AAAS MEETING

Presidential address sets the tone

Washington

THE annual meeting of the American Association for the Advancement of Science (AAAS) captured the attention of some 4,700 scientists in Washington this past week. The fare at the AAAS's 157th annual meeting included science as well as policy, light items as well as more serious research.

It may well be the last year, however, that the AAAS keeps this format for its annual meeting. At a time when specialized meetings seem to dominate the scientific landscape, the AAAS is thinking about revamping its meeting programmes. Declining attendance over the years has made some AAAS leaders wonder whether the multi-disciplinary annual meeting should be continued.

A brief speech by US President George Bush opened the five-day meeting.

■ Bush speaks to AAAS

ON the morning of Friday 15 February, an estimated 3,000 scientists gathered in a hotel ballroom in Washington to hear President George Bush address the AAAS meeting. But the news of the moment was not science but war. Only hours before, word had come from Baghdad that the Iraqi leader, Saddam Hussein, would pull his troops out of Kuwait. Many people expected that Bush would cancel his AAAS speech, which was to be broadcast by closed-circuit television because the secret service forbade a personal appearance.

But no. The president kept his promise to speak to the scientists, seizing the occasion to deliver an address on the politics of war and of science.

Acknowledging that when he first heard the news from Baghdad he was "happy", Bush went on to denounce Saddam's offer to withdraw as a "cruel hoax". Upon analysis, the president said, the Iraqi statement was "full of unacceptable old conditions", and unacceptable new conditions as well. "Let me state once again", said Bush, "that they must withdraw without condition." It was, as far as anyone could remember, the first time that a US president has delivered such a potent political statement to an audience of scientists.

But it was not the first time this president has symbolically acknowledged the scientific community with a direct appearance. Last spring, Bush spoke at the annual meeting of the National Academy of Sciences. His AAAS speech is seen as a reiteration of his recognition of science, as well as testimony to the influence of his own science adviser, D. Allan Bromley, within the White House.

When he reached what he called "the subject at hand", Bush touched on all the themes on the current science agenda, including the success of past investments in military research and development, a theme that is likely to dominate US debate on the future budget for the Pentagon. "Technology", he said, "is changing the face of war." Citing the Patriot missile in particular, Bush said "Our investment in defense [R&D] over the past decade is now saving the lives of Americans, of our allies, and even of our adversaries." The president spoke of the importance of science and mathematics education in the schools and quoted Nobel laureate Barbara McClintock who said of her work on the genetics of corn, "I did it because it was fun. I never thought of it as science." The president sought credit as a 'science' president for the 13 per cent increase in funding he requested in the 1992 budget, he cited the importance of the "individual scientist" or "small team", but he also gave the nod to such big science efforts as high-performance computing and communications, the human genome project and the Global Change Program.

The president saved his most original observations, however, for the subject of science in industry (he called for a permanent R&D tax credit) and innovation. He declared that "the spirit of innovation is alive and well in America", and touched on the issue of what industry considers excessive or stifling government regulation. "Some say that if Edison had invented the light bulb today, we'd have scores of studies citing the dangers of electricity. And the newspapers would headline the story 'Candle industry threatened'."

■ Meta-analysing the risks

THE epidemiological evidence linking electromagnetic fields (EMFs) with health effects, such as cancer and birth defects, has generally been suggestive but quite weak. Several studies have found, for instance, that living near electric power lines of a certain type may increase the risk of leukaemia and other cancers in children, but other studies have seen no such effects. Lacking any laboratory evidence of such an EMF–cancer link, scientists have been divided on whether EMFs might be dangerous.

At the AAAS meeting, Edward Washburn of the Harvard School of Public Health released the results of a new study indicating that the presence of the fields may indeed signal increased risk. A meta-analysis of existing epidemiological studies found, Washburn said, that living near certain power lines may double a person's chance of developing central nervous system cancers and increase the risk of lymphoma by 50 per cent.

Meta-analysis is a technique for integrating the results from many different and even contradictory studies on a single subject. Although controversial, meta-analysis has become increasingly popular over the past 15 years as an objective way of extracting a consensus answer from a mass of inconsistent data. Meta-analyses have been performed on subjects as varied as gender differences and the effectiveness of psychotherapy, but probably the most popular area for meta-analysis has been the health effects of various environmental and lifestyle factors.

For instance, Judson Wells of Kennett Square, Pennsylvania, described to the audience at the AAAS session his 1988 meta-analysis of passive smoking studies. Working with the data from 17 passive smoking studies around the world, he found that non-smoking women who lived with smokers were nearly 50 per cent more likely to contract lung cancer than non-smoking women who were not exposed to smoke in their homes. William Nicholson at the Mount Sinai School of Medicine in New York City discussed his meta-analysis of the effects of exposure to polychlorinated biphenyls (PCBs) on workers who came in contact with the chemicals in capacitor manufacturing plants. Analysing the various studies with respect to the subjects' durations of exposure and the times from onset of exposure, he found evidence that PCB exposure causes cancer of the liver, biliary tract and gall bladder.

Washburn and colleagues at Harvard, Mount Sinai and the University of Pennsylvania are in the midst of a series of meta-analyses examining the contradictory results from studies on the health effects of low-frequency EMFs, such as those generated by power lines and electrical appliances. At the AAAS meeting, he revealed preliminary results from a meta-analysis of ten studies on the correlation between proximity to power stations and the risk of leukaemia, lymphoma and central nervous system cancer in children.

The researchers went to great pains, Washburn said, to make sure their analysis was as reliable as possible, given that they were working only with existing studies and took no data themselves. They rated the quality of each study, using referees who did not know which study was which; they tried to make the assessment of EMF exposure consistent from study to study; and they searched the literature in order to include all studies on the subject.

The result? They found that residential proximity to power stations was linked to a higher risk of cancer in every category they examined, although the results were statistically significant in only two cases. The calculated risk ratio for central ner-

vous system cancer was 2.01 — meaning that exposed children were 2.01 times as likely as unexposed to develop cancer — with a 95 per cent confidence interval of [1.44, 2.82]. (That is, although the 'true' risk ratio is not known, it is 95 per cent certain that it falls between 1.44 and 2.82.) The risk ratio for lymphoma was 1.52, with a 95 per cent confidence interval of [1.08, 2.12].

Washburn's group also calculated risk ratios of 1.51 for childhood lymphoma, 1.20 for leukaemia and 1.26 for childhood leukaemia, although none of these were statistically significant.

These results slightly strengthen the case for an EMF-cancer connection, but they still suffer from the weaknesses of all of the epidemiological data so far. Researchers have not been able completely to rule out the presence of 'confounders' — factors that appear concurrently with the EMF exposure and that may themselves cause cancer, such as carcinogenic pesticides used to clear the right of way underneath power lines. And, for some mysterious reason, the cancer risk seems to correlate better with the types of power lines than with the actual measured EMF fields inside the subjects' homes (see *Nature* **349**, 554; 14 February 1991). The meta-analyses can point to these weaknesses in the original studies, but they cannot fix them.

■ Don't trust this headline

DECEPTION is rife in the world. Men lie to women, and vice versa. Predators try to fool their prey, and the prey return the favour. Even bacteria and viruses get into the act, with elaborate molecular mechanisms designed to distract, confuse and deceive the immune systems of their unwilling hosts.

Why all the deception? The short answer is that, in an evolutionary sense, it works. The long answer was the subject of a AAAS session on "The evolution of deception: A biocultural approach".

"We are not defining deception as a conscious, nefarious act", said session organizer Loyal Rue, a professor of religion and philosophy at Luther College in Decorah, Iowa. And given that "nature provides niches for deceivers at every level of life", he argued that it might be necessary to rethink our natural bias against it — even in some cases of human deception.

Examples of deception in nature are common. Viceroy butterflies, which are a tasty treat for birds, mimic the markings of the foul-tasting Monarch butterfly to trick birds into not eating them. Some male blue-gill sunfish mimic both the appearance and the courting behaviour of females so that they can enter the territories of dominant males and fertilize the eggs laid there by the females. Cuckoos fool other birds by laying eggs in their nests. All of these tactics provide some evolutionary advantage and so developed through natural selection.

The more complex deceptive practices, however, are the behavioural ones, especially those that are learned instead of innate. Robert Sussman, an anthropologist at Washington University in St Louis, described deceptive behaviour in primates which, he said, seem to be the only animals that engage in 'voluntary deception'. He described one experiment in which a single female chimpanzee was shown the location of food in a cage. When the female and other members of her group were let into the cage, she went excitedly to the food — at which point the other chimpanzees took it away from her. After a few repetitions, she got the hint. When next the group was let into the cage, the female did nothing at first. Then, once the others were all settled down and looking the other way, she grabbed the food for herself. "Deception", Sussman said, "seems to have evolved along with intelligence." That leaves humans in the position of being the earthly creatures most able to deceive others, as well as themselves. How humans have dealt with that ability is one of the fundamental issues underlying Western religion and philosophy, Rue said.

Despite the presumption that deception is wrong, the ability to deceive and to be deceived seem to be adaptive traits, he noted. The value of being able to lie convincingly is obvious, but being vulnerable to deception, particularly self-deception, can also be valuable. Studies have shown, for instance, that people with positive self-images — including those that involve a certain amount of self-deception — are usually happier and healthier than those with low self-esteem.

The advantage of deception does not stop with individuals, Rue argued. The health and even existence of human cultures has historically depended on what he calls 'noble lies' — myths, or self-deceptions, that are shared among the people of a culture and which define a common way of viewing the world. As long as the vision is left unexamined, it can provide a framework on which to build a society.

Barbara J. Culliton and Robert Pool

Hope for the musically mediocre?

FOR everyone who dreams of making beautiful music but whose fingers just cannot seem to find the right notes, there is hope. In a presentation at the AAAS meeting, Max Mathews of the department of music at Stanford University described a new computerized system that gives a person creative control over music without the necessity of first perfecting his or her technique.

A musical performance, Mathews explained, consists of two parts: the score, a predetermined sequence of notes fixed by the composer; and the expressive factors, such as tempo, subtle changes in the duration of notes and the loudness or softness of different passages, which the individual performer controls. But the score provides a difficult hurdle for some would-be performers because it takes many tedious years of practice to develop the necessary manual skills to reproduce the notes as they were written.

"We can remove this load from the performer by letting the computer provide the correct sequence of pitches", Mathews said, "but at the same time we zealously guard the expressive parts of the music and give complete control to the performer." This is possible, he said, through the use of a computer system consisting of software called a conductor program and a piece of hardware called a 'radio baton'. The conductor program 'reads' a score and instructs a synthesizer to play the correct notes, but the performance is controlled by a human performer wielding the radio baton. This is a stick-like device with a radio transmitter at one end, which is waved over a detecting surface. The surface detects the radio waves emitted by the baton, determines the baton's position in three dimensions to within a fraction of an inch and directs the conductor program to modify the music in response to the movement of the baton.

The performer controls the tempo of the synthesizer-generated music through the beats of his baton, much as a conductor directs the tempo of an orchestra.

And by varying the position of the baton over the detecting surface, the performer can modify the quality of the notes. The effect, Mathews said, is similar to that which a violinist achieves with his bow or a woodwind player with his breath.

To demonstrate the effectiveness of the device, Mathews played a tape recording of a Vivaldi concerto in which two human flautists were accompanied by a synthesized orchestra which Mathews had directed with the radio baton. To an untutored ear, the sound was practically indistinguishable from a recording of a full human orchestra.

This device could open the world of music to a new type of performer, Mathews said — one who does not have to divide his energy and attention between technical performance and the expressive factors. Mathews admitted, however, that he does not know how good these performers are likely to be. "Can we teach the expressive facilities quickly and simply with this new instrument? Or does a performer need the years of practice on technique [before he can develop these expressive powers]?" R.P.