100 years ago

In a letter written on board the seal-ship *Jason* in the Denmark Sound, Dr. Nansen draws attention to the scarcity of seals on the coast of Greenland in recent years. Only ten years ago the animals were so plentiful and tame that thousands could be "clubbed" with the greatest ease. Dr Nansen is of opinion that the ruthless persecution of these animals since 1876, when the first sealer appeared in the Denmark Sound, has caused them to alter their habits. Formerly they were found on the edge of the drift ice, where they were safe from their only enemy, the Polar bear, though falling an easy prey to the sealer. Now they gather close to the shore, whither vessels vannot penetrate.

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synthesizing a polythiophene (5*b*) containing both the linking vinyl group and the alkoxy substituent, Elsenbaumer confirmed his expectation that these two effects would be additive when present in the same polymer.

This polymer is deep blue in the insulating form, but on doping with electron acceptors ($FeCl_3$ and nitrosonium salts) its colour is reduced to a faint blue-grey; accordingly the band gap is about 1.32 electron volts (eV), comparable with that of *trans*-polyacetylene (1.3 eV) and about 0.4 eV less than the unsubstituted polythienylene vinylene PTV (5*a*). Moreover, the conductivity of the doped polymer, 2 S cm^{-1}, is still good. In the presence of suitable dopant anions, the alkoxy–vinyl derivatives (5*b*) are soluble in common organic solvents.

Similar vinylogues (6*a*) and alkoxy-substituted vinylogues (6*b*) of poly-*para*-phenylene (4) were reported by F. Wudl (University of California, Santa Barbara). The high-molecular-weight, stable prepolymer of the unsubstituted vinylogue (6*a*) is soluble in organic solvents, giving processibility during the heat-induced polymerization reaction. Once formed, polymer (6*a*) is insoluble and cannot be processed. Successful processing at the prepolymer stage is unusual. It was first achieved for polyacetylene and facilitates the formation of well-crystallized, highly orientated films of conducting polymer.

By analogy with the thiophene derivative (5*b*), a soluble poly-*para*-phenylene derivative (6*b*) can be prepared if long chains are present. The hexyloxy chains are attached to the phenyl ring at the outset of the synthesis. Again the effects of vinyl linking and alkoxy substitution combine to reduce the band gap of the polymer. □

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Natural selection

How females choose a mate

Ian Tomlinson

Gaudy male ornaments like those of the birds of paradise may have evolved because they are preferred by females in mating[1]. There is now considerable evidence that the females of many animal species can choose their mates[2]. Little is known, however, about how they express their preferences or what types of male character are chosen. Lynn Brodsky reports in a recent paper[3] that females may prefer male characters that fit some general criterion rather than traits of a specific size, shape or colour.

Females cannot choose a male until they have found one or several potential mates. Perhaps individuals actively search for the type of male they find most attractive. Choice will tend to carry large costs, but preferred males may gain a large advantage because most females can express their preferences, with little dependence on male frequency.

Alternatively, a female may randomly encounter several males. Each encounter might, for example, raise her level of excitement towards some threshold that must be exceeded for mating to take place. If an encounter fails to push the female over that threshold, she will reject the male, perhaps again incurring considerable costs. An encounter with a preferred male might excite a female more than meeting a non-preferred male, and preferred males would thereby gain more mates[4].

Another way for a female to find a mate is if several males display simultaneously to potential mates at a lek, for example. In species like the ruff (*Philomachus pugnax*; see figure), therefore, females can assess many males at once before making their choice. If preferring females rapidly decide on their mate, choice might carry few costs and could even be beneficial if non-preferrers take a long time to mate.

These mechanisms describe how a preferred mate is found, but they do not explain which males are chosen. There are four components of the process of mate choice that determine which male becomes the mate of a preferring female, and there are different mating behaviours possible within each component.

A female must have some innate, probably inheritable, standard by which she judges potential mates. This may instruct her to prefer a male of a particular value or type, or alternatively, one with as large a phenotypic value as possible. One component of mate choice is how many males a female compares before she decides on her mate. At one extreme, she will accept the first male she finds that matches her standard: this is 'absolute' choice. At the other extreme, where preference is relative, a female will choose only after comparing very many males. She must adopt this strategy, for instance, if she wishes to select the male with the longest tail.

A second component is the strength of female preference, which may vary on a continuous or on an all-or-none scale. The preference of female tungara frogs (*Physalaemus pustulosus*) for large, loud-calling males seems to increase gradually with the strength of the call, for example[5]. Female two-spot ladybirds (*Adalia bipunctata*), on the other hand, seem to prefer melanic males independent of their degree of pigmentation[6]. A preference for a polygenic character might also be all-or-none, if it were expressed only above some threshold value of the male trait. A third component of mate choice determines the 'choosiness' of females — their keenness or ability to express a preference. Fitter females, for example, may be better able to be choosy.

Finally, preferences could differ in their

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*Dressed to kill — male ruffs (*Philomachus pugnax*) displaying. (Photo K. Wothe/Bruce Coleman.)*