

ACQUIRED CHARACTERS.

THE TRANSMISSION OF KNOWLEDGE.

To the Editor.

Sir—Mr. Belchambers' extensive experience of animal behaviour and the devotion which he has exhibited for so many years to the study of this subject merit the most careful consideration of any views which he may express touching the inheritability of experience. In this matter I believe, however, that Mr. Belchambers' opinion and my own are not nearly so opposed as they may appear to be, and that Mr. Belchambers is laboring under a misapprehension of my opinions due to the extreme difficulty of explaining fully and in non-technical language the actual consequences of the view which I hold, and which the majority of experimental biologists hold, that acquired characters are not inherited.

In considering the possibility of the transmission of inherited experience it must always be most carefully borne in mind that the doctrine of the non-inheritability of acquired characters, which is founded upon an immensely broad and solid basis of experimental fact, was referred only to physical characters, that is, to structural or functional losses or gains due to modifications of the normal environment. These, it is asserted, cannot be inherited, although they may continue to be displayed by generation after generation of animals so long as the unusual environment persists. Now our mental capabilities or potentialities demonstrably depend upon the possession of certain definite structures, the neurones or nerve-cells, and the connections which these nerve-cells form with one another. If certain nerve-cells are absent, or if they fail to establish certain connections with other nerve-cells, then the corresponding intellectual process, or other functional capabilities of our nervous system will necessarily be lacking.

It might be concluded, therefore, that our intellectual capabilities and performances are rigidly marked out before birth, and that training by example or instruction must be without avail. This may indeed be true in certain groups of insects, in which behaviour appears to be utterly stereotyped and unadaptable to circumstances, but in man and the higher animals it is far from being the case, because our cerebral endowments are so enormously in excess of customary requirements that we never call into play the whole of the cerebral apparatus, which is at our disposal. A simple example will suffice to make this clear. Most of us, whether innately (hereditarily) musical or not, could be taught by diligent instruction to play the piano or any other musical instrument in a tolerable, albeit uninspiring fashion. The majority of us have not received such instruction, and the piano, perhaps fortunately, remains silent so far as we are concerned. Now here is a vast group of nerve-cells and connections standing idle because we have never called it into play, and so also with the thousands of other things we might do but do not. Microscopic examination of the brain shows, indeed, that only a fraction of our brain cells are ever used in a lifetime. The trained individual differs from the untrained in the larger proportion of his innate potentialities which have been called into active being.

The nerve-cells will be passed on from generation to generation, but not their functional activity, which is the result of training. An athlete's child is not an athlete without training; a pianist's child is not a pianist without instruction. Professor Pavlov believes that mice trained to run in a particular direction at the ringing of a bell transmit this experience, this functional activity of their nerve-cells, to their progeny, but other investigators exceedingly experienced in this type of research, deny that this is the case, and I am inclined to believe them.

But this does not mean that experience cannot grow and increase from generation to generation, so long as parents, or other elders, possess the capability of passing on their experiences by conscious or unconscious example or, as we do, by deliberate instruction. In this way acquired knowledge may be passed on to the offspring, and the capabilities of the race may increase from generation to generation. One of the greatest obstacles to learning, and indeed to intellectual development of all kinds, is fear. As Mr. Belchambers has pointed out the comparative intractability and unteachability of the wild animal is due in large part to fear. If such an animal is domesticated to the extent of overcoming its fear of man, then its offspring, observing the confident demeanour of the mother, do not experience the panic that her startled scuttles on the approach of man would otherwise have communicated to them. Thus they start with this advantage over their mother, that a needless fear is not implanted in them, and so they are more readily teachable. No physical alteration or new function is inherited, only experience has so ordered their environment that obstacles to training are avoided. Any very young child who sees an adult ob-

viously frightened of thunder or spiders or any other popular bugaboo is apt to acquire from that moment an ineradicable horror of the same phenomenon. On the other hand, I know a case of a little girl whose parents had sedulously avoided communicating any such unreasoning terror to her mind. When one day her father found her affectionately stroking the head of a live snake it occurred to him that a little fear would not have been amiss!

The accumulation of experience transmitted by example, tradition, custom, and precept, which becomes purposeful in man, ultimately creates civilisation, and its increase is the measure of our progress. Nor will this progress cease until every potentiality of every human being then living has been called into activity by the stimulus of his environment. A virtually infinite prospect of advancement thus opens up before us, and so far from being a pessimist I am a most inveterate optimist. Nevertheless this process of accumulation suffers from the disadvantage that, not being innate or inherited, it may be interrupted, or even reversed, and that very rapidly, by social disorder. History abounds with examples of civilisations which have crumbled in a single generation. Surely history is itself a gigantic illustration of the non-inheritability of experience? To those who contend that the view that acquired characters are not inherited imposes humiliating limitations upon our hopes for the betterment of mankind, I would say this:—“Before you sigh in vain for new powers be sure that you are using to the full the potentialities which you already possess. Else, perchance, you would neglect this new gift no less than countless others, which you now possess, and of the very existence of which you are ignorant.” But this admonition does not apply to Mr. Belchambers, who in the face of many discouragements and difficulties has so wholeheartedly devoted himself to the fascinating studies which he has made peculiarly his own. I look forward with the greatest pleasure to accepting Mr. Belchambers' invitation to visit him again in Hamburg Strub and discuss with him once more, and at greater length, the wonderful ways of the many beasts and birds which he has collected around him and domesticated—I am, sir, T. BRALSFORD ROBERTSON, University of Adelaide, July 9.

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LORD KELVIN.

From T. H. SMEATON:—The interesting references to the late Lord Kelvin, which appeared in “The Advertiser” yesterday, awakened dormant memories of occasions when I, as a lad, came under the spell of his personality. The first was at Lamlash, a little highland village on the island of Arran, where one morning, in the early seventies of last century, while a number of us young folks were having a strenuous time running, jumping, putting the stone, and throwing the hammer, a yacht, very dimly seen in the morning mist, rounded the northern point of Holy Island, and beating up the bay, cast anchor some fifty yards from the shore near where we were. Almost as quickly as I write this a dinghy was lowered; a tall, cloaked man and a sailor got into it, and landed. The cloaked man was very lame, and leaned heavily on a big, stout stick; nevertheless, he got over the shingly foreshore with marvellous speed and came straight to us; gave a cordial “Good morning, lads,” and questioned us about what we were doing. Our visitor was none other than Sir William Thompson, whose name was even then a household word. He was a man of striking appearance: tall and, except for lameness in walking, very lithe and upright. Wearing a monocle, his face appeared to be just a little distorted; but he had a ready smile and a knowing look, which put him on good terms with us at once. The next time I saw him was at a public lecture he gave in the City Hall, Glasgow, where I, as a student at the Andersonian University, was present. The subject of the lecture was “Astronomy,” and the thing that most fixed the occasion in my memory was the use that Sir William made of an elderly man who sat near him on the platform. I notice that Mr. Clark in his interesting reminiscence of Lord Kelvin, mentions his wonderful mental ability in calculating, and I wonder whether my memory is at fault in the matter I am about to mention. Sir William Kelvin was not a fluent lecturer; his manner was jerky and his delivery halting; but there was a fascination about him as he dealt with the subject of which he was master, which made his audience oblivious to these mechanical defects. What struck me most was the use he made of the old gentleman whom I have mentioned. Sir William did not seem to have a memory

for figures, and time and again he turned to this somewhat commonplace-looking man, who appeared to have just what was wanted on the tip of his tongue, and supplied it instantly. Perhaps Mr. Clark may be able to say something on the point.

UNIVERSITY MEN AND THE CIVIL SERVICE.

From Professor R. W. CHAPMAN, Adelaide University:—There is much in the letter of Mr. E. S. Rusk with which I quite agree, and I am somewhat at a loss to know how he got the idea that I said or implied that University graduates only were fitted to hold the responsible posts of the Civil Service. What I said in effect was this: We as a community apparently think, as evidenced by the financial support we give to it, that University training is a desirable thing for considerable numbers of our young men and women. We also have a very large Civil Service and it is in our interest that its officers should be well educated and efficient. Is it not, therefore, reasonable that we should encourage a certain proportion of University graduates to enter that service? Many of them enter the Departments of Education and engineering, but they should be desirable recruits in other departments. At present they are handicapped by the loss of seniority due to the years spent at the University. I quite agree that those qualities that go to make a leader of men are not necessarily found in the University graduate, but on the other hand I think that the young men fortunate enough to possess them will acquire a broader outlook and be all the better for a University training. We want the men who can both do and think.

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At the invitation of the Rockefeller Foundation, the Federal Director of Public Health (Dr. Cumpston) will leave Melbourne on Tuesday, on a visit to the United States of America. It is believed that the compliment has been paid to Dr. Cumpston at the suggestion of the scientists of the Foundation, who have been prosecuting health researches in Australia for several years. The Federal Public Health Department has co-operated with the Foundation researchers. Dr. Cumpston will be the guest of the Foundation. He has been asked to indicate places in the United States which he particularly wishes to visit, and the subjects he desires to study. The Federal Ministry has not only given the Director permission to accept the invitation, but has instructed him to investigate public health matters in Canada, Great Britain, and Europe. He will pay particular attention to public health administration, and will also investigate the latest treatments for cancer, tuberculosis, venereal disease, and diabetes.

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THE VALUE OF MUSIC.

EXPRESSION OF MAN'S DEEPEST EMOTIONS.

“BOILING OIL” FOR JAZZ MUSICIANS.

Sydney, July 10. Speaking at a luncheon given in his honor at the Hotel Australia by Messrs. Rupert and Ronald Beale, Dr. E. Harold Davies (Director of the Elder Conservatorium, Adelaide) dwelt on “the dignity of music.”

Dr. Davies said there was still a lurking tendency to regard the musician as more or less of a vagabond, whose sole vocation was to tickle the ears of the thoughtless crowd with a strolling minstrel song or a fiddler's tune, and whose sole reward was whatever dole heedless charity might bestow of kicks or halfpence. He admitted there were stars in the musical firmament who received disproportionate rewards, and there were social fashions which did not discriminate as to merit, but the rank and file of earnest musicians remained for the most part a struggling and poorly paid fraternity. Music, far from being an amusement or a light and harmless occupation, was a great art which expressed man's deepest emotions.

Mr. Arundel Orchard (Director of the State Conservatorium) put in a plea for the “boiling in oil of those scoundrels who degraded music by jazzing it.” The man who defaced a picture in the Art Gallery would be sent to goal. Why not a man who defaced a musical masterpiece?

MEAT DIET.

New Cure for Scurvy.

Stefansson's Startling Statements.

Mr. V. Stefansson addressed a meeting of the Graduates' Association at the University of Adelaide on Friday evening. Professor Brailsford Robertson presided over a large attendance.

Mr. Stefansson, in characteristically entertaining style, with many anecdotes, and frequent shafts of wit spoke of his dietary experiences and experiments while in the arctic regions. He said that if anatomists were cannibals—as most of them were not—they would know certain facts about marrow, which his companions and he had discovered, but which were not generally known to anatomists. After cracking marrow bones of many years, he and his men had become such expert judges of marrow, that if one were to give him a little bit of marrow in a dark room he could tell precisely the bone which the marrow came from—if the animal were one familiar to him, and had been in good condition. That was an interesting point which was well known to the contemporaries of King Arthur, although it was not generally known to-day. In introducing the subject of his various arctic trips, the lecturer dealt interestingly with his early experiences, and the diverse studies to which at different times he had turned his attention. A study of teeth discovered in the skulls of Eskimos who had died prior to the introduction of groceries, revealed an entire absence of dental caries and very little pyorrhea. The comparison of the teeth of Eskimos who had eaten groceries and mixed foods which had been subsequently introduced indicated the dire effects which the more civilized food had wrought.

Overcoming Prejudices.

The lecturer related how before he went to the north he had two dietary prejudices. He could not eat fish nor drink chocolate. When he joined the expedition to Alaska, however, he encountered circumstances which compelled him to adopt an exclusive fish dietary. He found great difficulty in becoming accustomed to the fish, and he felt that if only he could get some salt it would not be so bad. He almost expected to die from lack of salt, and his experiments in boiling down sea water were not too successful. (Laughter.) There was, however, an Eskimo who had some salt. He procured some, and his next meal was very enjoyable. The following meal had nearly been completed, however, when he remembered the salt. Thereafter he dispensed entirely with it. It was therefore merely a matter of psychology. Later he tried seasoning food for the Eskimos to see if they would refuse it. They were very polite and explained that they did not like salt meat. He had looked into the subject since from the anthropological standpoint and found that in the northern half of the United States and Canada many of the early tribes abominated salt. In their ice explorations when they left the ship tobacco, bread, and salt were left behind, and after a fortnight the men would long for a smoke. It seemed equally difficult to break the bread, salt, or tobacco habit. They lived on 100 per cent. meat and water. It was a superstition that all grazing animals needed salt. He had talked with certain physiologists who did not like his facts because they did not fit their theories. Living on 100 per cent. meat required a little explanation. The period of his Arctic life in which he had lived on nothing but meat, approximated nine years. His custom of returning from his polar trips was to get into touch with specialists to brush up on what had been going on in the scientific world during his absence. On one occasion he met a physiologist who had just proved that it was impossible for a man to live on an exclusive meat diet. He said he was very sorry, but had he known that he would not have done so. (Laughter.) He had broken in about 20 young men of various nationalities on a diet of meat, including fish and water. They ate square meals at first, gradually lessening the quantities, then they became gloomy and greasy, but as there was no alternative, no benevolent physicians standing around, they then ate nothing for a while. In a few weeks they returned to a meat diet and relished it.

Nothing Like Meat.

The question had been raised, proceeded the explorer, as to whether it was worth while. Did not the one article of food alone get monotonous. He would reply to that by asking, “Did a Chinaman get tired of rice?” The answer was that there were nothing else to eat they did not get tired of it. At the end of five years they agreed that there was nothing