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PRACTICUM I : PRODUCTION PROCESSES

1. For Practicum 1 I have selected the pile of nails in the basement level of Rhode Island Hall in a display with other objects found at the John Brown House. The nails look to have been made using iron and are about 2 inches long. The nails seem to have been found in a poor state of preservation being that they are covered in rust which is chipping, or flaking off.
2. The nails seem to have been made using a furnace that would have stimulated a chemical reduction process that would have started by the smith introducing ore into the furnace which would have a controlled temperature below that of the melting point of iron: between 1100 and 1300 degrees Fahrenheit. Most of the excess that was not iron would have been melted out into the slag. I say this because it does not seem to me that the nails were cast which would require the iron too to be melted, but instead it seems more probable that the iron was made into a workable mass by the use of a Tripp hammer or by a smith. Judging by the fact that the nails were found at the John Brown house, which was completed in 1788¹ it could be that the nails were made in a water powered iron mill. In any case in order to make ore into workable iron, temperature must be controlled, which is an indirect variable that can be directly controlled by the amount of fuel fed into the furnace, consisting of charcoal & the ore along with directly controlling the air amount. In order for the aforementioned chemical reduction process to happen (Fe_2O_3 to Fe) CO presence is also necessary, however the CO presence is an indirect variable resulting from the burning of the charcoal which is introduced to the furnace as fuel.
3. It is hard to tell if the nails were created successfully, the biggest problem with them is the rust. The rust on the nails seems likely to be a result of oxidation which could have easily happened over a period of time in rainy Rhode Island weather. The only way I know that could have prevented the rusting would have been to galvanize the nail but I do not think the manufacturer of the iron nails of that time would have known how, or had the means to since that technology wasn't patented until later on. The nails do seem to be slightly unequal in length from one another however this would have been hard to control since they were not cast and the nails that seem skewed or bent were probably so not due to a fault of the maker but probably because of how they were pulled out.
4. One unanswered question that could affect my inspection into how the nails were made is the dating of the nails and in what kind of place they were made. I could not

¹ Rhode Island Historical Society. February 4 2011. <<http://www.rihs.org/museums.html#jbh>>

find any dating of the nails and had to assume based on contextual evidence that they were made around 1788 when the John Brown house was completed. According to Paul Craddock, Nigel Meeks and Simon Timberlake, x-ray diffraction could establish what minerals were present in the nail and then inductively coupled plasma spectrometry could help determine how these elements were changed during smelting. My thought is that if after these analyses the results are significantly similar for each nail then it is most likely that they were all made in a large-scale iron mill which would produce more consistent iron since the variables affecting production would be controlled by regulated water power to feed the air supply and would be rid of impurities more consistently by the Tripp hammer, than iron made by an individual in a less controlled setting.