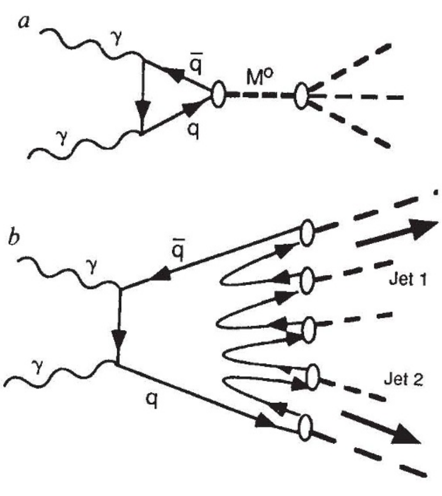

FIG. 2 *a*, Two-photon interaction via a virtual quark–antiquark loop to produce a neutral meson resonance M^0, which in turn decays, for example, into three lighter mesons — the dotted outgoing lines. *b*, Fragmentation of the fast outgoing quark–antiquark pair into jets of mesons (see D. J. Miller *Nature* **349**, 379–387; 1991). Final-state mesons may include π, η, η', ρ, K, K· and so on.

(glueballs). Gluons are neutral, so glueballs should have negligible couplings to photon pairs. New results from the low-energy machines confirm that the two most likely candidate glueball states — the $\eta(1440)$ meson, formerly called ι and the $f_2(1720)$, formerly θ — have very weak couplings to $\gamma\gamma$, but are copiously produced in gluon-rich processes such as ψ/J decay. If the glueballs are proved to exist it will be another success for the quantum chromodynamic theory (QCD), one of the cornerstones of the standard model of particle physics.

Progress is being made in understanding how photon–photon collisions can produce pairs of mesons. This is good old-fashioned 'strong-interaction theory', using methods developed long before QCD appeared. New results on $\pi^0\pi^0$ pairs from the Crystal Ball detector at DORIS (H. Bienlein, CERN) fit well to the known $\pi\pi$ scattering amplitudes (reported by D. Morgan, Rutherford Appleton Laboratory), where the initial coupling to two photons comes from a $\pi^+\pi^-$ pair in the normal diagram (Fig. 1*d*). It has even been suggested that rescattering of $\pi^+\pi^-$ can account for the very high rate of production of pairs of 'vector' mesons such as $\rho^+\rho^-$ seen in many experiments (confirmed by new data from ARGUS at DORIS).

Experiments at TRISTAN (AMY and TOPAZ) and LEP (OPAL, ALEPH and DELPHI) are using their higher energies to test QCD theory at short distances in processes like that of Fig. 2*b* in which very energetic jets of particles are produced in the most violent of photon–photon collisions. Some collaborations also reported an unexpectedly high rate for producing moderately energetic jets of mesons with their momentum transverse to the beam direction bigger than 2 GeV/*c*. M. Drees (DESY) presented his calculation involving gluon radiation which gives high rates for such jets; and J. Storrow (Manchester) demonstrated that a more detailed 'eikonal' calculation gives a rate only about one-third of that predicted by Drees. Present data are not precise enough to check Drees's calculations rigorously, but he predicts that these events will become increasingly prominent at future higher energy linear electron–positron colliders where they could be a serious background to studies of Higgs and W boson production and to top-quark physics.

So far all $\gamma\gamma$ physics has been done using the virtual photons around high-energy particle beams, but V. Telnov (Novosibirsk) has calculated that intense high-energy beams of real photons could be made by scattering laser light from the converging electron beams, a few millimetres from the intersection point of a linear collider. He calls it the Compton collider (Compton scattering being photon–electron scattering), and D. Borden (University of California, Santa Barbara) presented a survey of the unique physics programme which would be possible with it. The most exciting experiment would be the production of the much-sought Higgs boson by a process similar to that in Fig. 2*a*, with the Higgs taking the place of the heavy meson and with a rate calculated from a sum over all possible kinds of virtual charged particles in the loop labelled q and $\bar{q}$ which connects it to the two photons. The Higgs, which is required to explain why most particles have a mass, is predicted to couple to all such particles with a strength proportional to that particle's real mass. This coupling will exactly compensate for the suppression factor which comes in as the real masses of the charged particles in the loop become much greater than their virtual masses. So the production rate for Higgs bosons will have a finite contribution from every kind of charged particle which can couple to it, even if the particle's real mass is much greater than we can ever produce in a collider.

Of course, the collider would need to have enough energy to produce the Higgs — and we do not yet know how much that may be because we do not know its mass — but it would then put rigorous limits on the entire spectrum of elementary charged particles up to arbitrarily high masses. □

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DAEDALUS

Erotic quality

EVEN pop groups these days are urging us all to fight the spread of AIDS by using condoms. Everybody loyally keeps quiet about the fact that condoms are totally charmless objects which nobody would freely choose to use. As well as introducing a depressing air of calculation, social responsibility and clinical procedure into love-making, they make it less pleasurable. The commercial evidence is convincing. Some prostitutes can charge three times as much for intercourse without a condom. Female sexual delight can also be sabotaged. The condom revolution has probably reduced the erotic quality of life by a factor of about three.

Daedalus points out the reason. The nerves of erotic pleasure are stimulated by vibration — this is why sexual vibrators work. In normal intercourse, the vibrations arise from slip-stick friction, subtly evoked by the mechanical compliance of the genital tissues and their natural viscoelastic lubrication. A condom, with its synthetic lubricant and heavily damped rubber, deadens these vibrations and quenches sexual pleasure.

So Daedalus is inventing a condom with its own built-in slip-stick friction. He remarks that no stress–strain curve is truly smooth. On a fine enough scale, every material stretches in little jerks, as individual dislocation sources are activated or molecular segments step from one site to another. DREADCO's chemists are devising a rubber which stretches in jerks large enough to be perceptible. It is loaded with tiny pairs or clumps of magnetized particles. On stretching the rubber, the clumps snap apart one by one as the local tension exceeds their force of attraction. They snap back together in reverse sequence when it is relaxed.

A coarse-grained ionomeric rubber, with clusters of mutually-attracted ion-pairs that also snap apart and snap back in this way, might also vibrate powerfully under stretching or deformation. When one of these rubbers has achieved the required amplitude and frequency characteristics, it will be formed into DREADCO's 'Passionizer' condoms. They should take the market by storm.

A Passionizer will enhance sex from the very beginning. Even putting it on will be a beguiling sensation. As it stretches and relaxes in service, vibrating subtly through every change of loading, it will lyrically enhance the pleasure of both parties. It will do wonders for those nervous or ill-acquainted lovers in whom the need to use a condom is itself powerfully off-putting. The seal of commercial success will come when prostitutes start charging more for intercourse using a Passionizer.

David Jones