Now, in order to observe this effect of the friction on the elastic body, we made a preliminary experiment on the kinetic friction. Regarding the test pieces of photo-elasticity, we prepared two kinds of them, namely, (1). 25% gelatin-jelly, which was 16 cm. long, 11.2 cm. wide and 0.8 cm. thick, (2). 20% gelatin-jelly, being 16 cm. long, 16 cm. wide, and 0.8 cm. thick. In each of them a circular hole of 4.9 cm. in diameter was made and an ebonite disc of 5.8 cm. in diameter was fitted in it. The ebonite disc was rotated by a motor at the uniform speed of about 1 r.p.m.. The phenomena of kinetic friction caused by the rotation of the disc (rotating axis was horizontal) was observed. The coefficients of kinetic friction are tabulated as follows.

Table I. The coefficient of friction μ and the angle of friction α measured at the contact surfac. β is the angle between the vertical line and the radius of the disc at the measured point.

	β	τ	σ_y	$\mu=\lvert\tau/\sigma_y\rvert$	$\alpha=\tan^{-1}\mu$
Test piece (1)	0°	+ 0.270	− 2.01	0.134	7.6°
	50°	+ 0.216	− 1.48	0.146	8.3°
	90°	+ 0.330	− 1.60	0.207	11.7°
Test piece (2)	0°	+ 0.471	− 1.60	0.295	16.5°
	39.6°	+ 0.344	− 1.22	0.281	15.9°

In addition, we found the change of stress before and after the rotation of the disc. But the change was fundamentally different according to the test piece (1) or (2). This may be due to the fact that pure phenomena of friction are not seen at the contact surface, owing to the inadequate form of the test pieces. Using the new test pieces of improved form, the experiments are being carried on.

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4. Measurement of Ionic Mobility Using an Alpha-Ray Counter

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In the previous paper (this Bulletin, **21**, 61 (1950)), we described a method of measuring ionic mobilities by analysing the shape of the output pulse of an alpha-ray counter. And we also reported that the mobility of positive ions of air seems to change from 2.2 to 1.7cm^2/sec/volt during the interval from 2.5×10^{-4} to 1×10^{-3} sec of the age of the ions.

In the present study, we have examined this transition more carefully. Making the more detailed theoretical analysis on the effect of the transition of ionic mobility during the drift from the initial point of the electrode, we have ascertained that the change of the mobility of positive ions takes place at a definite age i. e., 1×10^{-4} sec.

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5. The Construction of a Mass Spectrometer without the Use of Magnetic Field

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We have constructed a kind of mass spectrometer, without the use of magnetic field, in which the separation of mass of ions was achieved by observing the arrival of short ion pulses of known energy projected through a long drift tube with length L (130cm). When the accelerating voltage of ion pulses is E (300 volts), the velocity of ions is $v=\sqrt{2eE/m}$, and then the time interval between the arrival of pulses of ions with mass m_1 and m_2 at the end of the drift tube will be proportional to $L(\sqrt{m_1}-\sqrt{m_2}$. The apparatus consisted of three parts: ion source, drift tube, and detector.

The ion beam produced at the ion source was interrupted by applying 30 volts to the one of two deflecting plates. When the pulse potential of 100 volts was applied to the another deflecting plate, ion pulses were projected through the drift tube. The ion pulses reached the end of the tube were collected on the first plate of an electron multiplier and the pulses were amplified. These amplified pulses were applied to the vertical plate of a oscilloscope. In our measurement, however, with the residual gas, the pulse size of the oscillograph was very broad. The resolvtion of this instrument generally depends upon the difference of ion energy, which was caused by the initial velocity of ions, different length of ion path, width of ion pulse, and scattering with the residual gas. The dispersion from the different initial energy of ions, Δt_E, is

$$\Delta t_E=\frac{1}{2}\times L\sqrt{m/2eE^3}\times\Delta E=2\times10^{-7}\text{ sec.}$$

The dispersion from the different length of ion path, Δt_L, is

$$\Delta t_L=\sqrt{m/2eE}\times\Delta L=1.6\times10^{-7}\text{ sec.}$$

The effect of scattering with residual gas is complicated and is unable to compute exactly. But the order of scattering is as follows:

Pressure of residual gass, N_2.	Percentage of scatted ions.
10^{-4} mmHg	20%
10^{-5} mmHg	3~5%

Our experimental results were in agreement with the above relation.
