

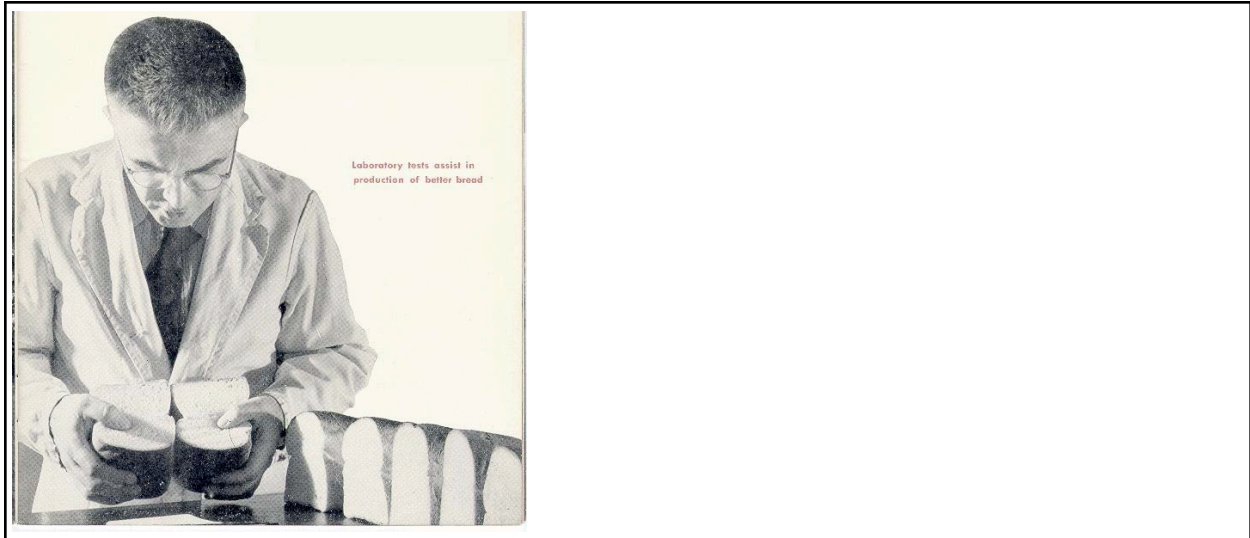
First the Loaf:

A Hybrid History of Wheat Improvement

A paper presented for discussion by members of the Agrarian Studies Colloquium,
Yale University,
September 24, 2004.

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NB: Please consult the author before citing this paper.



In spite of a good deal of critical interrogation into the socio-historical contingency of science and technology, and of modernity, historians remain alarmingly fast-moving in their retreat to a species of autonomous instrumentality when it comes to assessing certain technologies and technological systems.¹ Take the experimental bread loaf. In the photograph below a scientist is assessing a loaf of experimentally baked bread by a technique called “thumbing.” He is generally taken to be either an agricultural scientist – he *is*, after all, working in Canada’s Grain Research Laboratory – or a nutritional scientist, concerned with the nutritional enrichment of bread – the photo’s caption *does* read, “Laboratory tests assist in production of better bread.” These assumptions, both of which are tacitly about instrumentality, are wrong; our bread ‘thumber’ was neither of these things.

Where does this leave us? Well, with these more common assumptions about bread science inapplicable, and our bread thumber’s purpose still despairing of explanation, one might simply prefer to treat Willem Vanderberg’s pithy quote about the nature of modern technological societies as a stand-in caption for this photo. Vanderberg asserts that modern, technological societies engender a “fundamental insecurity about activities that people have successfully engaged in for tens of thousands of years.”² This is instrumentality’s other side: an indictment of putatively superfluous, even extravagant technological applications – highly complex *means* in search of something to do, whatever the ends. This is utterly tempting, but something very important is lost when we give up so easily. What we stand to gain by thinking counter-intuitively, by spending time problematizing technologies beyond the margins of our instrumentalist purview, is a redrawn map of technological ‘sites’ where truly important and highly constitutive forms of knowledge – ecological, political, and social – about the world are shrouded in apparent banality, and sequestered away in virtual anonymity.

The narrative arc of this paper begins in 1923, with L.H. Newman, Canada’s newly appointed Dominion Cerealists.³ Newman got to work finding a new, super-wheat for North

America's Interior Plains immediately upon assuming his new position. With Charles Saunders (later, Sir Charles⁴) discoverer of the inimitable Marquis wheat, as a predecessor, Newman had very big shoes to fill. Nevertheless, within two years of his appointment Newman presented Garnet wheat, a very high-yielding, early ripening bread-wheat variety that, among other apparent virtues, showed signs of resistance to prairie wheat's greatest 'enemy,' stem rust.⁵ Perhaps unsurprisingly, Newman himself did not doubt the virtues of Garnet, this "epic in the realm of scientific achievement." Then again, his enthusiasm, if slightly hyperbolic, was justified in one critical respect: to wit, the wheat's agronomic viability, particularly in northerly latitudes of Canada's Prairie West, where a new phase of expansion forced wheat production into new soil and climatic circumstances. In plain terms, his experiments had worked. But the bread was yellow, and it was not particularly "well-piled" besides. For these and a few other reasons, Newman failed to convince key bureaucratic and political figures in Ottawa, as well as an increasingly capitalized Canadian milling industry,⁶ of his discovery's brilliance; Garnet failed along with Newman.

The story of Newman's attempts to introduce his new wheat variety guides us through the theoretical problematic of this paper, and returns us to the 'moment' when the bread thumber pictured above was established as anything but superfluous – as, indeed, completely central to the colonization of the world's "Pioneer Fringe" and to the continued integration of all wheat-growing land in the twentieth century's food system. *Ambiguity* is the interpretive modality for this reading of wheat improvement: seeds, and, by extension, the scientific process of new-seed development, have long represented certain ambiguities in spite of seeds' clear metaphorical and bio-chemical (if not philosophical) status as the starting point of new plant life. For our purposes, ambiguity can be broken down into three categories.

First, seeds are ambiguous vis-à-vis technology: it is not entirely easy to ponder plant seeds as technological artifacts in quite the same way that one might think of, say, a combine harvester or a two-way disc cultivator. Jack Kloppenburg, in his classic study of plant biotechnology, *First the Seed*, suggests that seeds are commonly regarded as "uniquely benign" inputs in both ecological and structural terms.⁷ The tendency to think in this way about seeds establishes them as, at most, ancillary to other, more tactile forms of agricultural technology. All the same, when wielded deliberately by humans, seeds (the very seeds themselves, not just the seed breeding technology that brought them into being) *are* technological devices, no less (and often a good deal more) capable of altering a given region's physiognomic features and floral composition than any mechanical device. Nothing – not large railroad concerns; not ambitious state policy; not mould board ploughs; not even inanimate draught power; and certainly not individual human beings possessed of quaint liberal traits such as self-motivation – could colonize 'virgin' lands quite like appropriately developed

seeds.

This does not settle the matter. To argue that seeds are unambiguously technological is to prepare fertile ground, so to speak, for precisely that tendency – *reification* – that theorists of technology have worked so hard to reform.⁸ Where technology is cast as capital-T “Technology,” any given artifact (including a seed) simply becomes an unquestioned beginning, that is, a reified and historically unproblematic starting point on which the dynamics of historical change in other putative ‘spheres’ – social, political, economic, and so on – are based. This reductionist/determinist posture is equally at home in Whig histories focused on the Interior Plains⁹, and Frankfurt-School-inspired criticism from the likes of Herbert Marcuse and Jurgen Habermas, in general.¹⁰ If we are to circumvent this impasse seeds must be subjected to two articles of faith in science and technology studies (STS) from the beginning. First, we stand to learn every bit as much by studying those technologies that did not ‘hold,’ as by studying those that did. The case of Garnet wheat augurs perfectly with this important insight inspired by the so-called “Strong programme” in the sociology of scientific knowledge.¹¹ Second, we have to attempt a demonstration of what historian of technology Wiebe Bijker and others have called “interpretive flexibility” when it comes to the seed as technology.¹² That is, we can and must seek an understanding of how the seeds’ technological function, and even its actual design, was in fact open to a number of possible interpretations.

This can only be accomplished as we address another form of ambiguity. Seeds have been treated ambiguously relative to broad patterns of scientific inquiry, or of an evolving state-capital nexus through which broad goals of territorial expansion, labor and capital mobility, and even national development, are pursued; or, given the largely public nature of Canadian agricultural science well into the twentieth century, of both.¹³ On this view, by contrast to the orientation discussed above, seeds are something of an afterthought, emerging as effects of larger processes. Here again the very seeds themselves are treated as ‘fixed’; agential dynamics and historical contingency are reserved for the human machinations that *precede* the seed itself. And, here again, acute theoretical problems arise. Most importantly, adopting a term and concept from Lorraine Daston, the seed-as-end-product approach leaves the question of “salience” unexplored. There is, in other words, no questioning why the agricultural crop in question was ‘up’ for scientific investigation in the first place. One may raise questions about who benefits from what scientific process, and about how power is manipulated and materialized through scientific inquiry, but, it seems, the necessity of yield improvement and agronomic viability are both taken as given when it comes to agricultural science, in both its public and private forms.¹⁴ Stated prosaically, then, seeds are treated as either the beginning of certain historical processes or the end of others – as either cause or effect, determinant or outcome.

Jack Kloppenburg attends to a third sort of ambiguity, which offers us a way of confronting these first two forms creatively, while simultaneously coalescing with them to suggest a new intellectual framework for reconciling the relationship between bread thumbers and seed breeders. He shows how seeds have long symbolized commercial farmers' ambiguous positioning within a capitalist mode of production.¹⁵ On one end of the capital integration spectrum, it is the relative insulation from a wage contract, via the unity of property and labor that, according to historical sociologist Harriett Friedmann, distinguishes family-based commercial food production as a specific "form" within capitalist economies.¹⁶ At the same time, however, the reproducibility of this productive form (the family farm) relies on a high degree of capital expenditure and investment, particularly in productive technologies. This, of course, pertains to the well-known phenomenon of taking farm-input production off-farm, concentrating it in factory settings based on waged labor; it pertains, ultimately, to the phenomenon of "substitutionism" – the "indirect exploitation of the farmer" by capital interests.¹⁷ It is no secret whatsoever that capital has penetrated virtually every sphere of agricultural production in North America, from the mechanization of the farm site itself, to the use of commercially produced inputs, to the "value-added" processing industry.

Historically, seeds have slid along this spectrum of extremes in capital integration and penetration but have, by and large, remained anomalous to each. The fact is that as farmers produce "grain," a tendentiously abstracted notion, they also produce seeds, their inputs for successive rounds of production. Where primitive accumulation entails restricting the access of laboring humans to both the inputs and modes of production, which become commodified, seeds represent a clear challenge to would-be pursuers of surplus value. That farmers gain immediate and full proprietary access to their own seed inputs at harvest time is one barrier – "biological" – to capital accumulation in the seed business, according to Kloppenburg. The other barrier – "institutional" – to such accumulation, in the case of the US, anyway, was the state's willingness to fill an "investment vacuum" in agricultural science left by limited private interest – the latter being exacerbated, in turn, by the biological barrier noted above.

Kloppenburg's main quarry is capital and its insinuation in farmers' lives via seeds. By tracing capital's gradual manipulation of seed science, he seeks to show that hybrid-corn seeds were far from ambiguous in both origin and function – capital controlled and benefited from both. Capital's fortunes and misfortunes are thus defined and plotted by its relative success, over time, in resolving the biological barrier, through science, and pressing for the removal of the institutional barrier. It could be said, in short, that Kloppenburg seeks to identify the *capital turn* in seed manipulation. This is an undeniably important target, but it engenders two mutually reinforcing assumptions that, taken together, lead us to the wrong 'site' and date of capital's insinuation in farmers' lives via seeds. First, it engenders the tacit assumption that "seed-

breeding capital” is synonymous with “capital” *per se* – that the only way to control seeds is to be involved in their breeding. Second, it relies on the presumption that, however the seed technology in question may have been put to profitable use by capitalists, it was nevertheless the best, most efficacious seed, agronomically speaking.

“First the loaf” suggests otherwise on both counts. It provides an organizing trope for explication of another sort of turn that was well underway by the time hybrid corn made its admittedly dramatic appearance. I call this the *commercial turn*, and intend for it to denote a different, more encompassing socio-ecological temperament for analyzing and understanding the exigencies of seed improvement.¹⁸ Summarily, highly complex technologies of classification were in the process of being established as the leading paraphernalia of seed manipulation, some time before private concerns entered the seed breeding business itself. The archetypal classificatory technology, of course, was the rationalized ‘grade’ by which cereal crops were arranged according to commercially important parameters.¹⁹ However, grades themselves were contingent categories and, for all their pretensions to rational categorization, formed but one part of an ever-expanding quality-control apparatus run, in the case of most major exporting nations, by the state. This apparatus seems to evade interest, and it is manifestly under appreciated just how finely detailed was the information exporting states began to accumulate with respect to the quality and nature of crops grown within their borders. Bread thumbers proliferated, as did reams of data about bread. It is correspondingly under appreciated just how much sway classificatory technologies held over seeds and seed manipulation. Classificatory technologies provide clues to capital’s ability to make seeds a vehicle for accumulation before ever having direct and proprietary control through breeding programs.

It may be objected that this is just another way of showing how the demands of capital and industrialization affected standards (indeed, *effected* standardization) in agricultural commodities.²⁰ Maybe so, but it might also be seen as an inversion of that popular approach as a tactic for finding earlier, less muscle-bound forms of capital penetration via seeds. It is not several decades of capital penetration in agriculture that rendered the farmer an “intermediate converter of manufactured goods,”²¹ but, rather, it was a widespread ‘realization’ in the early twentieth century that the farmer *already* occupied such a position, that gave rise to new and novel opportunities for capital. Capital was, of course, an intimate part of the world in which this ‘realization’ emerged, but it did not establish and dictate the terms of its own involvement in an absolute or direct sense. Instead, capital made its first major foray into seed manipulation through the side door, so to speak, earning its salience in the matter through a historically contingent process that included state-sponsored simplification, environmental change, institutional reconstellation, and cultural imagining.

Understanding this historically contingent process is possible only if we brook consideration of all the forms of ambiguity discussed above *simultaneously*. For what each form of ambiguity overlooks and/or ignores may provide clues for the resolution of others: hybridity. For instance, Kloppenburg's emphasis on the political-economic ambiguity of seeds can be cast differently if interrogated alongside seeds' technological ambiguity and, also, the ambiguity of goals in seed-breeding science. Taking the first point, Kloppenburg speaks of corn cultivars but he treats the land in which they germinate, and grow, as a homogenous, invariable, material substrate. This may more or less fit the facts in the case of hybrid corn in 1930s and 1940s US, but the territorial/environmental context is highly relevant earlier and elsewhere. The case of wheat improvement in the twentieth century's first three decades differs to precisely the extent that newly developed seeds were designed in very large part for the purpose of encountering (indeed, colonizing) newly settled lands. Major wheat producing states such as Argentina, Australia, Canada and the U.S. itself had to interact with new seeds as technologies of spatial expansion, giving rise to a considerable degree of enviro-historical contingency, the latter of which is not accounted for in Kloppenburg's account.

On the second point, we must address an implicit assumption in Kloppenburg's work, namely, that the absolutely inviolable goal of all seed related science was the agronomic viability, along with its cognate, yield enhancement, of the cultivar in question. This may seem curious for, it is true, Kloppenburg casts his work as a challenge to "internalist" history of science, and even questions the notion that yield enhancement reigned supreme as a factor in corn hybridization.²² However, in making his case for eschewing "internalist" perspectives in the history of science; indeed, even as he raises doubts as to the primacy of yield enhancement; his criticism remains focused on the social effects of yield enhancement, which is not quite the same thing as identifying instances where yield enhancement came into direct conflict with other goals in seed manipulation *from the beginning*. As already suggested, Kloppenburg's narrative leaves the impression that all seed development is inherently sound, scientifically speaking, and *then* the manipulation begins; or, if one prefers, that any attempts by capital to manipulate seeds is only possible if the resulting seed is in fact superior in 'obvious' ways. Though it promises to challenge the notion of science as rational discovery and technological necessity, this form of "interests explanation" reifies 'the social' and, more importantly for our purposes here, is predicated implicitly on the instrumentalist vision described above – scientific discoveries may be socially based, but they must work, and work well.²³ Even the most hard-bitten cynic is unlikely to doubt that those engaged in seed-related activity were on some level deeply concerned to produce more food. Nevertheless, this does not fit the evidence from many wheat improvement circles.

Furthermore, institutional dynamics are more complex, less bifurcated, when viewed

through the commercial turn. Whereas Kloppenburg and others regard the straightforward supplantation of state–institutional involvement, *as a whole*, as the final stage in, and emblematic of, capital integration, it was in fact a reconfiguration of departments *within* the Canadian state that opened the door to perhaps the most significant expression of capital accumulation via seeds – the milling and baking industries. The state’s inhibition of private seed breeders’ accumulation opportunities was far from inhibition of capital *tout court*. There were many princes, as Bruno Latour might say.²⁴ Different state institutions were disposed to preserving favorable conditions for private accumulation to different degrees, and it was the adjustment within the state described in what follows that may be regarded as a prodromal stage in the later, wholesale supplantation of state institutions described by Kloppenburg.

The explanation of how state and capital priorities were rendered sociable for a time lies in certain broad assumptions at the heart the commercial turn. For one thing the commercial turn bore tacit assumptions and emerging ‘knowledge’ about consumption as an intractable and at least *semi*-autonomous force of modern existence. State officials were not quite in thrall to a notion of full-on consumer sovereignty, however the very idea of consumption certainly justified an institutional adjustment through which tighter ‘vertical’ links were drawn and maintained, from the science of plant breeding itself, through the handling and grading of wheat, to the industrial processing (milling and baking) and, finally, consumption stages. Consumption, or at least a loosely conceptualized notion of consumers, thus came to influence production as never before, a development manifest in bread thumbers’ rise to prominence relative to their counterparts in agricultural pursuits, namely the plant breeders. Again, this did not happen because bread thumbing was the technoscientific flavour of the week, rather, it transpired as a whole set of priorities related to the administration of a vast wheat-growing area interacted with certain environmental exigencies and met with strongly held assumptions about bread consumption.

Even if would-be private seed breeders were out of luck for the time being, milling and baking concerns were well positioned to effect new-seed development to their own ends. They did not do so through the mechanism of proprietary control of biological difference, as would be the case in the later capital turn, rather, they deftly manipulated the modern liberal state’s already legitimated role in *licensing difference*, to invoke Zygmunt Bauman’s apt phrase.²⁵ That is, the state, and in particular the Department of Trade and Commerce, oversaw legislation governing both the licensing of new seeds and the grading of export wheat. This was a subtler, less muscle-bound form of control, perhaps, but it achieved precisely the same ends in terms of brining wheat producers, private concerns, and seeds, together. Any new seeds developed by Department of Agriculture plant breeders, however efficacious the former or highly respected the latter, had to conform with rationalized categories of quality as

expressed in the state's grading apparatus or else face severe and costly penalty at the grading table. Ultimately, the millers won. Where farmers were forced to confront the combined priorities of the state and capital (where they felt the commercial turn most acutely) was at the country elevator, where their wheat was graded under the auspices of the Federal Department of Trade and Commerce (DTC), not the Department of Agriculture. This licensing and grading process, by which tens of millions of acres of land were rationalized, and by which new seed development was ultimately judged, boiled down to baking.

If wheat breeding had a golden era L. H. Newman probably just missed it. His Canadian predecessors and their famous counterparts around the world straddled that most exciting of times in new plant development, the rediscovery of Gregor Mendel's laws of heredity. From Patrick Sherriff in Scotland to William Farrar in Australia, Wilhelm Rimpau in Germany, and Nilsson-Ehle at Sweden's famous research station at Svalöf, plant improvement science reached a (public) institutional crescendo between the mid nineteenth and early twentieth centuries.²⁶ No one was more important than Newman's immediate predecessor, Charles Saunders. His crossing of Red Fife and Hard Red Calcutta to produce Marquis contributed significantly to the most dramatic upward acreage movement in any of the world's major "settler societies" between 1905 and the mid 1920s.²⁷ What gave Saunders and his early-century counterparts in other nations a heroic status was their timely 'response' to prophets of scarcity such as the British Association's President, Sir William Crookes.²⁸

Marquis wheat was indeed a smashing success. It ripened earlier than its predecessors and had strong straw, which helped guard against the economically harmful occurrence known as "lodging." By 1920 the variety accounted for approximately ninety percent of all spring wheat sown in the Canadian Prairie Provinces, and it accounted for just over eighty four percent of that grown in the US as of 1929.²⁹ For all its estimable virtues, however, Charles Saunders' most famous wheat had limitations. In spite of its cold resistance – acquired from one of its 'parents,' a wheat of Himalayan provenance, Hard Red Calcutta – Marquis showed signs of not performing so well as settlement stretched even further northward. Thus the task of developing and promulgating a variety that might take up where Marquis left off, quite literally, fell to Newman.

However, 'heroic' status was quite unlikely from the start for Newman. The very northward expansion that gave impetus to his work in the first place also threatened the likely success of his work as Cerealist. The problem lay in the fact that settlement in the Canadian West now broached a critical threshold, environmentally speaking. Explicitly, the enemy was cold harvest seasons and early frosts, so it was against these factors that breeding programs directed their resources and attention. But cold was only one manifestation of a much more integrated series of problems. Along with being cooler, northerly latitude production entailed

entirely different soil and moisture conditions, producing characteristically different wheat no matter what the variety. The Canadian Department of Trade and Commerce never accepted this, and, for a variety of reasons that will become clear, that Department saw wheat breeding as a process of rendering diverse environments invariable through discovery of the right seed variety – not the other way around.³⁰

This was a tall order, and anyway not one that Newman could anticipate, since his first priority was to produce a new seed that would, simply, grow at all in cool conditions. Garnet certainly did that, out yielding its ubiquitous counterpart, Marquis, by a fair margin, and apparently unsusceptible to frost.³¹ One major difference between wheat grown in the open prairie region and that grown in the transitional zone for which Garnet was suited, was a tendency for lower protein content in the latter. The reasons why this was a problem will be described below. For the meanwhile, Newman felt reasonably confident about Garnet; he seemed convinced that Garnet would do for farmers in the mid ‘twenties what Marquis had done a little over one decade earlier.

Not everyone agreed, as soon became evident. From the outset Newman was astute enough to know two things very well. First, that any attempt to introduce a new variety of wheat would likely meet with considerable resistance on any number of possible grounds. “People will likely be rather skeptical,” he had once written to a farmer seeking advice about introducing a new variety of his own.³² The Cerealist knew, for instance, that the road to approbation for Garnet wheat would necessarily travel through public relations territory, and traverse the political/bureaucratic landscape – also a very public undertaking. Moreover, neither could be navigated with success unless he could prove the commercial and industrial suitability of Garnet wheat with compelling scientific evidence. In other words, he seemed manifestly aware that agronomic viability alone, no matter how important, was not sufficient grounds for a defense of new wheat varieties.

Newman’s tireless campaign for Garnet wheat began in earnest in 1924. He arranged for the propagation of seed on various branch stations of Canada’s Experimental Farm Service (EFS), and by the following year, 1925, he had acquired adequate stocks of Garnet to extend testing activities beyond his own laboratory. His anticipation of a critical reception coupled with his apprehension of the need for evidence from both commercial and scientific sources prompted Newman to seek assistance from cereal chemists whose expertise related to the commercial value of new wheat varieties. He turned also to his friend F. J. Birchard, whose position as Chief Chemist in the Department of Trade and Commerce’s (DTC) Grain Research Laboratory (GRL, pictured above) made him the most strategically placed ally (of which more below). Meanwhile, he also turned to R. C. Sherwood, Director of Research at Minnesota’s State Testing Mill, who received one hundred bushels each of Garnet and

Marquis wheat. Sherwood's laboratory oversaw the scientific bake-testing procedures in general; however in addition to the state run baking tests, experiments were also conducted in the baking school of the Dunwoody Industrial Institute, and also in the commercial bake-shop of the Purity Baking Company. Also, two twenty-bushel samples were sent to the Pillsbury Company located in Minneapolis.

Summarily, results from these organizations glowed, and it looked as if Garnet wheat had a correspondingly bright future. Among R. C. Sherwood's favorable comments two stood out: that "no difficulties were experienced in milling either of the two samples...both were considered to be very good milling wheats"; and that "substantially higher yields of flour and of total products" were realized from the Garnet sample – two very glowing endorsements.³³ Reports from Pillsbury were likewise very positive. In a letter to Newman a Pillsbury representative stated clearly "...we might say that we consider both of these samples exceptionally fine...we can see little difference between the quality of Garnet and Marquis".³⁴

Even so, Newman saw no point in letting Garnet rest on its laurels. On 29 April he circulated a letter to all members of the Canadian Parliament and to all active senators announcing a "bread exhibition," including a number of loaves baked from Garnet and Marquis wheats, to be held in the Honourable Mr. Motherwell's, Minister of Agriculture, office.³⁵ He also arranged, as he made clear in the letter, to have bread from each variety served in the parliamentary restaurant, "both at luncheon and dinner so that an opportunity to compare the quality of the two breads will be afforded." Then, in the same memo, he availed himself of this opportunity to make a brief pitch for Garnet:

Interest in this variety is centered chiefly upon its early maturing qualities. Under normal conditions Garnet will mature from seven to ten days earlier than Marquis, which is a matter of immense concern to those in districts which require an early maturing variety...³⁶

Although shrewd enough on its own, Newman did not stop with this tactic. He arranged to have the Standard Bread Company of Ottawa – a commercial bake shop, he was always quick to point out – bake hundreds of loaves from both Garnet and Marquis wheat, which he had delivered directly to as many individuals as he could think to solicit. His very long list of recipients included federal members of parliament – notwithstanding the open exhibit he had already arranged for parliamentarians – among them Prime Minister Mackenzie King, opposition leader Arthur Meighen, and, perhaps most strategically, members from western Canadian constituencies. Freshly baked loaves also went to Ottawa Mayor John Balharrie, newspaper editors, high-ranking civil servants in various federal departments, and to employees in all divisions of the EFS. To be sure, it was a bread-blitz: appended to his long list

of recipients in his own Cereal Division, a note reading “any other boys who want them.” He wanted anyone and everyone to try Garnet bread.

Soon thereafter, the personal opinions he had solicited through this mass distribution of bread began pouring in. Frank T. Shutt, the Dominion Chemist found both loaves to be of “first class quality” and even preferred the Garnet loaf in respect of its flavour, which he described as “slightly ‘wheaty’ or mealy and very pleasant.”³⁷ Senator Andrew Haydon returned equally favorable comments on the question of taste. While some respondents jested – J. Adams from the Division of Botany expressed his hope that the acceptance of such gifts did not jeopardize his position in the “same manner as a bottle of liquor” – most accepted their charge as testing ‘experts’ seriously. Ernest Godfrey, Chief of the Division of Agricultural Statistics, and his wife, happened to be entertaining a large group of guests when the fresh loaves arrived at their Ottawa home. Caught up in the spirit of the experiment Godfrey convened an impromptu “committee of tastes” from among his guests, and reported their findings as a whole. Many others took equally great care in submitting the bread to the most rigorous assessment of all – R. A. Nicholson, that of his mother; A. B. Clarke, Agricultural Editor of *The Mail and Empire*, that of his wife.

Many more felt it important to simply acknowledge their lack of expertise and experience in taste-testing bread. W. A. Fraser explained his inability to distinguish between loaves as being “due to...inexperience in testing bread”³⁸; nor was the proprietor of Gold Note Stock Farm in Roddick Lake, PQ willing to consider himself “an expert bread taster or judge.”³⁹ Comments of this sort cannot be taken as benign caveats from self-effacing individuals. Rather, it is not these individuals’ declarations about being inexpert bread testers that interests us here, but their tacit awareness that there were, *somewhere*, bread-tasting experts at all! They took cognizance, implicitly, at least, that a loaf of bread was no mere quotidian object; they recognized bread as a scientific object around which, in Lorraine Daston’s words, criteria of inclusion and exclusion, along with “new forms of representation” for stabilizing regularity, had been established.⁴⁰ Whereas bread had always more or less *followed* wheat science, ancillary to the pursuit of agronomic viability, the individual loaf was now a discreet scientific fact in and of itself, an object of scientific inquiry as never before – circumscribed by criteria quite incompatible with sensory perception, much less personal judgment.⁴¹

The acknowledgement of loaf-as-scientific-object was coextensive with the commercial turn in that loaves of bread could not circulate, as objects of commerce, between and among consumers without having been submitted to exacting, explicit criteria of judgment. In an ironic kind of way, personal taste and subjective judgment were no grounds for addressing potentially diverse consumer tastes; standard, objective criteria alone could satisfy this requirement. In practical terms this tight connection between scientific criteria of judgment

and commercial viability announced the undeniable and unavoidable ‘vertical’ linkage between all aspects of the wheat breeding, wheat production, and bread consumption processes. This was potentially bad news for Newman, for it certainly precluded any hope of a retreat, in the face of criticism, to a defense of Garnet based on “down home” flavour, or any other folksy categories that, in effect, stood outside the commercial milieu.

And yet, there was a paradox lurking within this acknowledgment of bread’s positioning at the science-commerce nexus. For even in scrutinizing and drawing attention to their own taste-testing credentials, these apparently self-effacing judges seemed to amplify the most resonant endorsement of Garnet bread’s distinction: that it was *indistinguishable* from Marquis-rendered bread. Indeed, Garnet need not have *exceeded* Marquis in any particular respect; the more important message was one of consistency, compliance, and uniformity. This was most critical in terms of the bread’s “crumb texture” and “crumb structure,” characteristics that reflected and spoke to the wheat’s suitability for large-scale milling and baking procedures. In respect of these criteria, judgments could go either way: J. B. Spencer of the DOA’s Publications Branch found the Garnet to be closer in texture, having fewer large holes, a clear advantage,⁴² while reviewers at the Gold Note Stock Farm judged Marquis ‘closer’ in texture, although prone to “compress a little at the edges” on being bitten. The differences were few in any case, and favored neither variety in particular. Perhaps the best summary of this came from John C. Hopkins from Carp Flour Mills, whose strikingly mechanical language spoke volumes: “you are to be heartily complimented” he assured Newman, “in your success of this Garnet wheat structure”.⁴³

Structure? Indeed: Garnet-bread was quintessentially mechanical in nature. Even better, this quality prevailed alongside Garnet’s truest virtue in Newman’s mind, the fact that it offered farmers living in the ‘north’ a ‘safe’ alternative to Marquis. This was Newman’s main concern from the beginning, a concern he made sure to express to his many correspondents. Often, he received encouraging responses on this very point, as in the case of a letter from the Editor of the *Family Herald and Weekly Star*: “Western growers who are starting out with Garnet, may feel assured that it is equal to Marquis for bread making”.⁴⁴ It appeared as though Newman’s new wheat could even count on the support of large business concerns in the west – the largest of all, in fact. The Director of the Department of Colonization, Agriculture and Natural Resources for the Canadian National Railroad complimented the “enterprising and well calculated” Cerealist for his efforts, a sentiment echoed by the company’s Vice President, who added:

If the Garnet wheat will mature ten days earlier than the Marquis and is equal in all other respects, it is surely a great find for the Dominion of Canada⁴⁵

Garnet and Newman both had decent momentum in 1926. Newman's bread blitz was a highly successful undertaking, and efforts to increase Garnet seed stocks were beginning to yield more than negligible quantities of the wheat. He announced in an early spring press release that Garnet seed could be had at three dollars per bushel – limit, four per customer. Some 2826 farmers, including 862 soldier settlers occupying land arranged by the Soldier Settlement Board, managed to secure approximately 14000 bushels of Garnet seed that spring – enough to seed 12 000 acres to the variety.⁴⁶ And even before the fall harvest found its way to terminal elevators Newman busied himself by preparing an official Department of Agriculture Technical Bulletin, dedicated exclusively to Garnet, which he published and released early in the winter of 1927.⁴⁷ At this point Newman could count on virtually unqualified euphoria in the press's reportage of this new wheat. Given the seeming inevitability, not to mention desirability, of northern expansion, any variety that grew at all, let alone one that flourished, stood a very good chance of being "credited with an epoch making contribution to Canadian agriculture."⁴⁸

Notwithstanding the euphoria Newman must have felt, and that which he surely had managed to create through his tireless campaign for Garnet, the matter was far from over. Unfortunately for the Cerealist, a slightly unflattering report surfaced from Ogilvie Flour Mills in Montreal. Indeed, only one month after Newman's unprecedented bread blitz the *Canadian Milling and Grain Journal* obtained reports from Ogilvie and promptly published damaging excerpts. As he would do time and again with numerous editors, Newman pounced on the release of such damaging evidence, writing plaintively to the Journal's editor. In reply, the Editor noted that no intentional effort had been made to discredit Garnet wheat. But the damage was done: adjacent to the editor's signature on the publication's letterhead was the journal's ominous (for Newman) motto: "Read By Men Who Buy".⁴⁹

The Ogilvie report identified one of Garnet's greatest weaknesses from a commercial standpoint, its colour. The wheat had a propensity for yielding flour, and potentially bread, of a colour somewhat different from that of Marquis. Few seemed to agree as to how exactly to describe the colour difference, but comments identified Garnet bread as everything from darker, to creamier, to having a "yellowish" tint. From a technical standpoint this *could* have been the least damning criticism of all, for as Newman could prove from tests in Minnesota and elsewhere, the colour problem "reacts readily to common bleaching" by chlorine gas, a routine practice in commercial baking.⁵⁰ In fact, the yellow-colour causing compound, carotene, faded entirely if the flour was simply allowed to 'sit' and mellow (technically speaking, the carotene oxidizes, altering its colour to white).

The taint of discoloration was more than literal in nature, however. It took impetus from

a very long ‘discussion’ concerning the affinity between certain racial groups and wheaten bread. Sir William Crookes, in addition to being a prophet of Malthusian doom, emphasized the racial dimensions of wheaten bread, noting, “We [Anglos-Saxons] are born wheat-eaters...other races vastly superior to us in numbers, but differing widely in material and intellectual progress, are eaters of maize, rice, millet, and other grains.”⁵¹ This affinity had a strong elective element, based in the potential for the pure whiteness of bread from wheaten flour – on which Canada built its enviable world reputation in wheat production. As the international Wheat Advisory Committee summarized the point just a few short years later, ‘wheat is unquestionably the pre-eminent bread grain of civilized races,’ ‘[w]ith the march of progress from primitive to modern conditions there is increasing demand for a bread that is white...’⁵²

Thus, in spite of the fact that the discoloration problem was far from insurmountable, Newman’s foes enjoyed a clear advantage in making their case against Garnet. It was very difficult to overcome the notion that consumers just did not wish to eat yellowish bread. So hegemonic was the notion, in fact, that even defenders of Garnet had to ‘frankly’ acknowledge this facet of intractable consumerism. Professor T. J. Harrison of the University of Manitoba, for instance, wrote in his capacity as Secretary of the Manitoba Seed Growers Association to the Department of Trade and Commerce protesting “strongly” the state’s negative views on Garnet. And yet, in his capacity as an expert witness before a parliamentary committee he offered, willingly, “...for some reason or other, everybody insists on white bread.”⁵³

The first official – official, that is, in terms of federal government commitment to show prejudice against the variety – indication that Garnet was in for the rough ride Newman had suspected came in the fall of 1927. In that harvest season the Department of Trade and Commerce invoked its right to adjust grading regulations within a given year, for a given purpose, by determining that wheat of the Garnet variety could not be admitted to Canada’s top grade of wheat, No. 1 Northern. This move, tantamount to outright robbery in many producers’ eyes, codified a nearly-six-cent-per-bushel – the difference between No. 1 and No. 2 in that year – bias against Garnet wheat.⁵⁴ In arriving at its decision to degrade Garnet, the Standards Committee invoked findings published in Newman’s own pamphlet, pamphlet 83, on Garnet wheat, not yet a year old. Citing the very same source one year later, the Committee determined to continue its policy of not admitting Garnet into the top grade of spring wheat.

Concomitantly, and as a direct response to the Garnet controversy, new technologies and techniques for A) the assessment, and B) the inscription in official regulations, of bread qualities, emerged. Significantly, all emerged from within the Department of Trade and Commerce, as opposed to the Department of Agriculture, signaling the beginning of a critical institutional shift in the world’s largest exporter of wheat. Suddenly, as never before,

technologies presuming to rate criteria relevant to consumption began to take precedence over those by which agronomic performance (i.e., production) were rated. This had many different aspects. First, it engendered the formulation and articulation of new techniques for quantifying quality. To this end, the Department of Trade and Commerce instructed the Chief Chemist of its Grain Research Laboratory (again, the institution depicted in the photograph above) to begin routine sampling of export wheat shipments. This sort of information gathering was nothing especially new, perhaps, as the so-called “control revolution” described by James Beniger was at least a lanky adolescent by this point in time.⁵⁵ But there were some novel adjustments. All wheat samples taken from export shipments were to be tested for protein content, ground into flour, and baked into bread. Within five years the Laboratory baked five thousand loaves annually, all of which were subjected to rigorous examination by cereal chemists (see appendix A, figure 1 for a bread thumber working at a special grading table, illuminated by fluorescent light) and scored according to criteria established in conjunction with an American body, the American Association of Cereal Chemists.

Additionally, quality criteria such as “crumb structure” and “crumb texture,” represented three-dimensionally in the Lab’s doxa, the experimental loaf, were to be inscribed in new technologies of state simplification. That is, results gleaned from thousands of experimental loaves were subsequently plotted as brightly coloured patches on blank maps of the Prairie West (Appendix 1, figure 2). Maps thus produced were printed several different times in western newspapers throughout the harvest season, a reminder to farmers, as the harvest rolled in, what to expect from their encounter with local grain buyers. The constellation of experimental baking, inscription and mapping was a powerful force, not only in usurping the Department of Agriculture’s role in plant development, but also as a public pronouncement, to potential customers, of Canada’s new found control over the very vexing problem of categorization. Indeed, within ten years the Department of Trade and Commerce’s maps were touted as being as good as fresh-baked loaves in offering proof of the state’s rigorous control over the quality of export shipments (see Appendix 2, Figures 3 and 4)

The initial decision to degrade Garnet, and especially the 1928 decision to *continue* degrading Garnet, elicited an energized response from the Minister of Agriculture, W.R. Motherwell, who produced an eleven-page letter for the Chief Commissioner of the Board of Grain Commissioners (BGC), the body responsible, under the auspices of the Department of Trade and Commerce, for grading Canada’s export grain. The Minister conceded that the 1927 decision to downgrade Garnet “did not seem unreasonable for a trial year”, but he saw no justification for continuing with the policy after the “long and exacting period of testing and trying” to which the variety had been put before meeting the “public gaze.”⁵⁶ He could recall no instance in which a variety had undergone such rigorous and exacting tests; which left him

to wonder ‘aloud’ “where the kick against Garnet comes from and why thus far it has been so effective [in shaping the Department of Trade and Commerce’s policies]”.⁵⁷

He soon had his answer. One month later, in December 1928, western newspapers published a letter from the Canadian National Millers’ Association (CNMA) to James Malcolm, Minister of Trade and Commerce. Citing the work of “qualified chemists employed by different Canadian flour mills”, the letter implored that necessary steps be taken to “place Garnet in its proper position”. The implication was clear enough, that the policy of degrading Garnet ought to be extended further still, that Garnet ought not be permitted to *any* of the top grade categories. This, coupled with a dismissive response from the Chief Commissioner, in which the latter made clear the unlikelihood of a change in grading policy, left no doubt in Motherwell’s mind as to which segment of this “vicious circle” he would need to confront.

Motherwell stood fast, as did Newman. Together, they convened a meeting of the “various interests concerned” so as to “review the question from all angles.” In that meeting, they both emphasized Garnet’s value to farmers, specifically those farming north of what Newman, speaking as an agricultural scientist, referred to as the “Danger line.” For their part, meanwhile, milling representatives in attendance countered with a new criticism, the most harmful yet, that Garnet was a difficult wheat to mill on account of its particularly hard kernel, which necessitated a different ‘conditioning’ regime from other hard spring wheats. This was a truly damning criticism, for there existed no tenable counter-point for the problem of industrial unsuitability.⁵⁸ Nor was the industrial suitability argument unrelated to the cultural affinity described above. Indeed, highly ranked “grain men” and government bureaucrats alike read the wheat-as-civilized-grain narrative backwards, deducing that any wheat-consuming people would also have mechanized their milling and baking procedures.⁵⁹ These dual narratives, so tightly woven together, constituted what may be regarded as a kind of proto-modernization theory, bridging the nineteenth century’s scientific racism and a putatively depoliticized modernization theory, which reared its head in the post war reconstruction era.

Desperate, Motherwell took the decision to commission a sample shipment of Garnet to European scientists and millers in order to procure a wider array of expert opinions on the wheat’s quality. This decision opened an undeclared war, pitting millers’ interests, via the Department of Trade and Commerce, against Newman, Motherwell and others in the Department of Agriculture. Each side battled to make the most convincing claim of personal and political disinterest. Thenceforth, Newman was perhaps most diligent in claiming not to “hold any particular brief for Garnet wheat”, but so too was Motherwell very adamant about his own lack of self-interest.⁶⁰ The BGC’s new Chief Commissioner, E.B. Ramsay, was likewise cautious in making claims of personal aloofness, though his claims were made in the service of his case *against* Garnet. A corollary to all these claims of objectivity was the

crudely liberal-sounding assurance, made variously by both sides, that Garnet would have to, in Motherwell's words, "take its knocks standing up and win its spurs eventually entirely on its own merits."⁶¹

In truth, they were all being dishonest, the most so, perhaps, Newman, who clearly *did* carry a brief for Garnet wheat. Motherwell was also very much an advocate of the variety, although he attempted to appear aloof when telling European scientists that he simply desires "a straight try-out of the milling and baking qualities of Garnet wheat..."⁶² He clearly desired more than a "straight try-out" of Garnet's milling and baking qualities; he wanted millers to consider agronomic viability as at least one among many factors (most of the others having to do with commercial value) in defining wheat qualities. A. E. Humphries, a chemist with Coxes Lock Mills in Weybridge, England, had already registered the importance of balancing agronomic viability and commercial quality in passing judgment on Garnet. Humphries stated emphatically that Garnet was of high quality, especially "in as much as it seems to flavour the interests of the producer... at any rate in those parts of the Dominion where its virtues will be appreciated..."⁶³ In other words, any very slight differences there may have been in milling quality were more than offset by the service Garnet provided to wheat farmers.

There were plenty of good reasons to carry a brief for Garnet. If nothing else, Motherwell declared, it was a matter of practical sagacity. In a letter to fellow member of parliament, D. F. Kellner, Motherwell pointed out that, irrespective of millers' complaints, there remained "a practical question to be solved in the northern portion of the three Prairie provinces known as the 'Park Country' in which wheat production is developing northward steadily"⁶⁴: northern farmers had to have a wheat that would grow, pure and simple. Superintendents of various experimental sub-stations throughout the west shared Motherwell's concern for agronomic sensibility and urged the consideration of locale-specific agronomic characteristics in any discussions of a new variety's overall quality. W. D. Albright from the experimental sub-station at Grande Prairie, Alberta reported how several farmers in his district had grown Garnet and received No. 2 (the highest possible grade it could receive) at elevators, while a neighbor, "named Miller", changed his mind at the last moment and planted Marquis wheat – Miller's Marquis crop graded No. 5. "These facts", Albright rightly concluded, "are eloquent."⁶⁵

Producers' opinions also found their way to Newman's office – they had been doing so for some years. His exhaustive surveys of 1927 yielded reports from over 1100 farmers whose opinions he charted systematically. Comments from Alberta farmers especially were resoundingly positive: "only wheat for district"; "Some think coming wheat"; "only wheat 1928".⁶⁶ Indeed, the 1928 growing season offered an excellent case in point for Garnet. An early August frost in many parts of growing districts in northern Saskatchewan and Alberta

damaged varieties such as Marquis while Garnet, according to one of Newman's correspondents, was harvested "without frost". Another man, writing from Flat Lake, Alberta, north east of Edmonton, informed Newman that had he grown Marquis that season (as many of his friends did) he would have been offered nothing more than "feed" grade at the elevator (as his friends were). Farmers in northern districts clearly favored Garnet.

Motherwell's active campaign for Garnet probably seemed all the more justified considering it had become a more or less open 'secret' that Canadian millers tended to dismiss Garnet out of hand, without just cause. In a very bold letter to Newman, A. W. Alcock of Western Canadian Flour Mills confirmed, frankly, a certain unreasonable reticence on the part of millers:

Perhaps the millers, among whom I include myself, have not always given due consideration to the problem of farmers in districts where Marquis has failed to give satisfactory results. There is a tendency for all of us to look at the thing from our own narrow point of view...⁶⁷

Even as Alcock practiced irony on Newman in the final line of this quote, his point remained: millers gave little consideration to interests other than their own, even in instances where agronomic concerns were important. Nor was he the only one to make the point. England's preeminent cereal chemist and author of the seminal text in cereal chemistry, D. W. Kent-Jones, reported to Newman that "whenever anything happens to Canadian wheats, Garnet will likely have to take the blame whether it deserves it or not" – implying in part that millers would find any excuse to complain, and further that Garnet afforded such an opportunity. Newman heard similar news from G. E. DeLong at the Dominion's Experimental Station for Central Alberta, who reported a recent conversation with an unnamed "grain buyer". The grain buyer did not "believe the farmers were getting a fair deal on the grading of Garnet. In fact, all the grain men state that Garnet is being docked one grade by the official Graders of the grain Inspection Division, irrespective of any rulings in connection with same."⁶⁸

Motherwell analogized to boxing, asserting that no champion, "whether it be a 'Dempsey' or a Marquis...goes down on one knee without exciting the unreasoned sympathy of many critics..." Of course, there was a good deal more than nostalgia at stake in the case of Garnet wheat, something Motherwell's analogy to sport inadvertently helped elucidate. The sad demise of a downed champion paled next to the pernicious actions of both the millers and grain companies who, the Minister opined, did not even mind Garnet wheat *all that much*. They merely wished to impugn the variety so as to lower its market price (that which they paid farmers) but were in no way averse to mixing Garnet into shipments of No. 1 wheat. He was nearly poetic on this point:

[nobody] believes for a moment that any Garnet that is degraded

into No. 2 Northern stays put any longer than it takes the mixing hog at the Lake terminals to switch cars of such No.2 Garnet to a mixing plant. There in a very short time it becomes transmogrified into a choice No. 1, thus merely handing out to the mixer at the start a nice 8 cent piece of all velvet and the grower an 8 cent per bushel swat in the eye.⁶⁹

As for Motherwell's and Newman's test shipment, one could hardly use the word "fanfare", but the experimental shipment did hold a good deal of public and media interest in Canada and abroad. One headline read "Ottawa Man Goes to England to See New Wheat Baked into Bread."⁷⁰ Most importantly, in a blatant attempt benefit from Dr. Birchard's pre-existing sympathies, Newman insisted that the Chief Chemist be involved as well, a request to which Birchard's boss, Trade Minister Malcolm, assented; Birchard traveled on ahead of Newman and escorted test shipments on the Continent.

The Minister's consent must have been given in haste, and it was retracted with even greater haste, after Birchard made clear that his sympathies lay with his friend Newman, and with case being made on behalf of Garnet by Department of Agriculture officials. This was a clear conflict given Birchard's position in the very Lab that symbolized a major institutional reconstellation. Birchard's superiors brought him to heel in several "lengthy talks," during which he was apprised that he was not working on a "free lance" basis, and that his views on Garnet did not suit the views of the majority of the Department.⁷¹

In July 1930 Newman published results from his Garnet shipment in Technical Bulletin # 134: "Overseas Tests on the Milling and Baking Quality of Garnet Wheat." At best, or perhaps worst, reports from overseas millers were ambivalent: nowise could Newman escape Garnet's 'inferior' colour, a complaint that did surface throughout. On the other hand, D. W. Kent-Jones opined that differences between Garnet and other wheats were exaggerated by millers in England, and predicted that Garnet might even command *higher* prices at various times.⁷² The CNMA now laid a "complete and categoric" case against Garnet before the new Conservative Minister of Trade and Commerce, Henry Herbert Stevens.⁷³ In a letter of September 2nd, 1930, the CNMA invoked a greater-good theme, noting that the "inclusion of Garnet in the Northern class only benefits the grower of Garnet temporarily", and urging that the reputation of Northern grades be preserved through the *removal from Northern grades and separate classification* of Garnet wheat. Further, the letter suggests, the interests of Canadian and foreign millers, along with grain growers and of "the country itself" would be best served by a complete review of Newman's findings, conducted by the National Research Council (NRC) of Canada, and also by Parliamentary Committee.⁷⁴

The millers' request for an NRC review was honored by month's end when a special conference was convened in Winnipeg. Pretensions of cooperation between the Department of

Trade and Commerce and Agriculture faded. As the NRC looked into the matter, the Chief Commissioner of the BGC, a man named E.B. Ramsay, declared his own practical dilemma, just as the Minister of Agriculture had once done. Remarkably, he could acknowledge that Canadian millers took “an entirely unreasoning attitude to this [Garnet] wheat in view of the laboratory results achieved in baking its flour,” however, he continued, “you have a situation there that has to be faced”.⁷⁵ The Canadian milling industry had put its collective foot down, a stance that, however unreasonable, meant a closed off domestic market; with foreign markets also in a decidedly weak position, Ramsay’s hands were tied, or so he implied. As if this was not enough proof of his lack of choice in the matter, Ramsay also pointed out that grading decisions lie not with the BGC per se, but rather with a special sub-committee of the Board – a distinction that was at best dubious, and practically erroneous. Ramsay ended his letter by assuring Newman that “our side” (presumably meaning the Department of Trade and Commerce, though one could easily conflate the millers’ interests with the Trade and Commerce by this letter) “will be the determining side.”⁷⁶

His weak attempts to evade responsibility aside, Ramsay had both the authority and the inclination to see to his side prevailing. In October 1931, that special sub-committee over which Ramsay had claimed no influence, but of which he was Chairman, resolved that after July 31, 1932, Garnet would no longer be allowed to enter *any* of the top four grades of Canadian wheat; an entirely separate grade would be created for Garnet. Viewed one way, the move had the pretension of letting Garnet wheat “stand entirely on its own merits” – a politically astute tactic and a cognate of the battle to claim personal disinterest. ON the other hand, for a maneuver aimed at ‘liberating’ Garnet, it was interventionist in nature. It was interventionist enough, in fact, as to invite attention from the federal Department of Justice, which ruled that Ramsay’s sub-committee had “exceeded its powers” in establishing separate grades for Garnet beyond the current crop year.⁷⁷ For someone who bemoaned Canadian millers’ “unreasoning attitude”, and who claimed to have no special interest in the matter, Ramsay certainly adopted some proactive tactics directed at purging Garnet from the Prairie West.

Producers in affected districts expressed their devastation at the Committee’s decision. William Howse of Shand Creek, Saskatchewan explained in a letter to Newman that, on account of the Board’s decision to degrade Garnet he had put his entire wheat acreage in to another variety, Reward. An August 10th frost, sufficiently hard to “cut potatoes and tender garden stuff” occurred, damaging Reward wheat so badly that the cost of harvesting such wheat could not even be recovered. Plots of Garnet wheat still being grown at a nearby experimental farm, by contrast, were unaffected and graded No. 2 at local elevators. “It seems also from this incident”, Howse opined, “that Garnet wheat has a strong inherent hardiness to

frost and this quality is essential to any wheat intended to be grown in northern parts.” He added plaintively:

From a crop which promised 2 000 bushels of seed wheat, I shall probably be able to thresh between 200 and 300 only fit for feed and stock, all my expectations for help from very hard times were in this crop and a family of little ones depending on its proceeds, and it is the hope that my experience and this information may be the means of saving other from similar circumstances.

Letters of this sort affected Newman very much, prompting him to try one final bold tactic. He had suspected that the Board’s decision under Ramsay to grade Garnet separately was not an honest attempt to let the variety “fight its own battles.” It was a disingenuous move from the beginning, Newman felt, given the very nature of bulk grading as it was conducted in Canada. He knew, in short, that federal graders could not distinguish Garnet seeds from others when it came time to do so in vast quantities, and, also, within the de facto time restraints set by the St. Lawrence Seaway’s closure each fall. This led Newman to the conclusion that the separate grade proposal was nothing more than an expeditious, politically safe, means of ensuring Garnet’s demise, or at least of depressing its price to the point of inhibiting its economic viability altogether.

To prove his point Newman sent a shipment of anonymous wheat samples to J.D. Fraser, Head of the Inspection Division – who, as expert in charge of all experts in grading export wheat, presumably had the keenest eye for subtle differences. In a covering letter to the Inspector Newman expressed his doubt as to the likelihood of anyone, expert or otherwise, being able to determine Garnet admixtures with any precision. Fortunately, Newman implied, this was a “matter which can either be verified or refuted” concluding, cheekily, “the results should be useful to all concerned.”⁷⁸ He also told the Inspector’s boss, Ramsay, of being conflicted over the test samples, fearing that it looked as if he had tried to put the Inspector in “in more or less of a box”. “No one”, Newman continued, patronizing, “who is at all familiar with the splendid staff you have at Winnipeg in the Inspection Department would think for a moment of casting any reflection upon the said staff”, however, “it should be useful to you to know what it is possible to do with respect of the identification of these mixtures.”⁷⁹ The Deputy Minister of Trade and Commerce was clearly outraged over Newman’s “trick samples”, judging the Cerealists’ actions contemptuous and irresponsible “especially in view of the fact that the grading of Garnet Wheat gives promise of becoming a public controversy” – Newman’s wish precisely. Newman hoped to show by his “trick samples” that separate grading was in no way a legitimate attempt to establish a separate market for Garnet, but rather a means of forcing the substitution of wheat varieties considered more acceptable to

commercial interests. Exacerbating the problem, Fraser had gone ahead and attempted to grade the “trick samples”, inaccurately, as Newman suspected he would. It was Newman’s boldest tactic in defense of Garnet, and it was his last. Any residual sympathies Ramsay in particular, and the Department of Trade and Commerce in general, may have harbored for Garnet wheat ended there.

On Thursday May 19, 1932, the parliamentary committee to which the matter had been referred recommended Garnet’s removal from all top grades; it recommended the establishment of separate grades for Garnet wheat alone. It could not be helped, Ramsay as much a said. He also said, in rating his foes, that “they are more inclined to judge these and similar problems from a production [agronomic] standpoint”.⁸⁰ Astonishingly, the “production standpoint” could be interpreted as “purely selfish grounds”⁸¹ on which to assess the problem. A highly placed critic of Garnet spoke with only thinly veiled disgust about farmers “in the northern parts of Alberta and Saskatchewan, with their Garnet and other inferior types of wheat, riding to market on the backs of the poor devils in the south who are raising Marquis and other high types.” He feared “all these hybrid varieties in the north” (placing emphasis on hybridity, as if unaware that Marquis was a hybrid as well) being mixed with otherwise high quality grades in the south. Summarizing and punctuating the entire matter Chief Commissioner Ramsay asserted, coolly, the matter has “now resolved itself into one of practical business.”

There was no going back. As the Garnet situation “resolved itself” Canada’s major competitors all convened their own commissions and investigations into their respective classificatory technologies.⁸² This at once justified the Canadian state’s dismissal of Garnet and the repositioning of bread thumbers atop the state’s new-seed-development program. By the early 1930s, moreover, bread thumbers had help, as they entered the “teeming world” of instruments and instrumentation.⁸³ A new generation of dough testing instruments, designed to measure the physical properties of dough without requiring the “human element” (as did the baking test) emerged (Appendix 2, Figure 5). Ultimately, the two approaches complemented one another. “Crumb structure” read from experimental loaves and paper charts rendered by dough testing machines both served the dual purpose of ‘reading’ the cereal crops of vast territorial expanses, and of providing putatively incontrovertible evidence for either the dismissal or acceptance of new seed technologies.

Garnet’s dismissal from Canada’s existing statutory grades did not consign it to immediate oblivion. Elevator companies continued stocking the variety, and buyers – millers, presumably – continued buying it in reasonably significant quantities – not bad for a variety that had written one of the most “regrettable chapters” in Canadian agricultural history (see endnote 72). In a way, very little had changed. Then again, a few things *had* changed. For one,

the variety that millers had claimed so forcefully to hate, but clearly did not actually mind, could now be had far cheaper than wheat in other grade categories to which Garnet was comparable.⁸⁴ More broadly, some ambiguities with respect to seeds – as reified technologies of expansion, as the unproblematic result of “epic” scientific discovery, and as the chief source of farmers’ insulation from reproductive consumption – had become a good deal less ambiguous.

Appendix I

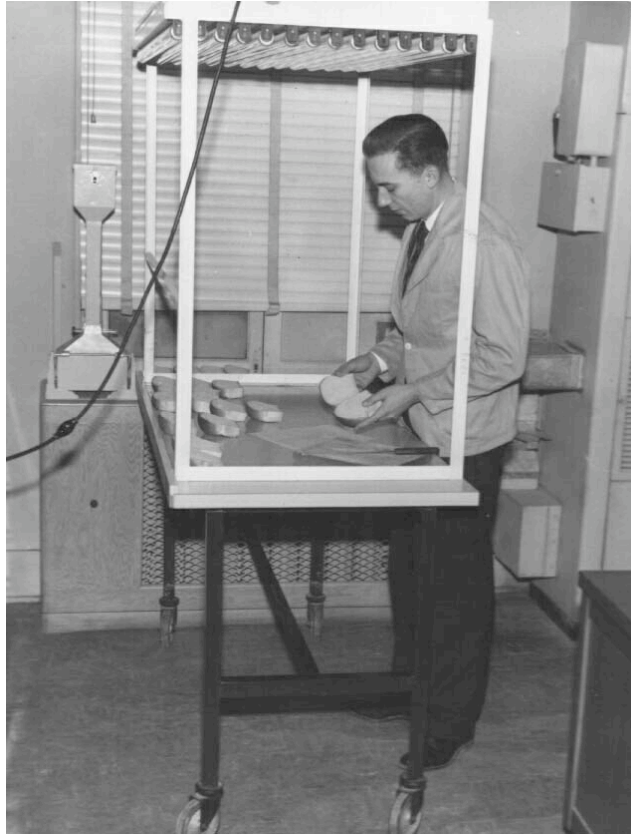


Figure 1: Grading Bread

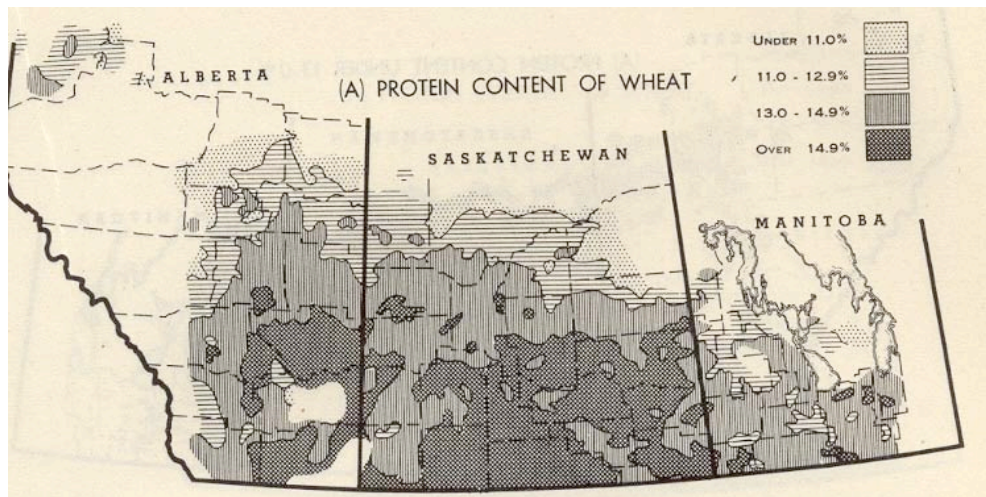


Figure 2: A map plotting protein content.

Appendix 2



Figure 3

In Figure 3 a successor of Dr. Birchard at the GRL shows a Norwegian delegation two loaves of varying quality. In Figure 4 he correlates this quality differential to different zones mapped out in the Lab's new maps of the Prairie West.



Figure 4

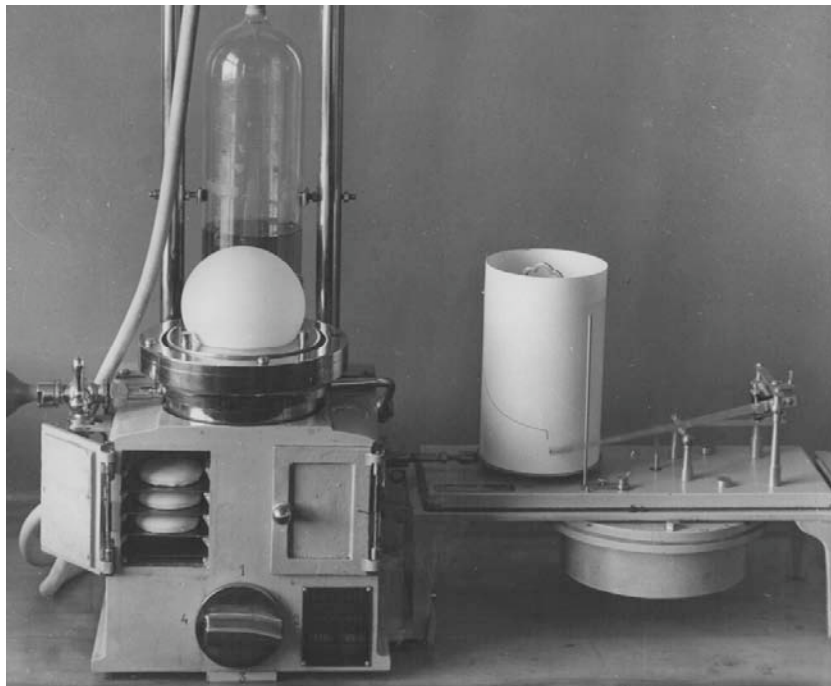


Figure 5: The “Alveograph” measures the strength and extensibility of dough by blowing a bubble (the round shape, centre-left) of dough, measuring the work output expended in doing so. A paper graph of the dough's strength is drawn (right).

¹ There is no direct citation for this admittedly generalized point. The thought came to me as I read Bruno Latour's case for the importance of mundane objects: "Where are the Missing Masses? The Sociology of a Few Mundane Artifacts," in Wiebe Bijker and John Law, eds. *Shaping Technology/Building Sociotechnical Change* (Cambridge, Mass.: MIT Press, 1992). Whatever insights Latour wishes to make about the moral and political significance of mundane objects, in this case an automatic door closer, his object of choice hardly threatens the instrumentalist paradigm: a door closer is, well, a door closer – its purpose is no mystery. Michel Foucault's work represents an implicit break with instrumentality given its emphasis on the non-centerdness of power and, in *Discipline and Punish* especially, on the latent functions of disciplinary technologies. The "Foucault effect" in this case pertains to patience – having enough patience to stick with apparently mundane technologies long enough to gain insight into the historical process of their becoming.

² Willem Vanderburg, "Political Imagination in a Technical Age," in *Democratic Theory and Technological Society*, eds. Richard Day et al. (Armonk: M.E. Sharpe, Inc., 1988), 10.

³ "Dominion Cerealst" was the title given to the individual who headed the Cereals Branch of the Dominion Experimental Farm Service. Newman succeeded Charles Saunders in 1923.

⁴ He was knighted in 1933 for his "contribution to the Empire and to humanity": "Charles Edward Saunders," reprinted from the Proceedings of the Royal Society of Canada, 1938, in author's possession.

⁵ The airborne fungus, *puccinia graminis*, or stem rust, had ravaged the West's wheat crop in 1916, reducing total yields to well below average levels. From that point forward the state's chief priority with respect to wheat was the eradication of this fungus. Garnet did not possess pathological resistance to rust. Its resistance was de facto in that it ripened early and could, theoretically, be harvested ahead of the onset of rust.

⁶ The Canadian milling industry followed its British counterpart in an interwar phase of concentration, especially in the 1920s. The result was a trend toward fewer, larger production units. The really significant part of the story, however, is that over the same period Canadian milling concerns gained controlling interest in baking enterprises across the country. Capital formation and concentration in the baking industry was notoriously slow owing to the perishability and also the bulky nature of the product, both of which confounded distribution processes. For a good insight into the milling and baking industries in Canada see the report: Canada, Department of Justice, *Investigation into an Alleged Combine in the Manufacture, Distribution and Sale of Flour and Other Grain-Milled Products*, 1948 (Ottawa).

⁷ Jack Kloppenburg, *First the Seed: The political economy of plant biotechnology, 1492-2000* (Cambridge: Cambridge University Press, 1988), 5.

⁸ The relevant literature on this point is vast. A new school, Science and Technology Studies (STS) arose in the early 1980s out of a decade-old innovation in the study of science and scientific knowledge, known formally as the Sociology of Scientific Knowledge (SSK). STSers range across a theoretical spectrum but share, in general, the belief that technology and technological artifacts are not born of rational thought and some ineffable kind of necessity: technology does not escape sociocultural determination. The strongest constructivist position is generally associated with Wiebe Bijker, laid out in a now-classic collection, *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, Mass: MIT Press, 1987). Bruno Latour's widely discussed Actor Network Theory (ANT), while similar to Bijker's approach in the respect that it eschews philosophical rationality and necessity in technological design, is epistemologically distinct in that it advances a notion of "generalized symmetry" – the idea that social (i.e. human) and natural forces combine to stabilize technical and scientific objects. See Bruno Latour, *Science in Action* (Cambridge, Mass: Cambridge University Press, 1987) and Michel Callon and Bruno Latour, "Don't Throw the Baby out with the Bath School! A Reply to Collins and Yearly," in Andrew Pickering ed, *Science as Practice and Culture* (Chicago: Chicago University Press, 1992), 343-368. The specific question of reification, however, has arisen through a recent attempt by Thomas Misa and others to reconcile technology studies and modernity theory. Modernity theory, Misa and others claim, has long (mis)treated technology as a uniform, reified, homogenous 'thing'; modernity theorists have unsubtly missed the empirical and theoretical differences between, for example, birth control and hydrogen bombs. See Thomas J. Misa et al., *Modernity and Technology* (Cambridge, Mass: MIT Press, 2003).

⁹ Not surprisingly this tendency is very common in institutional accounts emanating from within government

departments that oversaw agricultural science. Although published in an academic journal, J. W. Morrison's, "Marquis Wheat – A Triumph of Scientific Endeavor," *Agricultural History* 34 (1960): 182-188 runs a very close second to institutional histories in terms of its determinist, not to mention hagiographic, tone. It is, though, discernable in academic treatments such as John Herd Thompson, *Forging the Prairie West* (Toronto: Oxford University Press, 1998), 78. In *Vulcan: The Making of a Prairie Community* (Toronto: University of Toronto Press, 1988), Paul Voisey takes an admirable stab at exploring a user heuristic for technology, but only with respect to agricultural implements. Skip ahead to his chapter on "crop selection" and he speaks unproblematically about "new strains" "sweeping" across the landscape. For an example of an anarchist-inspired intervention in which agricultural inputs are treated slightly reductively, see James Scott's important work, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1997).

¹⁰ Andrew Feenberg has done the most to both identify and offer constructive criticism of "Frankfurters'" views of technology. For recent elaborations of his "instrumentalization theory" see Feenberg's *Questioning Technology* (London/New York: Routledge, 1999) and *Transforming Technology: A Critical Theory Revised* (New York: Oxford University Press, 2002). Also, despite its gathering years, Leo Marx's and Merrit Roe Smith's collection, *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, Mass.: MIT Press, 1994), remains a worthwhile source on the durability of technological determinism in western societies.

¹¹ The locus classicus for the "strong programme" is David Bloor's important work, *Knowledge and Social Imagery*, 2nd edn. (first published 1976) Chicago: University of Chicago Press, 1991.

¹² For a concise overview of science and technology studies' theoretical claims see Philip Brey, "Theorizing Modernity and Technology," in Misa et al. ed. *Modernity and Technology*.

¹³ There is no better example of this than Kloppenburg himself, though one leaves sources such as Deborah Fitzgerald's *The Business of Breeding: Hybrid corn in Illinois, 1890-1940* (Ithaca: Cornell University Press, 1990) with a sense that the real story is in the process, not the seed itself.

¹⁴ Lorraine Daston lays out four modalities for the empirical study of how phenomena "come into being and pass away as objects of scientific inquiry" in a recent collection, *Biographies of Scientific Objects* (Chicago: University of Chicago Press, 2000). This quote is taken from the collection's opening page.

¹⁵ This is the overall proposition of Kloppenburg's work, especially the chapter on "Science, Agriculture, and Social Change." Of course the question of agricultural producers' positioning within capitalism is a question/debate of very long standing. The discussion reaches back at least, and certainly most famously, to Marx in the *Grundrisse*, and has animated many lively theoretical discussions since. One of the key questions pertains to the likelihood of the agricultural mode "decomposing" into a full-on capitalist structure.

¹⁶ See especially Harriett Friedmann, "World Market, State, and Family Farm: Social Bases of Household Production in the Era of Wage Labor," *Comparative Studies in Society and History* 20 (1978), 545-586. Friedmann's work is an important intervention on the debate over family farm production's relative place in a capitalist mode. Friedmann charts a course between those of a classical Marxist ilk who, while recognizing the recalcitrance of petty commodity production to become fully proletarian, nevertheless believe that all agricultural activity will eventually "decompose" into industrial-style relations of production, and those inspired by A. V. Chayanov's classic formulation of Russian peasantry. For examples of the former see the de Janvry and Banaji entries in F. H. Buttell and H. Newby eds., *The Rural Sociology of Advanced Societies* (Montclair, NJ: Allanheld, Osmun and Company, 1980). For Chayanov see A. V. Chayanov, *On the Theory of the Russian Peasantry*, D. Thorner et al., eds., (Homewood, IL: American Economic Association, 1966).

¹⁷ Ibid. 34. See also George Liodakis, "The Role of Biotechnology in the Agro-Food System and the Socialist Horizon," *Historical Materialism*, vol. 11, no. 1, 2003, (37-74).

¹⁸ "Commercial" may be an infelicitous word here. I do not mean to speak of the more familiar discussion around the so-called "market revolution" inaugurated by James Henretta "Families and Farms: Mentalité in Pre-Industrial America" *William and Mary Quarterly* 35 (1978): 3-32 and taken up some years later, most notably by Charles Sellers, *The Market Revolution: Jacksonian America, 1815-1846* (New York: Oxford University Press, 1991), and Winnifred Rothenberg, *From Market-Places to a Market Economy: The Transformation of Rural Massachusetts, 1750-1850* (Chicago: University of Chicago Press, 1992). Borrowing from Harriett Friedmann I take for granted that wheat culture on the Interior Plains was commercial in nature from the very beginning.

¹⁹ It was William Cronon, in his marvelous book about Chicago, *Nature's Metropolis: Chicago and the Great West* (New York: Norton, 1991), who first fleshed out the commercial significance of rationalized schemes such as 'grades'. For a more detailed discussion of how the contingency of grades is to be carried forward, into the twentieth century, see John F. Varty, "On Protein, Prairie Wheat and Good Bread: Rationalizing Technologies and the Canadian West, 1912-1935" (forthcoming) *Canadian Historical Review*, 85:4.

²⁰ Allusions to this phenomenon are legion. A highly influential contribution has been Steven A. Sanderson, "The Emergence of the 'World Steer': Internationalization and Foreign Domination in Latin American Cattle Production," in F. Lamond Tullis and W. Ladd Hollist eds., *Food, the State and International Political Economy: Dilemmas of Developing Countries* (Lincoln: University of Nebraska Press, 1986).

²¹ R.C. Lewontin and Jean-Pierre Berlan, "Technology, Research, and the Penetration of Capital: The Case of U.S. Agriculture," *Monthly Review*, Vol. 38, no. 3 (July-August 1986), 26.

²² Kloppenburg, *First the Seed*, 21.

²³ For a discussion of agricultural science that is very similar in tone see R.C. Lewontin and Jean-Pierre Berlan, "Technology, Research, and the Penetration of Capital," cited above. Concerns over interest-based explanation in the history of science and technology were first raised by Steve Woolgar, who argued over twenty years ago that authors who focus on relevant social groups' manipulation of science and technology tend to reify 'the social' every bit as much as historians once reified scientific knowledge and technological artifacts: Steve Woolgar, "Interests and Explanation in the Social Study of Science," *Social Studies of Science*, Vol. 11, no. 3, (August 1981), 365-394. I am suggesting something as interest based explanations dismantled the tendency for reification they retained a strong grip on instrumentality, which has directed research topics and research questions alike.

²⁴ Bruno Latour, "How to Write 'The Prince' for Machines as well as for Machinations," in Elliott, Brian ed. *Technology, Innovation, and Change: selected papers from a seminar organized by the University of Edinburgh, Centre of Canadian Studies* (Edinburgh: Edinburgh University Press, 1986).

²⁵ I have adapted this idea from Zygmunt Bauman, *Intimations of Postmodernity* (London and New York: Routledge, 1992), xvi.

²⁶ For a classic study of British agricultural science see Sir John Edward Russell, *A history of agricultural science in Great Britain, 1620-1954* (London: Allen and Unwin, 1966). For a decent overview of plant breeding work around the world consult F.G.H. Lupton ed., *Wheat Breeding: Its Scientific Basis* (London and New York: Chapman and Hall, 1987). Also, for Farrar's important work Edgars Dunsdorfs' *The Australian Wheat-Growing Industry, 1788-1948* (Melbourne: The University Press, 1956) remains a valuable source of information.

²⁷ Some fifteen million acres were brought under wheat production in Canada during that period. For a dated but still very useful account of acreage movements in the early twentieth century see Wilfred Malenbaum's classic *The World Wheat Economy, 1885-1939* (Cambridge, Mass: Harvard University Press, 1953).

²⁸ William Crookes raised the Malthusian 'bogey' in his 1898 Presidential address to the British Association. He expanded on his remarks in a publication one year later, in which he made special reference to the slow expansion of wheat acreage in Canada's North-West: *The Wheat Problem: Based on Remarks Made in the Presidential Address to the British Association at Bristol in 1898* (London: John Murray, 1899), 24. See Arthur Henry Reginald Buller, *Essays on wheat, including the discovery and introduction of marquis wheat, the early history of wheat-growing in Manitoba, wheat in western Canada, the origin of red bobs and kitchener, and the wild wheat of Palestine* (New York: The MacMillan Company, 1919) for a decidedly hagiographic treatment of wheat breeding.

²⁹ This statistic appears in many different places. I have drawn it from the transcript of a radio address, given by Newman, under the title "The Part Played by the Plant Breeder in Reducing Farm Costs," broadcast under the auspices of the Professional Institute on March 28, 1933, on C.N.R.O. radio. The document is in possession of the author. The American statistic is taken from U.S., Department of Agriculture, *Distribution of the Classes and Varieties of Wheat in the United States*, Department Bulletin No. 1498 (Washington, D.C.: GPO, 1929).

³⁰ By the early 1920s settlement had straddled the transitional zones between chernozemic and luvisolic soils, the latter a barometer of higher rainfall, and, subsequently, more woody vegetation such as aspen and poplar. For a complete overview of the Canadian system of soil classification, which differs from that of the U.S., see

Canada, Department of Agriculture Research Branch, *The Soils of Canada* (Ottawa: 1977).

³¹ Ibid. 75

³² Letter from L. H. Newman to J. L. Parker, September 23, 1924, National Archives of Canada (hereafter, NAC), RG 17, Volume 3947, File “Garnet Wheat – General, 1924-1928”.

³³ Report entitled, “Tests of Special Lots of Marquis and Garnet Wheat shipped from Scott, Sask.”, NAC, RG 17, Vol. 3947, File “Garnet Wheat – General”.

³⁴ Letter from Pillsbury Co. to L. H. Newman, March 30, 1926, Ibid.

³⁵ L. H. Newman to all members of Parliament and senators, April 29, 1926, RG 17, Vol. 3947, File “1924-1928”.

³⁶ Ibid.

³⁷ Frank Shutt to L. H. Newman, May 3rd 1926, Ibid.

³⁸ W. A. Fraser to L. H. Newman, My 5, 1926, Ibid.

³⁹ From Proprietor of the Gold Note Stock Farm to L. H. Newman, May 11, 1926, Ibid.

⁴⁰ Daston, *Biographies*, 6.

⁴¹ For an important study on the political significance of explicit criteria of judgment versus tacit knowledge and cultivated expertise see Ted Porter *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton, N.J.: Princeton University Press, 1995).

⁴² J. B. Spencer to L. H. Newman, May 3, 1926, RG 17, Vol. 3947, file “Garnet Wheat General.” The reduction of large holes and, conversely, the assurance of a smoother texture, became a central theme in a 1940s Wonder Bread advertising campaign. At the heart of the matter were hitherto unidentified, or in any case undeclared, problems of modern existence, such as the problem of jam seepage.

⁴³ John C. Hopkins to L. H. Newman, May 5 1926, Ibid.

⁴⁴ Letter from the Editor to L. H. Newman, May 10 1926, NAC, RG 17, Volume 3947, File “Garnet Wheat – General, 1924-1928”

⁴⁵ W. J. Black to L. H. Newman, May 4 1926, Ibid.

⁴⁶ These figures were reported in an article in the Brandon, Manitoba *Weekly Sun*, October 4, 1928. For an overview of the federal government’s soldier resettlement scheme see Department of Trade and Commerce, Dominion Bureau of Statistics *The Canada Year Book*, (Ottawa) 1920.

⁴⁷ L. H. Newman and A.G.O. Whiteside, *Garnet Wheat: A Promising Variety of Early Maturing Spring Wheat*, Dominion of Canada, Department of Agriculture Bulletin no. 83, 1927.

⁴⁸ Brandon, Manitoba *Weekly Sun*, October 4, 1928.

⁴⁹ The Editor to L. H. Newman, May 31 1926, RG 17, Vol. 3947, file “Garnet Wheat General”.

⁵⁰ Newman pointed this out in a letter of April 21, 1926 to A. J. Banks of Ogilvie Flour Mills, Ibid.

⁵¹ Sir William Crookes, Report of the British Association, as cited in “Report of the Wheat Advisory Committee”, NA, RG 17, Vol. 3076, File 45-2-3.

⁵² Sir William Crookes, Report of the British Association, as cited in “Report of the Wheat Advisory Committee”, NA, RG 17, Vol. 3076, File 45-2-3.

⁵³ Select Standing Committee on Agriculture and Colonization, *Minutes of Proceedings and Evidence and the Report In the matter of an Order of Reference respecting the Grading and Inspection of Wheat and the feasibility of utilizing the protein Content as a basic factor in the grading of wheat*, Appendix No. 7, House of Commons Session, 1928, 2.

⁵⁴ The average spread between No. 1 and No. 2 Northern for the 1927-28 crop year was 5.5 cents.

⁵⁵ James R. Beniger *The Control Revolution: Technological and Economic Origins of the Information Age* (Cambridge, Mass: Harvard University Press, 1986).

⁵⁶ W.R. Motherwell to Leslie Boyd, November 29, 1928, NAC, RG 80, Volume 9, File T14-53

⁵⁷ Ibid.

⁵⁸ This criticism was outlined in a report of the conference authored, presumably, by Newman. The report is in NAC, RG 17, Vol. 3948, file “Garnet Wheat, 1928-1929”.

⁵⁹ The “Report of the Wheat Advisory Committee” cited above is absolutely shot through with connections of

this sort.

⁶⁰ This claim by Newman was made in a letter to editor of the *Manitoba Free Press* on November 23, 1931, NAC, RG 17, Vol. 3948, file “Garnet Wheat, 1930-1932”. He repeated the claim several times, as in a letter of March 19, 1931 to E. B. Ramsay, Chief Commissioner of the BGC, NAC, RG 17, Vol. 3925, file “Dominion Cerealists—Board of Grain Commissioners.”

⁶¹ W.R. Motherwell to Leslie Boyd, November 29, 1928, NAC, RG 80, Volume 9, File T14-53

⁶² W.R. Motherwell to participating European millers and bakers, June 10, 1929, NAC, RG 17, Vol. 3948, file “1929, April, May, June.”

⁶³ NAC, RG 17, Volume 3947, File 1924-1928

⁶⁴ W.R. Motherwell to D. F. Kellner, March 5, 1929, RG 17, vol. 3948, file “1929, April, May, June”.

⁶⁵ W. D. Albright to L. H. Newman, December 17, 1928, NAC, RG 17, Vol. 3948, file “Garnet Wheat, 1928-1929”

⁶⁶ NAC, RG 17, Volume 3948, File “Garnet Wheat 1924-1918”

⁶⁷ A. W. Alcock to L. H. Newman, April 25, 1928, Ibid.

⁶⁸ S.C. DeLong to L. H. Newman, December 4, 1928, NAC, RG 17, Volume 3948, File “Garnet Wheat 1928-1929”

⁶⁹ These statistics were reported later by J. G. Carl Fraser in “The Varietal Composition of Canadian Export Wheat, 1926-1946,” *Scientific Agriculture*, Vol. 29, no. 3 (March, 1949): 97-127

⁷⁰ Unidentified press clipping in NAC, RG 17, Vol. 3948, file “1929, April, May, June.”

⁷¹ Letter from E. B. Ramsay to F. C. T. O’Hara, December 6, 1929, NAC RG 80, Volume 9, File T-14-53

⁷² Report by D. W. Kent-Jones is in NAC, RG 17, Volume 3948, File “Garnet Wheat – General – 1928-1929”

⁷³ In a letter of February 18, 1930, A. J. Banks told Newman that he considered the “introduction of Garnet Wheat as a regrettable chapter in the otherwise splendid history of the Cereal Division of our Experimental Farms”: NAC RG 17, Vol. 3948, file “Garnet Wheat – Gen. [1930].

⁷⁴ Canadian National Millers’ Association to Henry Herbert Stevens, September 2, 1930. Appendix “A”, Proceedings of a Conference on the Grading of Garnet Wheat, Winnipeg, September 18, 1930.

⁷⁵ Ramsay to Newman, March 27, 1931. NAC, RG 17, Volume 3925, File “Dominion Cerealists – Board of Grain Commissioners”

⁷⁶ Ibid.

⁷⁷ This was first made clear in a letter from the Deputy Minister of Justice to Jas. Parmelee, Deputy Minister of Trade and Commerce. Parmelee informed Ramsay in a confidential letter dated February 17, 1932: NAC, RG 80, Volume 9, File “Garnet Wheat”.

⁷⁸ L. H. Newman to J.D. Fraser, February 9, 1932, RG 17, Vol. 3948, file “Garnet Wheat, 1930-1932.”

⁷⁹ L. H. Newman to E. B. Ramsay, April 5, 1932, Ibid.

⁸⁰ E. B. Ramsay to Jas. G. Parmelee, June 7th, 1932.

⁸¹²⁸ McFarland to Stevens, March 5, 1935.

⁸² A three-nation race between the USA, Canada and Australia reached a feverish pitch in the early 1930s. Australia convened two separate but related royal commissions, one on ‘bulk handling’ and one on ‘wheat, flour and bread industries’: Western Australia, Royal Commission on the Bulk Handling of Wheat, *Report of the Western Australia Royal Commission on the Bulk Handling of Wheat*, 1935; Australia, Royal Commission on the Wheat, Flour and Bread Industries, *Royal Commission on the Wheat, Flour and Bread Industries, Second Report*, 1934. The USDA assessed the US’s competitive position in: United States, U.S. Bureau of Agricultural Economics, *The Milling and Baking Qualities of World Wheats*, USDA Technical Bulletin No. 197, 1929. From the USDA’s report, it would seem that Argentina was losing ground, unable to segregate wheat of different classes, let alone that of different varieties and protein levels. Argentina investigated this problem a few years later: Argentine Republic, Comision nacional de granos y elevadores, *Industrial Qualities of Argentine Wheat Compared with Canadian and United States Wheats*, 1937.

⁸³ This is philosopher of Science Ian Hacking’s term: Ian Hacking, “The Self-Vindication of the Laboratory Sciences,” in Andrew Pickering, *Science as Practice and Culture* (Chicago: University of Chicago Press,

1992), 30.

⁸⁴ Canada, Dominion Bureau of Statistics, Agriculture Branch, Monthly Bulletin of Agricultural Statistics, October 1936, No. 338, Vol. 29. Garnet wheat sold for anywhere from one to nine cents per bushel less than No. 1 Manitoba, a close rival in terms of hardness, flour yield, and baking strength.