

Y Cymry 'N Erbyn Yr Eira The Influence of Snow on the Welsh Settlements of North America

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ABSTRACT

At the time of North American colonisation, the Welsh, though familiar with snow and dependent upon the wet conditions prevailing from snowmelt runoff, were relatively unfamiliar with techniques to cope with snow or harsh winters. Because of their persistent hold on the Welsh language it is possible to trace the success and persistence of Welsh settlements in the New World and relate this to the snow and climate conditions prevalent with settlement. The experience and climates of 33 Welsh settlements were examined. It is shown that Welsh settlements could not thrive as cultural units in severe winter or snowy conditions. However, successful Welsh settlements are never found far away from snowmelt runoff and its agricultural and industrial consequences. The success of Welsh settlements in Pennsylvania and Ohio to this day are examples that demonstrate this. It is suggested that the cultural link to the landscape and weather of the homeland as expressed in snow hydrology may play a role in the success of immigrant communities in the New World.

Key Words: Wales, snow, Welsh-Americans, climate change, environmental determinism

INTRODUCTION

The distinctive Welsh contribution to North American life, economy, science and culture is considered by many to be unexceeded per capita amongst immigrant groups (Hartman, 1967; Thomas, 1972; Bennet, 1985; Davies, 1990). Important to this contribution was the early influx

of Welsh settlers in the Colonial period and their historical skill in retaining their culture in a predominately English (Sais) milieu. Also important was the geographical selection of sites for "Welsh Colonies" where a critical mass of colonists could retain community values in an environment suited for the use of Welsh agrarian and industrial skills and knowledge. One sometimes adverse element the Welsh contended with in the New World was winter, with often very different snow accumulation and melt regimes and winter extremes of climate from those experienced in the coastal lowlands of Wales. However, runoff water from the seasonal melt of upland snowcovers provided a necessary basis for industry in both Wales and the new industrial settlements of mid-America (Davies, 1990; Evans, 1974; Izant, 1953). The Welsh have a strong cultural relationship with water, dating from pre-Christian religious beliefs that held springs, wells, rivers and the cyclic nature of water to be focal points of religious practise (Dooge, 1996). This dichotomy of relationship with winter and water put successful Welsh settlements in North America under the same restrictive geographical requirements as those in the homeland. A mild climate was beneficial for a strong agricultural economy but substantial runoff was required for heavy industry associated with coal. The combination of temperate valley/lowland settlements adjacent to snowy uplands seemed to provide a solution in both new and old world. This paper examines the dichotomous relationship of the Welsh with snow and climate and how it may have influenced the successes and failures of Welsh settlement in the New World. By using the excellent historical records of Welsh colonies and

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regional representations of climate and hydrology, the relationship of these colonies to environmental conditions can be ascertained.

WALES - HEN WLAD FY NHADAU: SOURCE OF THE DIASPORA

Wales is a small mountainous Celtic nation on the western fringe of Britain. It is girted by sea on three sides and faces Lloegr (England) on the east side. Elevations rise from sea level to about 1100 m at the highest mountain, Y Llofa (Snowdon). Wales is the cultural and national home of the last Britons and the oldest living European language. A marginal agricultural economy of upland grazing and lowland tillage characterized Wales for much of its history since Roman times. Defensive measures against the Romans and later the Sais (English) sometimes forced the Welsh to retreat to hillforts in the damp and snowy mountains (Evans, 1974; Davies, 1990). The Welsh skill at survival in such inclement locations permitted their independence and cultural survival when opposed by wealthier and larger populations. The industrial revolution brought dramatic change to Wales as coal mining, heavy iron and metal working industry developed along with hydro-electric power in the southern lowlands. Immigrants from Wales in the 19th century brought not only agricultural but valuable industrial skills with them to the New World. The combination permitted successful and cohesive Welsh Colonies whose success can be traced (Williams, 1946; Hartman, 1967; Izant, 1953).

SNOW IN EARLY WALES

Snow as snow cover and snowmelt runoff had a major impact on rural and village life for the Medieval Welsh. Inclement winter weather and resulting snowdrifts and floods helped to prevent the Normans from conquering the Welsh hills for hundreds of years after the English lowlands had been conquered in 1066. Arable land in Wales was limited by short growing seasons for grains to the lower elevations (Gerald of Wales, 1193; Thomas, 1986; Davies, 1990). The extent of tillage depended upon the climate which has varied throughout history. A climatic optimum from roughly 1000-1300 AD permitted the extension of tillage above elevations of 200 m (Thomas, 1986; Davies, 1990). This permitted better linkage between the populated valleys of Wales which may

have promoted a more organized resistance to the Norman/English invaders. A seasonal snowcover developed in the lowlands during the Little Ice Age (1400-1700 AD) concomitant with agricultural decline and the last Welsh independence under Owain Glyndwr (1400-1410 AD) (Jones and Pomeroy, 1996). During this colder period Wales remained a poor agricultural land under the domination of the English. The Welsh farmer, whilst knowledgeable about snow, did not have to cope with it for long periods in the winter. The Welsh herdsman, however, dealt with the difficulties of mountain snowcovers, deep drifts and snow storms but formed a smaller yet prosperous component of the population.

Figure 1 shows snow in Wales today with the number of days experiencing snowfall and having snow cover in various altitudinal bands (Waring, 1981). The high mountains have over 100 days per year with snowfall and up to 160 days per year with snow cover. Coastal regions have less than 20 days per year with either snowfall or snow cover. Snow cover remains usually only a day or two after the snowfall. It is clear that the country is strongly divided with respect to its snow hydrology. The lowlands experience little snow, yet receive much runoff from snow. The uplands receive frequent snowfalls in winter and spring. It is clear that Welsh colonists dependent upon cultivation would have little experience from their homeland with either long snow-covered periods or shortages of water.

Snow in Wales Today

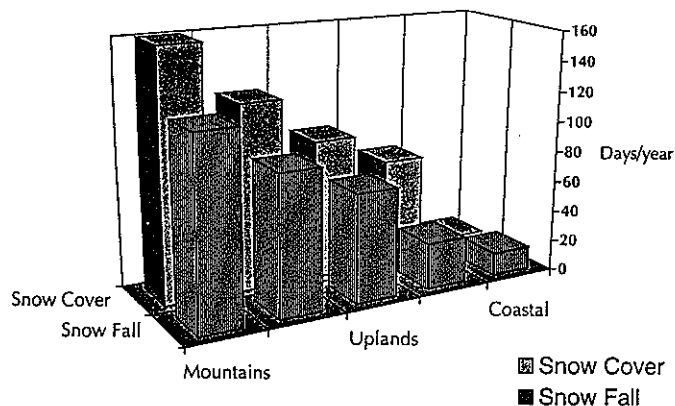


Fig. 1 Snow in Wales Today. Days per year having snow cover and having snowfall in Wales. Coastal: 0-200 masl, Uplands: 200-600 masl, Mountains: 600-1100 masl.

Y Wladfa: THE NEW HOMELAND

The Welsh romance with the establishment of a new, pure Wales, a homeland or *Gwladfa* free from the problems of *Cymru* (Wales), has persisted since the establishment of Brittany by Welsh and other Celtic colonists during the period of Saxon incursion in Britain. The early drive for *Gwladfa* reached spectacular heights with the legendary sailing of Prince Madoc ap Owain Gwynedd to America with 11 ships and the intent of colonising in 1170 AD (Pugh, 1970). Madoc had reputedly learned of America from his Norse mother. The successful development of this colony is doubtful. Disputable archeological evidence from the Allegheny Mountains (Tennessee) and Ohio River valley can be interpreted as stone fortifications/forts, out of character with indigenous habitations (Pugh, 1970). Cherokee legends relate the destruction of the "Iron shirts" in the Ohio River valley in the centuries before Columbus. William Clark and Meriwether Lewis (DeVoto, 1953) noted fair skin, hair and eyes and the usage of Welsh words, mud huts with thatched roofs, agriculture and coracle boats amongst the Mandan Indians of North Dakota before their extinction by small pox in 1836.

The possibility remains that Welsh colonists established remarkable settlements in the southern Appalachians/Ohio River valley, were defeated in war, and that the remnants retreated to the northern US great plains to be assimilated with indigenous populations and cultures (Deacon, 1965). If so, the establishment of Madoc's Colony would have been made during a climatic optimum (Fig. 2, IPCC, 1990) and the lack of recognizable European culture in the remnants amongst the Mandans *might be* related to the gradual decline of air temperature and the associated increasing harshness of climate.

The actual existence of Madoc's Colony is less important to subsequent modern history than the legend of *Gwladfa* that prompted extensive Welsh emigration, "Welsh or Madoc Fever", to America in the late 1700s and early 1800s (Davies, 1990; Greenslade, 1986). The discovery of America by Prince Madoc was also used by the English government of Elizabeth I to claim North America with priority over the Spanish claim, using Elizabeth's descent from the Welsh Tewdwr's. With British and then additional United States hegemony over North America secured using Madoc's claim and subsequent wars of conquest, the foundation was laid for the historical Welsh settlement period.

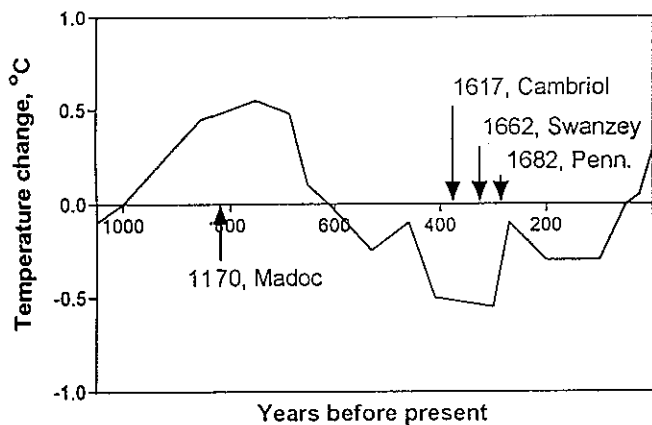


Fig. 2 Climate Change during Welsh Settlement. Time line of the global temperature variations during the past 1000 years and the foundation of early Welsh settlements in North America (IPCC, 1990)

In the historical period approximately 32 Welsh colonies can be identified in North America (Hartman, 1967; Bennet, 1985). These colonies were often established for religious or idealistic reasons and functioned as communities. Their success can often be indicated by the persistence of the Welsh language or particular religious or cultural institutions. For example, in the Welsh settlements of the counties of Jackson & Gallia, Ohio, teams are regularly sent to the National Eisteddfod in Wales, Welsh is taught in the schools and at the local university. The occasional emigration from or immigration to Wales, the local cultural centre and the hosting of Welsh conferences at the university (Rio Grande University) keeps some connection between the settlement and Wales despite 178 years since establishment. Figure 3 shows the location of 32 modern and one conjectural (Madoc) colonies, numbered in order of their establishment. The locations of corresponding source areas in Wales, where known, are also shown. The names and dates of establishment of these colonies are indicated in Table 1. It is clear that most Welsh settlement attempts were in a band from Pennsylvania, through Ohio in the east to the upper American midwest (Wisconsin). Interestingly, the focus on the Ohio valley matched one area of suggested early settlement by Madoc's Welsh. In Canada, most settlements were in the Atlantic provinces. The Welsh source areas of these colonies were the *gwerin* (country folk) from mainly agricultural West Wales (Dyfed) where land enclosure by English landlords forced the expulsion of many farmers. These *gwerin* would have little familiarity with snow, being from the low and middle elevations of Wales.

Table 1: Welsh settlements in North America, location on Figure 1, name, present location, and foundation date.

No	Name, present location	Date
1	North Dakota	1170
2	Cambriol, Newfoundland	1617
3	Swanzey, Massachusetts	1662
4	New Wales, Pennsylvania	1682
5	Pennepek, Pennsylvania	1683
6	Gwynedd, Pennsylvania	1697
7	Pencader, Delaware	1702
8	New Hanover, North Carolina	1730
9	Putnee River, South Carolina	1735
10	Oneida, New York	1795
11	Cambria, Ohio	1796
12	Paddy's Run, Ohio	1801
13	Radnor, Ohio	1801
14	Gallipolis, Ohio	1818
15	Welshpool, Nova Scotia	1819
16	Cardigan, New Brunswick	1819
17	Brecon, Ontario	1820
18	Londonderry, Nova Scotia	1827
19	Gomer, Ohio	1833
20	Old Man's Creek, Iowa	1838
21	Genessee, Wisconsin	1840
22	Racine, Wisconsin	1842
23	Columbia, Wisconsin	1845
24	Oshkosh/Utica, Wisconsin	1847
25	Jordan River, Utah	1849
26	South Bend, Minnesota	1853
27	Emporia, Kansas	1856
28	Brynfynnon, Tennessee	1856
29	Howard County, Iowa	1858
30	Beaver Creek, Oregon	1880
31	Powell, South Dakota	1883
32	Wood River, Alberta	1900
33	Bangor, Saskatchewan	1902

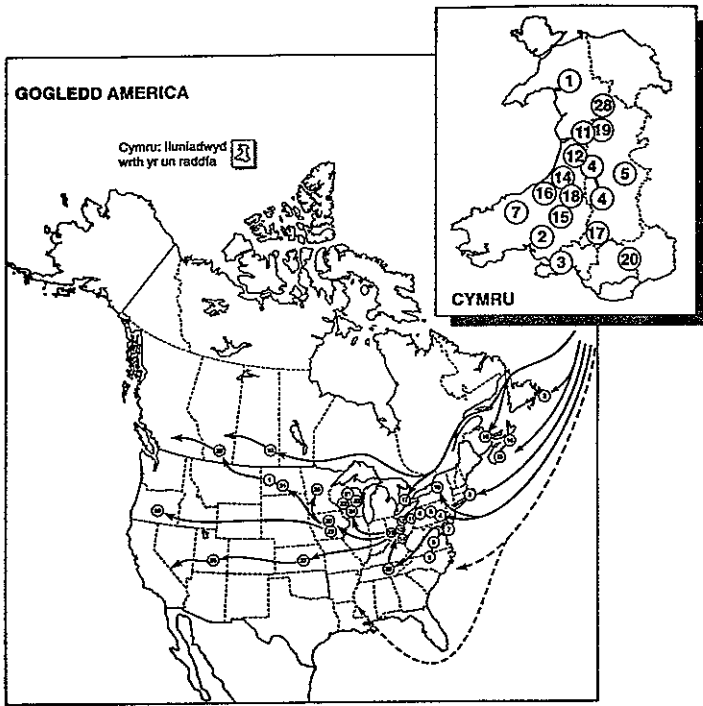


Fig. 3 Location of Major Welsh Settlements in North America and Source Areas in Wales, 1170-1902. see Table 1 for names, dates, etc.

The preference of Welsh colonists for an east-west band of settlement is interesting but does not indicate whether this was an appropriate settlement strategy. Figure 4 shows the number of Welsh immigrants retained by various states or provinces. Notably the American south and extreme north retained very little settlement as did eastern Canada and the Canadian prairies. The mid-American Welsh settlement band is striking as being also the zone of successful population retention, with Pennsylvania and Ohio dominating the population the US and Ontario dominating in Canada. This confirms that locations of original settlement can still be seen in the present statistics and that the east-west mid-American band of initial settlement was largely appropriate. Similarities between the settlement regions and Wales may have played a role in this success.

INFLUENCE OF SNOW HYDROLOGY ON SUCCESS OF WELSH SETTLEMENT

The reasons for the success or failure of the various colonies are broad; famine, heat, long winters and poor fishing due to icebergs are evident

in the few examples discussed here. Such factors relate somewhat to the snow hydrology of the settlement regions. Cambriol in Newfoundland was established in 1617 at the height of the Little Ice Age (Fig. 2) by an aristocrat, Sir William Vaughn. His settlers lived in miserable conditions with little freedom. The colony's governance was delinquent, but heavy snowfalls caused agricultural failure and frequent icebergs on the coast prevented fishing, certainly playing a great role in the demise of Cambriol in 1635 (Williams, 1924). The Massachusetts colony of Swanzey (1662) survived the Little Ice Age but in a more moderate climate. Better soils, less snowfall, shorter, mild winters and a cohesive community may have helped it to flourish, despite the cold conditions of the time (Ludlun, 1966). Another early colony to the south in Pennsylvania (New Wales, 1682) also succeeded for similar reasons. As technology progressed and the climate improved in the 18th and 19th century, the strict limitations imposed by environmental conditions became less important in the survival of the immigrants but still important in the retention of the population. Given a choice, a Welsh farmer would immigrate to a region where his agricultural tradition was relevant and where the *Cymry* had settled rather than to an excessively hot, cold or dry region.

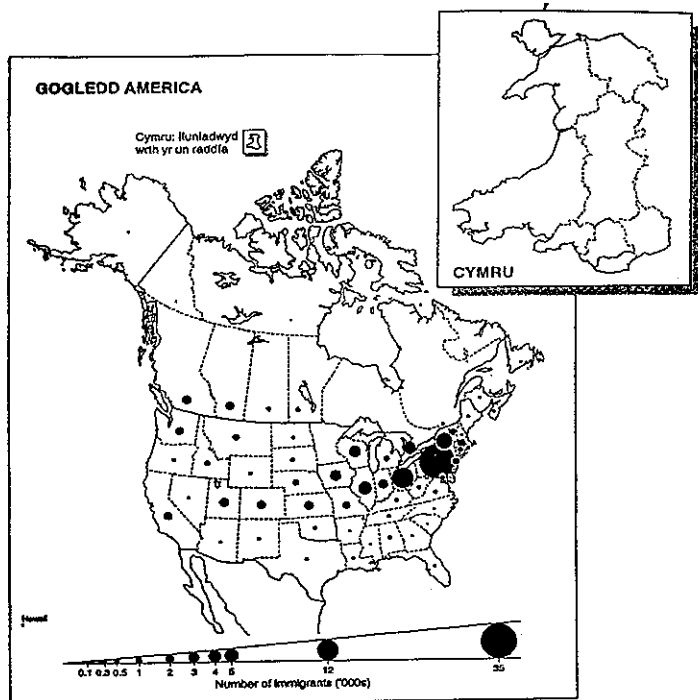


Fig. 4 Welsh population by State or Province, after settlement.

Snow hydrology also influenced the success of industrial technologies. Part of the reason for the success of the Ohio-Pennsylvania Welsh settlements was the introduction of coal mining and heavy iron industries from Wales. The iron industry required substantial runoff and sufficient runoff was found in these settlements along with appropriate raw materials.

Did snow, hydrology and climate along with more traditionally considered factors play a role in the success of these colonies? To quantify the conditions, average hydrology and snowfall are compared for the Welsh source area (Dyfed) and seven areas of settlement (Ohio, Pennsylvania, Massachusetts, Newfoundland, Virginia {Delaware-North Carolina}, North Dakota/Saskatchewan and Tennessee) in Figure 5. Data for this plot are gathered from the Atlas of World Water Balance (Korzoun et al., 1976) whose techniques for estimating and extrapolating precipitation and evaporation are uniform over and appropriate for the study area. For instance Budyko's method is used to estimate evapotranspiration, snowfall data is corrected for wind effects, orography is considered, etc. The estimates for Wales are consistent with published data from experimental basins in Plynlimon (Rodda, 1996). The data show that annual precipitation is similar in most regions at between 1300 and 1600 mm/year except for North Dakota/Saskatchewan where it is less than 500 mm/year.

Snow Hydrology - Cymru & Gogledd America

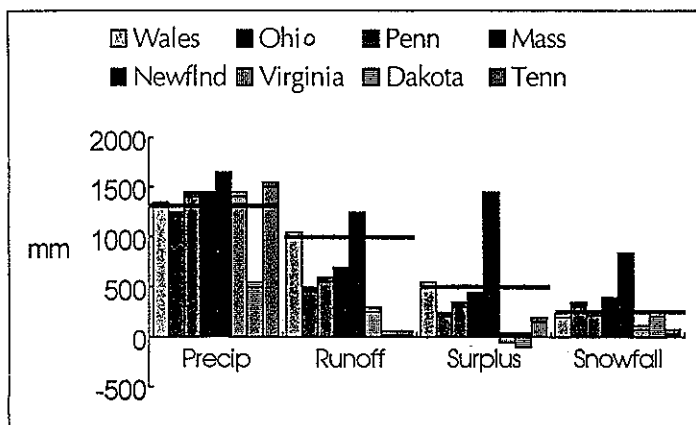


Fig. 5 Snow Hydrology of Wales and North American Welsh Settlements. Average annual conditions for the settled lowlands of west Wales and the regions where Welsh attempted settlement in North America (after Korzoun et al., 1977)

Annual streamflow runoff in the agricultural zones of Wales is about 1000 mm/year. Newfoundland is slightly higher at 1300 mm/year and the colonies in Ohio, Pennsylvania and Massachusetts have 500-700 mm/year. It is known that many successful settlements in these areas are located in regions of locally heavier runoff than the regional mean, such as along the margins of low mountains. The North Dakota/Saskatchewan, Virginia and Tennessee settlements have substantially lesser runoff, at 50 to 200 mm/year. Again, the location of Bangor, Saskatchewan on the margins of Moose Mountain and by the Qu'Appelle Valley promotes locally higher runoff.

Surplus in the annual water balance is roughly similar from Ohio, Pennsylvania and Mass. to Wales (250-500 mm/year) but an excessive surplus of 1400 mm/year in Newfoundland and water deficits in Virginia and North Dakota/Saskatchewan suggest that farming techniques in these latter areas would be substantially different from Wales. Snowfall is roughly similar at about 200 mm/year in Wales, Ohio, Pennsylvania, Massachusetts and Dakota/Saskatchewan but substantially more at 800 mm/year in Newfoundland and substantially less in Virginia and Tennessee. The dates of snowfall disappearance for Massachusetts, Pennsylvania and Ohio are a month to six weeks earlier than that in Newfoundland and much later than that for Virginia and Tennessee (McKay and Gray, 1981). These differences may have been accentuated in the Little Ice Age, even up to the mid-1800s.

The comparison of hydrology and snowfall amongst sites is instructive because certain regions differ substantially from Wales on several points. Except in the high Smoky Mountains, Tennessee has very little runoff, a small water surplus and negligible snowfall compared to Wales. Virginia has slightly more runoff but a water deficit and small, irregular snowfall amounts except on its highest Allegheny Mountains. North Dakota/Saskatchewan has substantially lower annual precipitation, negligible runoff and a water deficit. Newfoundland has a substantially higher water surplus and snowfall than any other site. Only Ohio, Pennsylvania and Massachusetts have similar hydrological and snow hydrology characteristics to Wales on all points. Interestingly these are the areas of successful Welsh early colonisation or later highly successful Welsh colonisation and subsequent settlement. The Welsh colonies in Virginia, Newfoundland and Tennessee all either failed immediately or grew slowly and were abandoned. Any remnant of Madoc's Colony had

integrated with the local Mandans in North Dakota, who became extinct in 1836. The successful Saskatchewan settlement of Bangor (1902) is an exception with a curious explanation. Bangor was settled by Welsh refugees from the troubled Gwladfa in Patagonia, South America. Patagonia is harsh and dry, hence these refugees would have had experience in dryland farming techniques on the open grasslands.

DISCUSSION

There would appear to be a remarkable correspondence between the success of Welsh settlement and the similarity of snowfall and hydrological conditions prevailing in the new sites to Wales. The settlers of Ceredigion (Cardiganshire, Dyfed) in Jackson County, Ohio noted this with comments that they chose the land because it reminded them of home (Izant, 1953). Certainly to this day the "Welsh Hills" are reminiscent of west Wales as the rolling, lower ground to the east rises to sharply defined higher land in the south and west. Both areas receive orographic precipitation which promote a dependable water surplus, in the case of Jackson, this surplus is much less on the plains to the west and north. In the cases of successful settlement, snowfall is quite similar to lowland Wales, yet local runoff is high because of nearby snowy uplands, as in Wales. The persistence of Welsh culture is well correlated with the success of the Welsh colonies and settlements (Hartman, 1967; Thomas, 1972).

CONCLUSIONS.

Welsh Colonies in North America (Gwladfa) because of their initial lack of knowledge of farming in snowy environments, familiarity with farming and industry in a wet environment, persistence in adverse situations and strong cultural identity make useful examples of the influence of snow and hydrology on an existing cultural tradition. The Welsh immigrant communities in North America can be traced as succeeding in a particular belt across the central middle and eastern United States. This belt has similar hydrology and snowfall to that of lowland Wales, from whence the settlers emigrated. The landscape and hydroclimatology of Wales exerts a strong influence on its people. As immigrants to a new land, they sought comfort in the familiar and hence aspects of

snow hydrology may have played a strong role in the success of Y Wladfa and the retention of Celtic cultural values in the New World.

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