the introduction of leaded gasolines in 1923.

The cleanup bill

The proposed $1.6 billion fund to clean up chemical and toxic waste dumps, by extracting fees from oil and chemical companies, would cost the public about 0.07 cents per gallon of gasoline, says Thomas C. Jorling, EPA assistant administrator for water and hazardous materials. The price of products made of organic "final petrochemical products" (plastics, for example) should rise less than 0.6 percent. Products made of inorganic material should cost about one percent more.

The fund would be collected over four years, with 20 percent supplied by government revenues. Half of the industry fees would come from petrochemical feedstock producers. The cost passed on to consumers is not expected to affect inflation or create unemployment, says Marc Tipermas, staff assistant for Jorling. "The impact will be absolutely negligible."

PHYSICAL SCIENCES

Everywhere a black hole

Black holes have become a popular cause for many strange effects observed in the heavens. The latest celestial object to receive this label is Cassiopeia A, one of astronomy's most intriguing mysteries.

Cas A is the remnant of a supernova whose shell of gas is expanding thousands of kilometers each second. Located 9,000 light years from earth, it is most noted for being the strongest source of radio emission in the sky after the sun.

So where's the mystery? From the measured rate of expansion, it is estimated that the supernova explosion took place in the late 17th century, a period of great activity for European astronomers. At its peak, the supernova should have outshone the brightest stars in the sky. Yet no one recorded the event. A possible explanation for this omission is proposed in the June 21 NATURE.

From analysis of X-ray observations, Russian astrophysicist Iosef S. Shklovsky suggests that the star that gave birth to Cas A was so massive (about 20 times the mass of the sun) that when it exploded its core collapsed into a black hole instead of becoming a neutron star. He says that without the formation of a rapidly rotating neutron star, the supernova could not be visible from earth. The formation of a pulsar during collapse would have caused powerful optical emissions.

Shklovsky also points out that a neutron star has yet to be seen in the middle of Cas A. Such a star would show up as a point source of soft X-ray radiation; a black hole would not. The astrophysicist believes the strongest evidence is the lack of iron-group elements in the fast-moving filaments of Cas A. He implies that the heavy elements must have remained behind in a black hole after the Cas A outburst.

Dating deep-sea cores with TL

Two Canadian researchers suggest in the June 21 NATURE that thermoluminescence could be a new tool in dating ocean floor sediments.

For the past decade, TL dating has been used primarily in archaeology. When a sample to be dated is heated, a light (TL) is emitted whose intensity is proportional to the natural radiation dose it has received over the years.

In the case of ancient pottery, the event being dated is the last heating of the material to a high temperature. For deep-sea cores, it is the sediment's last exposure to sunlight, which sets its TL levels to zero.

A. G. Wintle and D. J. Huntley of Simon Fraser University in Burnaby, B.C., used the method to date samples of a deep-sea core from the Antarctic Ocean. They found that the TL intensity increased as the depth down the core increased. The dates they calculated for each depth by the TL method agreed with dates determined by other methods.

New superconductor: Irradiated Pd

Because of strong spin fluctuations, the metal palladium has not been a serious candidate for superconductivity. But now a West German physicist may have discovered a way to overcome that obstacle.

B. Stritzker reports in the June 25 PHYSICAL REVIEW LETTERS that he has transformed a thin palladium film into a superconductor by irradiating it with helium ions at low temperatures. The critical temperature at which the electrical resistance virtually disappeared was 3.2°K.

Stritzker believes the metal was able to superconduct once the defects produced in the thin film by the irradiation diminished the strong spin fluctuations.