Topology

437. D. G. Bourgin: *Linear topological spaces.*

Most of the results concern convex sets. Some theorems on regularly convex sets and weak closures in vector normed spaces are extended to linear topological spaces (l.t.s.) though in some cases a restriction of local convexity of the l.t.s. is required. As a consequence of these results it is shown that a necessary condition for the metrizability of the conjugate space of the locally convex l.t.s. L is that there exist a denumberable basis of bounded sets such that any bounded set in L is contained in a set of the basis. The sufficiency of this condition is already known and the local convexity requirement may be waived here. (Received July 31, 1941.)

438. S. S. Cairns: *The space of a variable geodesic complex on a sphere.*

A simplicial 2-complex on a sphere, S, will be called *geodesic* if its 2-cells are spherical triangles each of area less than a hemisphere. Consider a geodesic complex τ which covers S. Let $T(\tau)$ be the space each of whose points is a geodesic triangulation of S isomorphic with τ, orientation being preserved, where continuity is defined in terms of the positions of vertices. Theorem. *The space $T(\tau)$ is the topological product of projective 3-space and a $(2n-3)$-cell, where n is the number of vertices of τ.* The connectedness of $T(\tau)$ imples that, by continuous motions of the vertices and of the geodesic cells which they determine, it is possible to carry τ into an arbitrary isomorphic similarly oriented geodesic complex on S, no 2-cell becoming degenerate during the motion. Let $T_0(\tau)$ be the space defined precisely as above, but with the stipulation that the vertices of some particular 2-cell be self-corresponding under each isomorphism and remain fixed during each motion. *Then $T_0(\tau)$ is a $(2n-6)$-cell.* There are ready extensions of these results to geodesic complexes which do not entirely cover S and also to rectilinear complexes on a plane. (Received July 30, 1941.)

439. S. S. Cairns: *Topological mapping of a Brouwer 4-manifold on an analytic Riemannian 4-manifold.*

A *Brouwer n-manifold* is a simplicial complex on which the star of each vertex covers an n-cell and admits a piecewise linear homeomorphic mapping into euclidean n-space. The words "piecewise linear" mean linear on each simplex of the star. Theorem. *Every Brouwer 4-manifold can be homeomorphically mapped onto an analytic Riemannian manifold.* This supplements the results of an earlier paper by the writer (Annals of Mathematics, (2), vol. 41 (1940), p. 796). The deformation problem stated in that paper (p. 808) is involved in the proof of the present theorem. It has now been solved, and the solution is included in an article, not yet published, dealing with variable geodesic complexes on a sphere (abstract 47-9-438). (Received July 30, 1941.)

440. Max Dehn: *On the mapping of closed surfaces.*

A system of curves on a closed surface of genus $p>1$ is, apart from deformations, characterized by a matrix of integers with $3p-3$ rows and two columns. The mappings of the surface (conserving the indicatrix), apart from deformations, constitute a group Γ_p which can be generated by screwings parallel to $p(3p-1)/2$ curves. The elements of Γ_p may be regarded as transformations of the characterizing matrices. If these matrices are considered modulo 2, then Γ_p degenerates into a finite factor group which