Discourse Processing - Topic annotations

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A spark, a flint: How fire leapt to life

To early man, fire was a divine gift randomly delivered in the form of lightning, forest fire or burning lava. Unable to make flame for themselves, the earliest peoples probably stored fire by keeping slow-burning logs alight or by carrying charcoal in pots. (Fire)

How and where man learnt how to produce flame at will is unknown. It was probably a secondary invention, accidentally made during tool-making operations with wood or stone. (Produce flame)

Studies of primitive societies suggest that the earliest method of making fire was through friction. European peasants would insert a wooden drill in a round hole and rotate it briskly between their palms. This process could be speeded up by wrapping a cord around the drill and pulling on each end. (Friction)

The Ancient Greeks used lenses or concave mirrors to concentrate the sun's rays and burning glasses were also used by Mexican Aztecs and the Chinese. (Concentration)

Percussion methods of fire-lighting date back to Paleolithic times, when some Stone Age tool-makers discovered that chipping flints produced sparks. The technique became more efficient after the discovery of iron, about 5000 years ago. In Arctic North America, the Eskimos produced a slow-burning spark by striking quartz against iron pyrites, a compound that contains sulphur. The Chinese lit their fires by striking porcelain with bamboo. In Europe, the combination of steel, flint and tinder remained the main method of fire-lighting until the mid-19th century. (Percussion methods)

Fire-lighting was revolutionised by the discovery of phosphorus, isolated in 1669 by a German alchemist trying to transmute silver into gold. Impressed by the element's combustibility, several 17th century chemists used it to manufacture fire-lighting devices, but the results were dangerously inflammable. With phosphorus costing the equivalent of several hundred pounds per ounce, the first matches were expensive. (Revolution by phosphorus)

The quest for a practical match really began after 1781 when a group of French chemists came up with the Phosphoric Candle or Ethereal Match, a sealed glass tube containing a twist of paper tipped with phosphorus. When the tube was broken, air rushed in, causing the phosphorus to self-combust. An even more hazardous device, popular in America, was the Instantaneous Light Box - a bottle filled with sulphuric acid into which splints treated with chemicals were dipped. (Phosphorus self-combust)

The first matches resembling those used today were made in 1827 by John Walker, an English pharmacist who borrowed the formula from a military rocket-maker called Congreve. Costing a shilling a box, Congreves were splints coated with sulphur and tipped with potassium chlorate. To light them, the user drew them quickly through folded glass paper. Walker never patented his invention, and three years later it was copied by a Samuel Jones, who marketed his product as Lucifers. (Walker's matches)

About the same time, a French chemistry student called Charles Sauria produced the first 'strike-anywhere' match by substituting white phosphorus for the potassium chlorate in the Walker formula. However, since white phosphorus is a deadly poison, from 1845 match-makers exposed to its fumes succumbed to necrosis, a disease that eats away jaw-bones. It wasn't until 1906 that the substance was eventually banned. (First 'strike-anywhere' match)

That was 62 years after a Swedish chemist called Pasch had discovered non-toxic red or amorphous phosphorus, a development exploited commercially by Pasch's compatriot J E Lundstrom in 1885. Lundstrom's safety matches were safe because the red phosphorus was non-toxic; it was painted on to the striking surface instead of the match tip, which contained potassium chlorate with a relatively high ignition temperature of 182 degrees centigrade. (Safety matches)

America lagged behind Europe in match technology and safety standards. It wasn't until 1900 that the Diamond Match Company bought a French patent for safety matches - but the formula did not work properly in the different climatic conditions prevailing in America and it was another 11 years before scientists finally adapted the French patent for the US. (America lagged behind Europe)

The Americans, however, can claim several 'firsts' in match technology and marketing. In 1892 the Diamond Match Company pioneered book matches. The innovation didn't catch on until after 1896, when a brewery had the novel idea of advertising its product in match books. Today book matches are the most widely used type in the US, with 90 percent handed out free by hotels, restaurants and others. Other American innovations include an anti-afterglow solution to prevent the match from smouldering after it has been blown out; and the waterproof match, which lights after eight hours in water. (American innovations of matches)

The motor car

There are now over 700 million motor vehicles in the world - and the number is rising by more than 40 million each year. The average distance driven by car users is growing too - from 8 km a day per person in western Europe in 1965 to 25 km a day in 1995. This dependence on motor vehicles has given rise to major problems, including environmental pollution, depletion of oil resources, traffic congestion and safety. (Dependence on motor vehicles)

While emissions from new cars are far less harmful than they used to be, city streets and motorways are becoming more crowded than ever, often with older trucks, buses and taxis, which emit excessive levels of smoke and fumes. This concentration of vehicles makes air quality in urban areas unpleasant and sometimes dangerous to breathe. Even Moscow has joined the list of capitals afflicted by congestion and traffic fumes. In Mexico City, vehicle pollution is a major health hazard. (Congestion and traffic fumes)

Until a hundred years ago, most journeys were in the 20 km range, the distance conveniently accessible by horse. Heavy freight could only be carried by water or rail. The invention of the motor vehicle brought personal mobility to the masses and made rapid freight delivery possible over a much wider area. Today about 90 per cent of inland freight in the United Kingdom is carried by road. Clearly the world cannot revert to the horse-drawn wagon. Can it avoid being locked into congested and polluting ways of transporting people and goods? (Freight by car)

In Europe most cities are still designed for the old modes of transport. Adaptation to the motor car has involved adding ring roads, one-way systems and parking lots. In the United States, more land is

assigned to car use than to housing. Urban sprawl means that life without a car is next to impossible. (City adaptation and Urban sprawl)

Mass use of motor vehicles has also killed or injured millions of people. Other social effects have been blamed on the car such as alienation and aggressive human behaviour. (Effects blamed on cars)

A 1993 study by the European Federation for Transport and Environment found that car transport is seven times as costly as rail travel in terms of the external social costs it entails such as congestion, accidents, pollution, loss of cropland and natural habitats, depletion of oil resources, and so on. Yet cars easily surpass trains or buses as a flexible and convenient mode of personal transport. It is unrealistic to expect people to give up private cars in favour of mass transit. (Costly but flexible car transport)

Technical solutions can reduce the pollution problem and increase the fuel efficiency of engines. But fuel consumption and exhaust emissions depend on which cars are preferred by customers and how they are driven. Many people buy larger cars than they need for daily purposes or waste fuel by driving aggressively. Besides, global car use is increasing at a faster rate than the improvement in emissions and fuel efficiency which technology is now making possible. (Problems of technical solutions)

One solution that has been put forward is the long-term solution of designing cities and neighbourhoods so that car journeys are not necessary - all essential services being located within walking distance or easily accessible by public transport. Not only would this save energy and cut carbon dioxide emissions, it would also enhance the quality of community life, putting the emphasis on people instead of cars. Good local government is already bringing this about in some places. But few democratic communities are blessed with the vision - and the capital - to make such profound changes in modern lifestyles. (Long-term solution)

A more likely scenario seems to be a combination of mass transit systems for travel into and around cities, with small 'low emission' cars for urban use and larger hybrid or lean burn cars for use elsewhere. Electronically tolled highways might be used to ensure that drivers pay charges geared to actual road use. Better integration of transport systems is also highly desirable - and made more feasible by modern computers. But these are solutions for countries which can afford them. In most developing countries, old cars and old technologies continue to predominate. (Integration of transport systems)