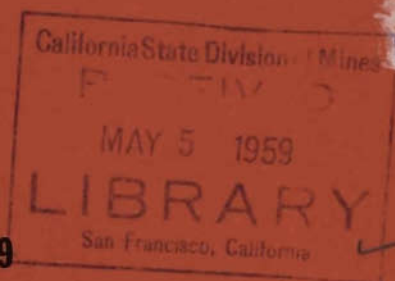


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RELATIONS AMONG SOME DIKES IN
CABARRUS COUNTY, NORTH CAROLINA 1/

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CABARRUS COUNTY, NORTH CAROLINA, OCCUPIES AN AREA UNDERLAIN BY WIDELY FRACTURED, SHEARED, AND INTRUDED PLUTONIC ROCKS. THE REGION CONTAINING THESE ROCKS WAS NAMED THE CHARLOTTE BELT BY P. B. KING (1955, P. 346-350). THE CHARLOTTE BELT APPEARS ON THE NEW GEOLOGIC MAP OF NORTH CAROLINA AS A ZONE CONTAINING MIXTURES OF DIORITE, GABBRO, AND GRANITE (STUCKEY AND CONRAD, 1958, P. 22-23) LYING BETWEEN THE CAROLINA SLATE BELT ON THE EAST AND THE KINGS MOUNTAIN AREA ON THE WEST. THE CHARLOTTE BELT EXTENDS SOUTHWESTWARD FROM THE VICINITY OF WINSTON-SALEM AND GREENSBORO IN NORTH CAROLINA TO ABBEVILLE AND CALHOUN FALLS IN SOUTH CAROLINA.

A DISTINCTIVE GEOLOGIC FEATURE IN THE CHARLOTTE BELT IN CABARRUS COUNTY IS THE MANY DIKES OF WIDELY DIFFERENT COMPOSITION AND AGE. THE VARIETIES INCLUDE ANDESITE, PYROXENITE, GRANITE, PEGMATITE, SYENITE, AND LAMPORPHYRE. THE THIN AND SMALL DARK-COLORED DIKES HAVE OFTEN BEEN INTERPRETED TO BE INCLUSIONS IN THE SALIC PLUTONIC ROCKS, BUT LOCAL CROSSCUTTING ATTITUDES AND CHILLED MARGINS SHOW THAT THESE DARK LAYERS ARE DIKES. THE LARGEST DIKE IN THE COUNTY, A LIGHT-COLORED COARSE-GRAINED AUGITE SYENITE (WATSON AND LANEY, 1906, P. 93), FORMS A RING STRUCTURE (LEGRAND AND MUNDORFF, 1952, P. 28) WEST OF CONCORD. ITS CROSSCUTTING HABIT IS CLEAR, AND THE SYENITE HAS BEEN INTERPRETED BY P. B. KING (1955, P. 348) TO BE ONE OF THE YOUNGEST MEMBERS OF THE PLUTONIC COMPLEX CONSTITUTING THE CHARLOTTE BELT. A LONG HISTORY OF SUCCESSIVE IGNEOUS EPISODES IN THE COMPLEX SEEMS TO BE REVEALED BY A STUDY OF INTRUSIVE RELATIONS AMONG THE DIKES AND BETWEEN THE DIKES AND THE PLUTONIC ROCKS.

SOME OF THE DIKES IN CABARRUS COUNTY ARE EXCELLENTLY EXPOSED IN THE ISENHOUR QUARRY ABOUT 3 MILES EAST OF THE LARGE SYENITE RING DIKE. THE QUARRY IS ON NORTH CAROLINA HIGHWAY 73 ABOUT 0.5 MILE EAST OF CONCORD. THE OPERATOR, MR. C. E. ISENHOUR, PERMITTED THE WRITERS TO MAKE A PLANE-TABLE MAP OF THE EXPOSURE. FIGURE 1 IS A GEOLOGIC MAP OF THE QUARRY. THE ROCKS, IN PART USED LOCALLY FOR ROAD METAL, ARE SAPROLITE, BUT TEXTURES ARE WELL PRESERVED AND FOLIATION, LINEATION, AND OTHER FEATURES CAN BE MEASURED. THE EXPOSURE SHOWS THAT THE DARK-COLORED LAYERS IN THE SALIC ROCKS ARE DIKES, AND THAT SYENITE IS THE NEXT TO YOUNGEST INTRUSIVE IN A GROUP OF CHARLOTTE BELT ROCKS WHICH DISPLAY SIX EPISODES OF INTRU-

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SION.

THE EARLIEST OF THESE INTRUSIONS IS REPRESENTED BY COARSE-GRAINED GNEISSIC GRANODIORITE WHICH CONTAINS INCLUSIONS OF SCHIST. THE SCHISTOSITY OF THE INCLUSIONS GENERALLY CONFORMS TO THE FOLIATION IN THE GNEISS. SOME INCLUSIONS TAPER INTO LONG THIN BIOTITE ZONES THAT MERGE INTO THE GRANODIORITE GNEISS. MOVEMENT WITHIN THE GNEISS HAS CAUSED SMALL MYLONITE ZONES. THESE FRAY OUT ALONG AND ACROSS THE STRIKE.

A SWARM OF STEEPLY DIPPING NORTHWEST-TRENDING DARK-COLORED METAMORPHOSED DIKES, LABELLED ON THE MAP AS ANDESITE, WAS INTRUDED INTO THE GRANODIORITE. LOCALLY THEY DIVERGE FROM A COMMON STRIKE, FORK, AND STRIKE NEARLY EASTWARD ACROSS THE GRAIN OF THE GRANODIORITE. THEY REPRESENT THE SECOND PERIOD OF INTRUSIVE ACTIVITY EVIDENT IN THE ROCKS AT THE ISENHOUR QUARRY. THE FINER GRAIN OF SOME OF THE ANDESITE DIKES PARALLEL TO THEIR MARGINS SUGGESTS THAT THE DIKES HAVE CHILLED BORDERS. THE NORTHWEST-TRENDING DIKES ARE FOLIATED PARALLEL TO THEIR MARGINS. MOVEMENT WITHIN THE GNEISS HAS CAUSED SEPARATION OF SOME OF THE THINNER NORTHWEST-TRENDING DIKES INTO DISALIGNED FRAGMENTS. THE TREND OF THE FOLIATION IN THE GRANODIORITE AND IN THE ANDESITE DIKES, OF THE SHEARING IN THE MYLONITE ZONES, AND THE ORIENTATION OF THE DIKES AND OF THE INCLUSIONS IN THE GRANODIORITE GENERALLY ARE PARALLEL.

A NORTHEAST-TRENDING, MEDIUM-TO COARSE-GRAINED ROCK WITH POSSIBLE GABBROIC OR PYROXENITIC AFFINITIES CUTS ACROSS THE GNEISSIC GRANODIORITE AND NORTHWEST-TRENDING ANDESITE DIKES IN THE SOUTHEAST PART OF THE AREA SHOWN ON FIGURE 1. IT IS YOUNGER THAN THE ANDESITE AND IT IS UNFOLIATED. IT REPRESENTS THE THIRD PERIOD OF INTRUSION AT THIS SITE.

A MASS OF UNFOLIATED MEDIUM-GRAINED GRANITE, DIKES OF THIS GRANITE, AND RELATED PEGMATITE DIKES CUT THE OLDER ROCKS ALONG NORTHEAST-TRENDING FRACTURES. EMPLACEMENT OF THE GRANITE AND PEGMATITE IS THE FOURTH INTRUSIVE PULSE RECOGNIZED AT THE QUARRY. THE CONTACT BETWEEN THE GRANITE AND ITS ENCLOSING ROCKS IS SHARP AND SHOWS NO EVIDENCE OF REACTION. THE LARGE MASS OF GRANITE IN THE NORTHWEST HALF OF THE AREA HAS ABUNDANT SMALL, DARK, ROUND TO ANGULAR INCLUSIONS. THE INCLUSIONS IN THE MAIN MASS OF GRANITE, UNLIKE THOSE IN THE SMALL GRANITE DIKE IN THE SOUTHEASTERN PART OF THE AREA, DO NOT RESEMBLE FRAGMENTS OF THE ANDESITE OR GRANODIORITE. THEY ARE FINE-TO MEDIUM-GRAINED DIORITE UNLIKE ANY ROCK IN THE QUARRY. POSSIBLY THEY ARE METEORITES. THERE ARE NO INCLUSIONS OF SCHIST IN THE GRANITE. THE LITTLE SOUTHERN GRANITE DIKE, WHICH INTERSECTS ROCKS OF THE THREE PRECEDING INTRUSIVE EPISODES, CONTAINS ROTATED BLOCKY INCLUSIONS OF GRANODIORITE, ANDESITE, AND THE GABBROIC OR PYROXENITIC ROCK.

THE FOLIATION IN THE INCLUSIONS OF GRANODIORITE AND ANDESITE IN THE SMALL GRANITE DIKE IS RANDOMLY ORIENTED FROM INCLUSION TO INCLUSION.

ABUNDANT FELDSPAR PHENOCRYSTS ARE SCATTERED THROUGHOUT THE GRANITE. THE PHENOCRYSTS DISPLAY NO PREFERRED ORIENTATION EXCEPT IN A ZONE ABOUT A FOOT THICK AT THE CONTACT. THERE THEY ARE ALIGNED PARALLEL TO THE CONTACT AND ARE ACCOMPANIED BY SIMILARLY ORIENTED PLATES OF BIOTITE. THE ORIENTED PHENOCRYSTS DEFINE A NARROW FLOW BANDING AT THE MARGIN OF THE GRANITE. THE FLOW BANDING, TOGETHER WITH THE ROTATED INCLUSIONS OF GRANODIORITE AND SCHISTOSE ANDESITE IN THE SOUTHERN GRANITE DIKE, INDICATE A MOBILE INTRUSIVE.

THE PEGMATITE DIKES TEND TO OCCUPY NORTHEAST-TRENDING FRACTURES. MOST OF THE FRACTURES ARE JOINTS, BUT A FEW FRACTURES ARE FAULTS ALONG WHICH MINOR DISPLACEMENTS OCCURRED. NUMEROUS OFFSETS CAN BE SEEN IN THE ANDESITE DIKES WHERE THEY ARE CROSSED BY DIKES OF GRANITE OR PEGMATITE. SOME OF THE LARGER PEGMATITE DIKES HAVE COARSE-GRAINED WALLS AND FINE-GRAINED CORES. ONE PEGMATITE DIKE GRADES INTO GRANITE. MOST OF THE PEGMATITE DIKES THIN OUT AND ARE DISCONTINUOUS ALONG THEIR STRIKE.

THE FIFTH INTRUSIVE EPISODE IS SHOWN BY A DISTINCTIVE DIKE THAT CUTS THE GRANITE, THE PEGMATITES, AND THE OLDER ROCKS. THIS IS A LIGHT-GRAY DIKE THAT TRENDS NORTHWEST AND DIPS NORTHEAST. IT IS PROBABLY A FINE-GRAINED SYENITE RELATED TO THE SYENITE RING DIKE. A SIMILAR DIKE HAS ALSO BEEN FOUND IN A QUARRY 3.5 MILES NORTH OF THE ISENHOUR QUARRY. THESE FINE-GRAINED SYENITE IN GRANITE IS CUT BY MINETTE THAT IS SIMILAR TO LAMPROPHYRES WHICH FILL FRACTURES IN THE LARGE SYENITE RING DIKE WEST OF CONCORD.

THE YOUNGEST DIKES AT THE ISENHOUR QUARRY, REPRESENTING THE SIXTH PERIOD OF INTRUSION, CUT AND OFFSET THE SYENITE. THEY ARE THIN AND FINE GRAINED, AND THEY HAVE NUMEROUS SMALL APOPHYSES. THESE YOUNGEST DIKES ARE FOLIATED PARALLEL TO THEIR WALLS. THE ORIGINAL COMPOSITION OF THESE DIKES IS NOT KNOWN, BUT THEIR DARK COLOR SUGGESTS THEY ARE BASIC IN COMPOSITION. THEY DIFFER MARKEDLY FROM THE MINETTE THAT CUTS THE SYENITE RING DIKE WEST OF CONCORD, BUT THEY MAY BE RELATED TO THE POST-SYENITE LAMPROPHYRES.

MAFIC DIKES WITH SHARP, CHILLED MARGINS, THAT ARE YOUNGER THAN THE GRANITE AND OLDER THAN THE SYENITE AND LAMPROPHYRE, HAVE BEEN SEEN IN CABARRUS COUNTY, BUT THEY ARE NOT EXPOSED IN THE ISENHOUR QUARRY.

THE ROCKS AT THE ISENHOUR QUARRY INDICATE REPEATED FRACTURING AND SHEARING. THE DIKES OF SEVERAL

AGES AND COMPOSITIONS HAVE BEEN EMPLACED ALTERNATELY IN PERSISTENT NORTHWESTERLY AND NORTHEASTERLY TRENDS. WATSON AND LANEY (1906, p. 184-187) NOTED A PARALLELISM IN DIRECTION BETWEEN JOINTS AND BASIC DIKES THROUGHOUT THE MAIN GRANITE BELT IN NORTH CAROLINA. MUNDORFF (1948, p. 13-14) HAS MAPPED A LARGE AREA IN ALAMANCE, GUILFORD, AND CASWELL COUNTIES AS SHEARED GRANITE WHICH HE DESCRIBED AS SCHISTOSE OR GNEISSIC AND CUT BY INNUMERABLE DIKES. HE STATES THAT "THE DIKES APPEAR TO BE MORE NUMEROUS AND MORE CLOSELY SPACED ALONG THE MARGINS OF THE GRANITE WHERE IT IS IN CONTACT WITH THE GREENSTONE SCHIST." FUTURE MAPPING MAY SHOW THAT THE COMPLEX OF DIKES DESCRIBED BY MUNDORFF IN THE GREENSBORO AREA EXTENDS SOUTHWARD INTO CABARRUS COUNTY AND, PERHAPS, INTO SOUTH CAROLINA. POSSIBLY DIKES OF DIFFERENT AGES HAVE PERSISTENT TRENDS THAT CAN BE CORRELATED WITH TECTONIC EVENTS IN THE CAROLINA PIEDMONT. LARGE AREAS OF DIKE SWARMS NEAR LARGE AREAS OF ACID AND BASIC VOLCANICS SUGGEST THAT THE INTRUSIVE ROCKS ARE RELATED TO THE EFFUSIVE ROCKS. IT MAY BE THAT THE DIKE SWARMS IN THE PLUTONIC COMPLEX OF THE CHARLOTTE BELT ARE THE SOURCE OF THE LAVAS AND TUFFS IN THE CAROLINA SLATE BELT.

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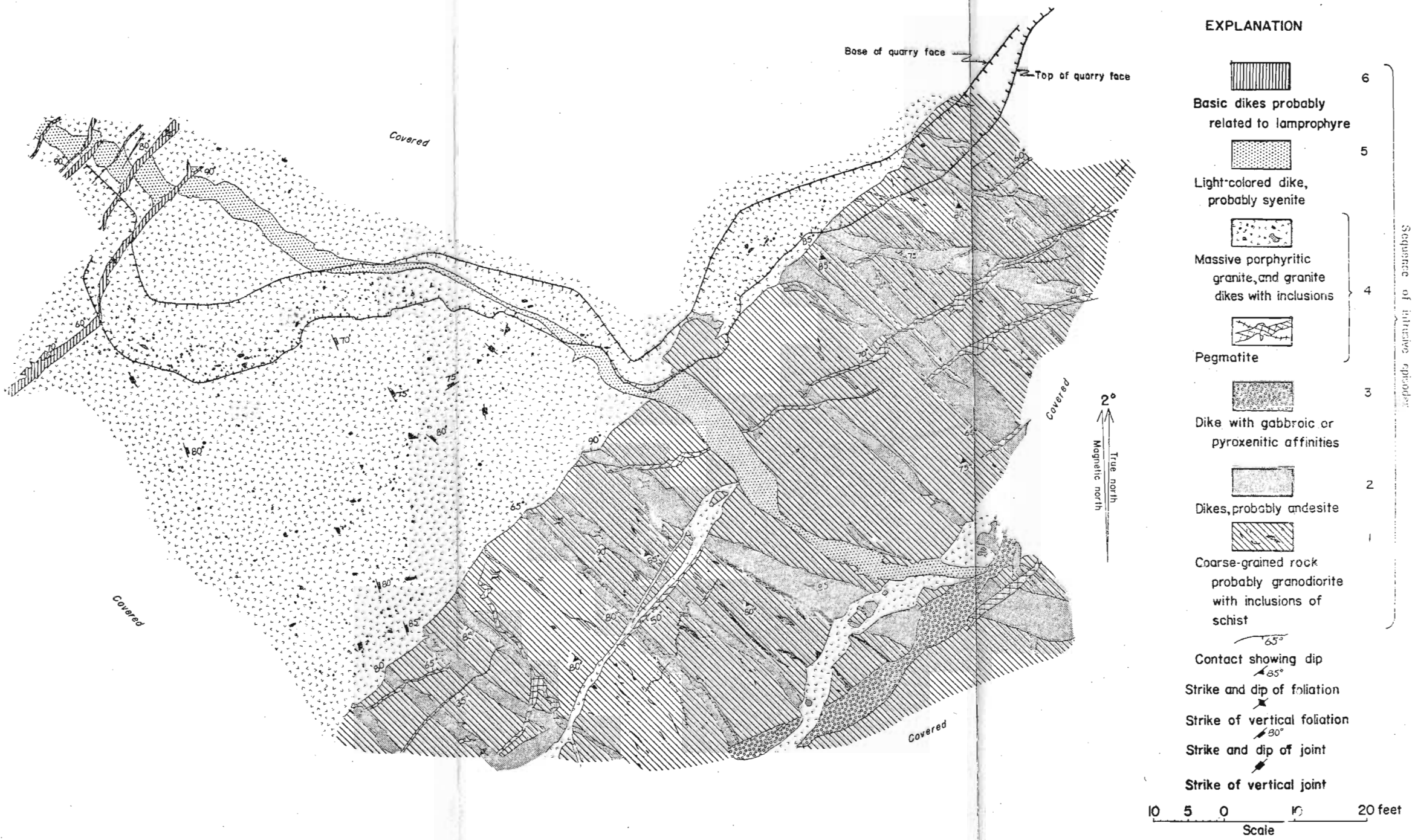
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NOTE

THE FOREGOING ARTICLE, RELATIONS AMONG SOME DIKES IN CABARRUS COUNTY, NORTH CAROLINA, IS PRESENTED BY THE SOUTH CAROLINA DIVISION OF GEOLOGY AS A CONTRIBUTION TO THE GEOLOGY OF THE SOUTHEASTERN PIEDMONT. THE ROCKS STUDIED IN DETAIL BY BELL AND OVERSTREET IN CABARRUS COUNTY ARE ALSO PRESENT IN SOUTH CAROLINA, WHERE THEY ARE IMPORTANT CONSTITUENTS OF THE CHARLOTTE BELT, ONE OF THE PRINCIPAL GEOLOGIC DIVISIONS OF THE PIEDMONT.

THE RELATIONSHIP BETWEEN THE METASEDIMENTARY AND PLUTONIC COMPLEX OF THE CHARLOTTE BELT AND THE VOLCANIC ROCKS AND FINE-GRAINED CLASTIC ROCKS OF THE CAROLINA SLATE BELT IS ONE OF THE PRINCIPAL PROBLEMS OF PIEDMONT GEOLOGY. THE ARTICLE PRESENTED HEREIN GIVES EVIDENCE SUGGESTING THAT THE VOLCANIC MATERIAL THAT IS SO ABUNDANT IN THE CAROLINA SLATE GROUP MAY HAVE BEEN DERIVED FROM SOURCES IN THE CHARLOTTE BELT TERRANE.

IT IS HOPED THAT THIS ARTICLE WILL STIMULATE OTHERS WORKING IN THE PIEDMONT TO UNDERTAKE SIMILAR DETAILED STUDIES WHICH MAY THROW MUCH LIGHT ON THE PROBLEMS OF PIEDMONT GEOLOGY.



Geology by W.C. Overstreet and Henry Bell, 1957

Figure 1. Geologic map of the Isenhour quarry, Cabarrus County, North Carolina

