of $4{\cdot}1\times10^4$ cm/sec. The dispersion relation for these striations was obtained by modulating the discharge current over a range of frequencies close to the natural frequency. The wavelength increased with frequency which showed these moving striations were backward waves. The group velocity was $3{\cdot}9\times10^4$ cm/sec. The second type, present at a discharge current of 100 m.amp, had a frequency of 2·1 kc/s and a wavelength of 8·5 cm, corresponding to a phase velocity of $1{\cdot}8\times10^4$ cm/sec.

The spherical measuring probe was located 110 cm from the cathode and the a.c. signal applied to it had a frequency of 50 kc/s and a peak to peak amplitude of 0·5 V. This signal was applied for 12 μsec in each striation period. The space potential was taken to be the point at which the first derivative was maximum.

Fig. 1 shows the observed variations of light intensity with time. Two energy distribution measurements made in the higher current striations are given in Fig. 2. The first measurement was made 30 μsec before the crest of the light intensity, the second 150 μsec after the crest. These results show the two well defined groups of electrons which are characteristic of stationary striations, the higher energy group being produced by the acceleration of low energy electrons from the tail of the previous striation through a double space charge sheath[4].

Fig. 3 shows six measurements made in the striations occurring at the lower current. The first ($T=0$) was made 100 μsec before the crest of the striation and the other distributions correspond to delays of 50, 200, 300, 370, 420 μsec, respectively (striation period, 470 μsec).

The second measurement ($T=50$) shows two groups of electrons, the high energy group, with mean energy of ~12 eV, having been produced by the acceleration of a low energy group through a potential step. The four subsequent measurements ($T=200$, 300, 370 and 420) show the depletion of this high energy group through the striation. Unlike the high energy electrons in the striations occurring at higher current this group is not completely exhausted but is accelerated through a further potential step to produce an energy distribution identical to that shown in the first measurement ($T=0$). A novel feature of this distribution is that the high energy tail, capable of direct ion-pair and metastable production, has been produced by the acceleration of electrons through two successive sheaths.

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Linear Polymers in the Turbulence Vortices

LONG chain linear polymers in dilute aqueous solutions show several anomalies, particularly a reduction in turbulent skin friction. Attempts have been made to explain such anomalies in terms of visco-elasticity. It is, however, worth considering the possibility that the effects arise from a "spiral combing" of the macromolecules in the cores of the vortices which constitute the turbulence. If aligned at an angle to a cylindrical surface of slippage—with their front ends in the faster flow on the interior—these macromolecules would act as "sea anchors" bridging the streamlines of different velocities, thereby increasing the effective local viscosity in these cores, and thus making these cores act more nearly as rigid bodies. In a plane shear flow such an alignment is improbable, for there a macromolecule, even if it happened to have been stretched, would tend to be turned by the vorticity of that flow until it is aligned with a streamline, and becomes free to slip with respect to other macromolecules so aligned. But the rather unusual circumstances necessary to produce such "combing" at a fairly large angle to the pathlines—namely, a brief spurt of a strong shear, followed by some reduction of the tendency of the fluid to sweep (turn) a stretched macromolecule towards a pathline—are indeed experienced by a macromolecule which is close to a vortex at the moment of its birth. As the diffusing vortex spreads over the macromolecule, this macromolecule first experiences a spurt of shear accompanied by the vorticity of an opposite sense; and by the time it is engulfed by the core (the vorticity of which would tend to sweep this macromolecule towards a pathline) the vorticity of the core is already diminished by the diffusion. It is therefore conceivable that an occasional macromolecule might be stretched by the spurt of the shear enough to have its end "caught" in the manner suggested in Fig. 1. Such "rigidized cores" would be less likely to diffuse, turn, stretch and break up than the vortices which constitute the turbulence in a homogeneous fluid; and so would more likely be formed in longer sections, and act as "rollers", namely, as more effective constituents of the vortex sheet formed by the turbulent layer. This explanation accounts also for other anomalies manifested by these solutions.

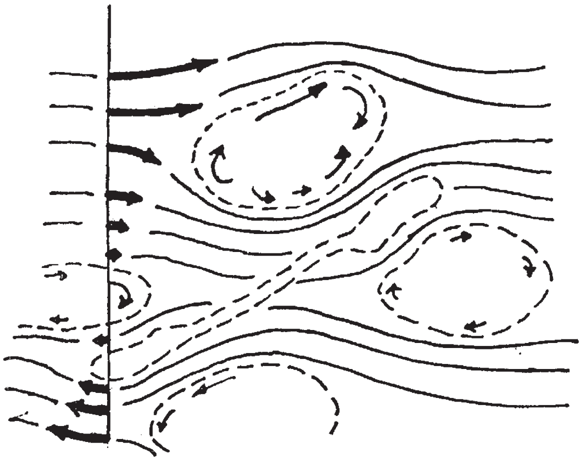

Fig. 1. Ends of a macromolecular tangle may get caught between other tangles.

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Musical Flames

INTERACTION between flames and sound was first reported by John Leconte in 1858 and has since been studied by Rijke, Rayleigh, Tyndall, Andrade[1] and many others. It was the subject of a special session at the fourth symposium of the Combustion Institute in 1952 under the heading "Oscillatory Combustion".

Leconte had noticed that a gas flame at a concert responded to certain beats of the music. Subsequent work attempted to analyse and explain this effect in terms of