

Quaternary Dating Methods Symposium

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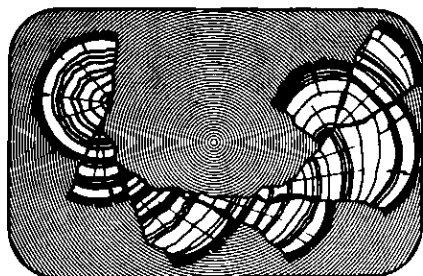
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Conference Reports



Quaternary Dating Methods Symposium

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Participants convened (May 22-24, 1981) at York University to discuss *dating methods* of importance in Quaternary research and over 100 scientists from various institutions attended. Papers were organized into groups dealing with absolute, relative and multiple dating methods.

The first session opened with discussions of radiocarbon dating by J. Terasmae (Brock Univ.) and J. Rucklidge *et al.* (Univ. of Toronto). They reported on some of the limitations and problems involved in using gas counting methods in radiocarbon dating, and the potential value of a new particle accelerator under construction at the University of Toronto, for measuring very small samples. Both speakers stressed the importance of detecting very small concentrations of ^{14}C to permit dating of materials older than 40,000 years. Uranium series dating was discussed by H.P. Schwarcz (McMaster Univ.) and C.E. Stearns (Tufts Univ.). Both speakers summarized the problems of dating different materials, such as corals, mollusca, and speleothems, as well as the importance of using U-series dates in reconstructing sea level and climatic fluctuations. The application of $^{40}\text{Ar}/^{39}\text{Ar}$ to dating young volcanic

rocks provided the topic of discussion for C. Hall and D. York (Univ. of Toronto). They summarized numerous problems, including mineral separations and enrichment of radiogenic ^{40}Ar . They stressed that ^{40}Ar can be used for very young samples down to near zero age, and further, that results are often superior to K/Ar determinations.

The afternoon session began with a paper by R. Walter and J.A. Westgate (Univ. of Toronto), who described fission track dating where ages are based on tracks counted in separate grains, and tephra characterization as it applies to dating continental sequences. They stressed the utility of using the fission track method for dating of distal-ash grade tephra. R.W. Barendregt (San Francisco State University) discussed paleomagnetism as a technique for relative and absolute age dating of a variety of deposits. Shortlived excursions in the continental paleomagnetic record will likely provide a useful correlative tool as more work is carried out on terrestrial sequences. A second contribution on paleomagnetic dating was given by M. Stupavsky and C.P. Gravenor (Univ. of Windsor). They outlined the problems of matching polarity transitions in undated sequences of deposits with the radiometrically dated magnetic polarity time scale and evaluated the problems of using small amplitude time variable characteristics (excursions) in successful dating and correlation of sediments. Improved sampling techniques, magnetic cleaning, screening and smoothing of sediment magnetic remanence help to refine the magnetic calendar. Dates obtained by measurement of hydration thicknesses on obsidian clasts were discussed by I. Friedman and F. Trembour (U.S.G.S., Denver, Colo.). They stressed the immense time frame over which the method operates - several million years - as well as the precision of measuring hydration thickness, and factors controlling the rate of hydration. Thermoluminescence dating was reported on by M. Lamothe *et al.* (Univ. of Western Onta-

rio). They explored the use of quartz particles in the 100 to 140 μM and 40 to 70 μM sizes and polymineralic fine silts (4 to 11 μM) to determine TL ages over most of late-Pleistocene time. Amino acid dating of molluscs, utilizing the racemization reaction where the L-form (left-handed) develops into an equilibrium mixture (50-50) of D (right-handed) and L amino acids, provided the subject of discussion by J. Wehmiller (Univ. of Delaware). He evaluated the method utilizing samples within radiometrically dated sections and stressed that several genera give increasing D/L values with older ages, and that each genus achieves racemic equilibrium in samples ranging from Miocene to early Pleistocene age. The utility of using amino acid D/L ratios in dating wood samples was reviewed by N.W. Rutter (Univ. of Alberta). He assessed the ratios found in aspartic acid, and cautioned that the correlation of ratios in sedimentary sequences must be based on assumptions of similar climatic and environmental histories. The use of amino acid ratios in wood does not appear to be applicable to units older than Sangamonian age. The principle, limitations and application of tree-ring dating was discussed by M.L. Parker *et al.* (Forintek Canada Corp., Vancouver B.C.). They reviewed the method and stressed the importance of X-ray densitometry in measuring ring width and density as well as the value of computer cross-dating to match samples that are difficult to date using other matching techniques.

The third session opened with a paper on lichenometry by P.E. Calkin and J.M. Ellis (S.U.N.Y., Buffalo). They examined the successful use of lichen measurements to date Holocene geologic events in the Brooks Range, Alaska. The problems of determining a time-size curve for slow growing *Rhizocarpon geographicum* formed the central part of their discussion. The value of landform characteristics in determining the relative ages of landscapes was reviewed by D.R. Coates (S.U.N.Y., Binghamton, N.Y.). He synthesized the use of various relative

age indicators, such as drainage density changes, hypsometric integrals, bifurcation ratios, stream junction angles, spur morphology and hillslope geometry. The employment of paleosols as a relative age dating tool was examined by W.J. Vreeken (Queen's Univ.). He reviewed several principles of age relationships between soils and surfaces, and summarized the use of soil properties as time indicators. The use of pollen assemblages to check the accuracy of radiocarbon dates and for relative dating beyond the range of 50,000 yrs. formed the nucleus of the discussion by A.M. Davis (Univ. of Toronto). He explored numerous problems resulting from variations in pollen spectra, redeposition of pollen from older sediments, size of the pollen sum, and use of numerical clustering methods. Changes in vertebrate faunal groups from Blanford, through Irvingtonian and Rancholabrean Land Mammal ages was discussed by C.R. Harington (National Museums of Canada, Ottawa). He analyzed the evidence for the first appearance of *Bison* in North America at the end of the Irvingtonian Age as well as conflicting absolute age determinations on the same materials. The use of Pleistocene insect assemblages to differentiate particular interglacial and interstadial geological horizons in Britain and North America was described by A.V. and A. Morgan (Univ. of Waterloo). They reported on the degrees of similarity among insect faunas in different beds of Sangamonian age and discussed the major difficulties involved in correlation.

The final session began with a report by A. MacS. Stalker on till sheet characteristics from several sections in the southwest Canadian Prairies. Deposits are distinguished by postglacial chemical alteration, compaction, structure, jointing, style of breakage and oxidation features. C.W. Finkl (Nova U., Dania, Fla.) investigated the chronological ordering of pedological episodes vital to the reconstruction of paleoenvironments. He stressed the importance of micromorphological data as a tool in establishing chronological sequences of soils, especially in deeply weathered tropical terrain. W.C. Mahaney, D. Halvorson, J. Piegat and K. Sanmugas (York Univ.) evaluated multiple dating methods used to differentiate Quaternary deposits in the Wind River and Teton ranges, Wyoming. They stressed the importance of lichenometry, weathering characteristics and soils as age indicators, and paid particular attention to the use of Fe ratios (oxalate extractable/dithionite extractable iron) and quartz/feldspar ratios, clay mineral composition, and organic properties in age differentiation. Relative and

absolute dating methods applied to dating late glacial sediments in the Lake Agassiz Basin provided the basis for discussion by R.W. Klassen (Geological Survey of Canada, Calgary). He assessed the discrepancy between absolute and relative chronologies, and suggested that the oldest ^{14}C dates may be contaminated with dead carbon. The relative chronology suggests a shorter time interval because it does not account for several low water stages of Lake Agassiz and at least one major readvance of continental ice. W.J. Wayne (Univ. of Nebraska, Lincoln) described the use of several relative dating methods used in the Rio Blanco Basin, Cordón del Plata, Mendoza Province, Argentina, to date glacial and periglacial deposits. These methods included zircon fission track, deposit morphology, loess thicknesses, soil profile development, vegetation characteristics and lichens.

The papers were followed by a panel discussion on Saturday evening. The panel was chaired by C.S. Churcher (Royal Ontario Museum, Toronto), D.R. Coates, H.B.S. Cooke and J. Terasmae. They reviewed and assessed the information presented by various speakers. This ended with a short, but lively discussion led by C. Kolb (Louisiana State Univ., Baton Rouge, La.) on the suitability of salt domes in Louisiana for nuclear waste disposal. The importance of using various dating methods to determine the ages of salt domes and overlying stream terraces cut in late-Tertiary sediments formed the major thrust of his discussion.

The Symposium abstracts-with-program and field guide may be obtained from W.C. Mahaney for \$3.00. The proceedings will be published in 1982 by A.M. Dowden Inc., Stroudsburg, Penn.

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Geological Survey of Canada's Current Activities Forum

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About 300 people braved the rigours of one of the coldest Januaries on record to listen to 20 talks and view 34 technical exhibits over January 20 and 21, 1982, at the Skyline Hotel, Ottawa. Some 200 of them are used to such weather - they live in Ottawa. The remainder came from points as distant as Halifax and Vancouver. For some time the GSC has been asked by industry spokesmen to hold an annual review somewhat along the lines of the successful Yukon and NWT forums held each December. The Ottawa meeting is a response in part to these requests. A first, it was successful and may well become an annual affair.

Brand-new GSC Director-General R.A. Price, 20 days into this new career but with all the right credentials and skills, welcomed attendees to the Forum, noting that the GSC's responsibilities include increasing our understanding of the country both for the development of resources and for the wise use of the land. Deputy Director-General J.G. Fyles told participants that the GSC has a total manpower of about 750, including 250 scientists, and has about 450 active projects, 200 of which involve field work.

The 19 technical papers that followed were organized in a somewhat random fashion, perhaps to encourage everyone to take in the complete program. Papers group into about six areas: Precambrian geology, mineralization, geophysics, exploration methods using surficial materials, surficial material studies, and mineral resource appraisal. At least 11 of the 19 talks had one page typewritten abstracts available.

What better way to start off a Precambrian session than with Paul Hoffman's elegant account of the tectonic zonation and origin of the Wopmay Orogen, surely